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Trends and Prospects of Attracting Foreign Investment in Arctic Megaprojects under Geopolitical Tension

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Abstract. The article analyzes the participation of foreign investors in the implementation of investment projects in the Arctic zone of the Russian Federation. The features of organizing foreign investments at the regional level are considered. The dynamics of indicators of attracting foreign investment in the Russian Arctic in 2016–2021 is analyzed. It is noted that in the last few years, the attraction of loans from foreign banks has decreased to a minimum, and the entire volume of investment was carried out at the expense of direct investments by foreign investors in large megaprojects of the Russian Arctic. The situation with the involvement of foreign investors in Arctic projects in the context of geopolitical tensions in 2022 is assessed. It is concluded that Western companies are currently withdrawing their assets from joint Arctic projects, while the potential for investment cooperation with Asian, Latin American and Turkish partners in the Arctic zone of the Russian Federation is increasing. It has been established that the withdrawal of Western investors from joint Arctic projects carries not only financial risks associated with the search for new sources of investment, but also technological risks that necessitate the development of alternative options for obtaining the necessary equipment. As ways to overcome the difficulties associated with the withdrawal of Western investors from Russian Arctic projects, it is proposed to intensify direct state financing of the implementation of infrastructure facilities based on the program method, as well as to direct efforts to create interstate mechanisms for financing large Arctic projects with friendly countries interested in the development of Arctic policy within the framework of existing BRICS and SCO associations.
Keywords: *AZRF, foreign investors, direct investments, Arctic megaprojects, sanctions, investment risks*

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Introduction

The Arctic is an area of strategic interests of Russia, the importance of which has been steadily increasing over the past decades. A significant resource potential of our country is concentrated here, a complex of infrastructure projects is being implemented to ensure the functioning of the Northern Sea Route [1, Drozdova I.V., Alievskaya N.V., Belova N.E.]. At the same time, the Arctic territories are characterized by difficult conditions for economic activity and high cost of

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implementation of large-scale projects, which determines the particular importance of attracting investment resources to ensure the necessary pace of economic development of these territories. The high investment demand [2, Krasulina O.Yu.] and the presence of large-scale, technologically complex infrastructure and industrial projects increase the importance of attracting foreign capital to the Russian Arctic, which not only activates investment processes, but also contributes to the modernization of the technological base of the economy of the regions of the Arctic Zone of the Russian Federation (ASRF), as well as ensures the introduction of unique technologies and innovative solutions.

It should be noted that the Russian part of the Arctic, unlike the northernmost territories belonging to the United States, Canada, Denmark, Norway, has until recently been quite open to foreign investors. Other countries have never created attractive conditions for foreign investors in their Arctic territories (Svalbard, Greenland, Alaska, the northern lands of Canada). The main reason for this is the policy of protectionism and the desire to maintain control over the resource base of the Arctic, which in recent years has been considered by many non-Arctic countries (primarily China) as a zone of common international interests. The Russian authorities considered the attraction of foreign capital for the implementation of large projects on our territory as a favorable factor in the development of the Russian Arctic.

The high attractiveness of the Arctic territories for foreign investors has been repeatedly noted in various strategic documents and numerous scientific studies [3, Ryzhova A.V.; 4, Kudryashova E.V., Zarubina L.A., Sivobrova I.A.]. The increasing interest of foreign investors in the Russian Arctic is also facilitated by global processes that affect the demand for Arctic resources and infrastructure, including the growing importance of transportation along the Northern Sea Route in the context of melting polar ice and the modernization of the icebreaker fleet capable of year-round navigation in the northern seas, the emergence new oil and gas production technologies that provide the possibility of developing hard-to-reach fields, as well as the availability of unique natural resources, the demand for which will grow in the coming years. However, recent geopolitical events associated with the aggravation of international relations, as well as the sanctions war, can have a significant impact on the prospects for the participation of major international corporations in the implementation of Russian Arctic projects. Under these conditions, the state policy aimed at attracting foreign capital and increasing the investment attractiveness of the Russian Arctic is of particular relevance. It should ensure the inflow of the necessary investment and the introduction of advanced world-class technological solutions as well as provide a sufficient degree of financial security and an acceptable level of technological independence of our country in relation to the development of the Arctic territories.

Features of organizing foreign investment at the regional level

Foreign investment is one of the sources of investment financing in modern practice. According to Russian legislation, foreign investment is defined as the investment of foreign capital

carried out by a foreign investor directly and independently in an object of entrepreneurial activity in the Russian Federation in the form of objects of civil rights owned by a foreign investor, if such objects of civil rights are not withdrawn from circulation or are not restricted in the Russian Federation [1]. Thus, the main criterion for classifying investments as foreign is the state affiliation of the entity making the investment, which is different from Russia.

The scientific literature devotes considerable attention to the issues of foreign investment. For foreign investments, as well as for investments in general, classifications and evaluation methods are used that allow analyzing the dynamics, structure and effectiveness of their implementation. Thus, according to the nature of participation in projects, there are direct and portfolio foreign investments; according to the period of implementation — short-term and long-term ones; according to the type of investment object — real investments, financial investments, investments in intangible assets.

Currently, the main issues of regulating the process of attracting foreign investment are referred to the federal level, but the Federal Law of July 9, 1999 N 160-FZ “On foreign investments in the Russian Federation” states that the constituent entities of the Russian Federation have the right to adopt laws and other legal acts regulating foreign investments on the issues falling under their competence, as well as the joint jurisdiction of the Russian Federation and the constituent entities of the Russian Federation, in accordance with the legislation. Despite the fact that the list of such issues is not fixed in the law, the analysis of regulatory practice shows that the regions are forming legislation specifying federal laws in the field of identifying priority areas for investment for a constituent entity of the Russian Federation, establishing a list of regional guarantees and benefits for investors, forming a set of mechanisms to increase attractiveness and improvement of the investment climate in certain territories. As a rule, benefits and preferences for investors include tax exemptions, certain conditions for the use of land plots and state property. However, as practice shows, regional investment legislation is generally not specified for foreign investors, but considers this category on an equal footing with Russian investors. Only in a small number of regions (for example, the Novgorod Oblast, the Republic of Tatarstan) provide specific conditions for foreign entities to carry out investment activities [2].

Despite the fact that federal legislation is focused on regulating the basic guarantees and rights of foreign investors on the territory of the Russian Federation as a whole, and most of the scientific research is devoted to the methodological basis for organizing foreign investment at the federal level, the issues of involving foreign capital in investment processes at the level of individ-

[1] Ob inostrannykh investitsiyakh v Rossiyskoy Federatsii: Feder. zakon ot 9 iyulya 1999 g. № 160-FZ: prinyat Gos. Dumoy 25 iyunya 1999 g.: odobren Sovetom Federatsii 9 iyulya 1999 g.: [red. ot 2 iyulya 2021 g.] [On foreign investment in the Russian Federation: Feder. law of July 9, 1999 No. 160-FZ: adopted by the State. Duma June 25, 1999: approved by the Federation Council July 9, 1999: [ed. dated July 2, 2021]. Collection of Legislation of the Russian Federation, 1999, No. 28, art. 3493.

[2] Tagasheva O.V. Kommentariy k federal'nomu zakonu ot 9 iyulya 1999 g. N 160-FZ «Ob inostrannykh investitsiyakh v Rossiyskoy Federatsii» [Commentary on the Federal Law of July 9, 1999 N 160-FZ "On foreign investments in the Russian Federation"]. URL: https://pandia.ru/text/77/203/77262-3.php (accessed 12 August 2022).

ual regions, as well as increasing the investment attractiveness of specific territories for international actors are important and relevant. This situation is caused by the diversity of investment activities in various constituent entities of the Russian Federation, a significant differentiation in the investment attractiveness of certain territories, as well as a significant difference in indicators characterizing the effectiveness of attracting foreign capital into investment processes in certain regions. Under these conditions, it is necessary to take into account regional specifics and interests, which should be translated into clearly formulated sectoral and territorial priorities for stimulating foreign direct investment at the national and regional levels [5, Bashina O.E., Matraeva L.V., Alyabyeva A.V., p. 21].

A significant amount of scientific work is devoted to assessing the impact that foreign investment has on the development of individual territories. The attraction of foreign capital in the form of direct investment contributes to the formation of a sufficient financial base for the implementation of large-scale projects in the region, the creation of new jobs, the organization of high-tech joint ventures based on world leading innovative solutions, the increase in the overall financial potential of the territory. In recent years, studies have been published that have established a relationship between the volume of foreign investment attracted to the region and the economic growth rates (GRP) [6, Koroleva G.A., Titov A.V.], employment [7, Abdullaev G.S., Chernetsova N.S.], average wages [8, Khramchenko A.A., Kukhtinova A.A., Simakova A.A.].

However, attracting foreign capital to finance investment in fixed assets for the regions is associated with certain risks; the risks of increased financial and technological dependence on foreign corporations and states, which in the current environment can be used for economic and political pressure, should be primarily highlighted.

Foreign investments, on the one hand, are considered as a significant factor in the development of a certain territory [9, Olkhovik V.V., Lyutova O.I., Juchnevicius E.]. On the other hand, they act as a certain indicator characterizing the economic attractiveness of a particular region for an investor. As a rule, the higher the economic potential of the territory is, the more stable the conditions of economic activity are, the greater is the interest of foreign investors in making investments. Scientific literature distinguishes a large number of factors determining the attractiveness of the territory for foreign investors [10, Pozdnyakov K.K., p. 10; 11, Abdullina A.R., p. 1250], among which are:

- level and potential of economic development of the territory;
- nature and type of economic specialization;
- availability of large industrial enterprises and attractive investment projects;
- level of financial infrastructure development;
- development of private property institute and the degree of state participation in economic processes;
- stability of legislation, political and economic situation in the region;
- privileges and preferences granted to foreign investors;

- territorial location of the region, proximity to financial centers, main transport arteries, border position and involvement of the region in international relations.

The work of I.M. Drapkin and E.O. Dubinina [12] presents an appropriate classification of factors that determine the attractiveness of a particular territory for foreign investors and distinguish three groups of factors: economic factors, institutional factors and factors that define the similarity of territories (countries), determining the foreign investors' ownership and the location of the investment object.

A significant number of factors affecting the attractiveness of the territory for foreign investors prevent the application of uniform standardized tools to attract foreign capital for all regions. When in most regions a large share of foreign capital is accounted for by several large investors participating, as a rule, in large regional infrastructure and industrial projects, targeted regulation of interaction with foreign entities and targeted measures to increase the investment attractiveness of a certain territory come to the fore [13, Izotov D.A.]. Typically, the system of such measures includes tools for forming benefits and preferences for foreign companies, providing state guarantees for investors, and achieving interstate agreements that contribute to the activation of interaction between business structures. In this regard, the synthesis of efforts of the state authorities of various levels and the largest Russian companies in the field of ensuring optimal interaction with foreign partners is of particular importance for the regional level to intensify the processes of attracting foreign capital.

Dynamics of foreign investments in the Arctic zone of the Russian Federation

Foreign investments as a source of formation of the financial base for the implementation of megaprojects in the Russian Arctic have been characterized by an extremely uneven character in recent years [14, Serova N.A., Gutov S.V., p. 85]. The dynamics of foreign investment was influenced by several macroeconomic factors, such as the increase in international environmental standards in the implementation of projects in the Arctic and, consequently, the imposition of restrictions on the participation of the largest credit institutions in financing many economically attractive projects, the outflow of international capital from the markets of developing countries, significant price fluctuations in key commodity markets and a decrease in interest in high-risk projects. Currently, Russia's tense relations with Western countries and the sanctions that have been imposed are creating additional difficulties in attracting investment resources for large megaprojects in the Arctic.

Fig. 1 shows the dynamics of foreign investments in fixed assets in the Russian Arctic.

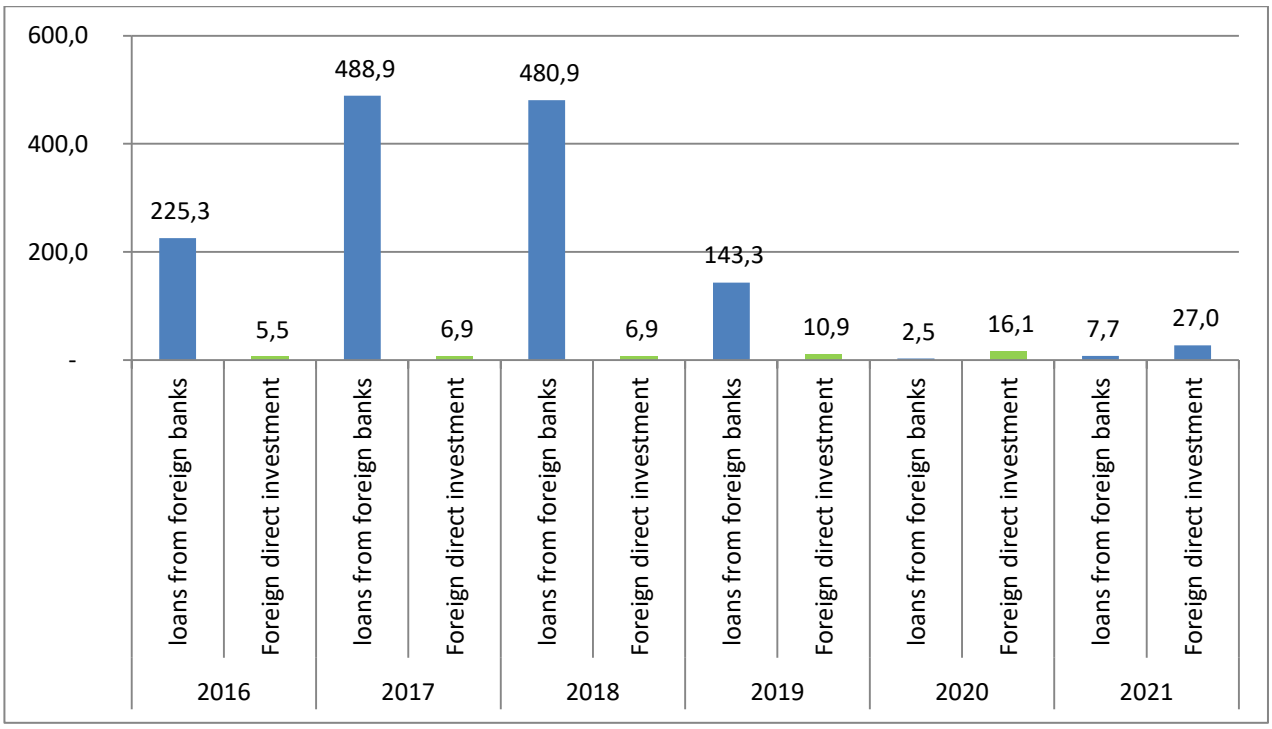

Fig. 1. Dynamics of foreign investments in fixed capital in the Russian Arctic, billion rubles [3].

The presented data indicate several trends in the dynamics of foreign investments in fixed assets in the Russian Arctic.

First, the volume of foreign bank loans to finance investment in non-financial assets declined to a minimum in 2020–2021. The peak values of loans from foreign banks as a source of financing investments in fixed assets occur in 2017–2018. It should be noted that the share of this source in the overall structure of real investment financing in these years reached 33%, which was about 6 times higher than the average Russian level. It should be noted that more than 99% of the total volume of foreign bank loans allocated for investment purposes in these years accounts for the Yamalo-Nenets Autonomous Okrug, where a significant part of the Yamal LNG project was financed from this source (the project was actively financed by Asian credit institutions (Japanese Bank for International Cooperation JBIC, Export-Import Bank of China and China Development Bank) and European financial institutions (in particular, Italian bank Intesa Sanpaolo, European bank Intesa, French bank Coface). When the project was finished, the amount of foreign bank loans used as a source of financing for fixed investment decreased by more than 50 times by 2021.

Foreign direct investment as a source of funding in 2016–2021 has tended to increase steadily. Over six years, the volume of investments from abroad increased five-fold to 27 billion rubles. The share of this source of investment in fixed assets in the Russian Arctic increased from 0.4% in 2016 to 1.4% in 2021 (similar values for Russia as a whole in 2016 and 2021 were 0.8% and 0.4%, respectively). In general, the high diversification of the activity of foreign investors in certain regions of the Russian Arctic should be noted. In particular, the values of the indicator of direct

[3] Source: compiled by the author based on Rosstat indicators: Rosstat. Official statistics for the Arctic zone of the Russian Federation. URL: https://rosstat.gov.ru/storage/mediabank/Calendar1_2022(4).htm (accessed 10 August 2022).

investment in 2021 for the Arctic regions of the Russian Federation differ by several orders of magnitude (Table 1).

Table 1

Inflow of direct investments into the Russian Federation: transactions by constituent entities where residents are registered (according to the balance of payments of the Russian Federation), USD mln

	2018	2019	2020	2021
RUSSIAN FEDERATION	140 079	185 547	206 907	188 711
including:				
Republic of Karelia	31	34	32	44
Komi Republic	689	288	46	219
Arhangelsk Oblast	30	28	852	64
Nenets Autonomous Okrug	0	0	836	0
Arkhangelsk Oblast without data for the Nenets Autonomous Okrug	30	28	15	64
Murmansk Oblast	62	32	66	107
Yamalo-Nenets Autonomous Okrug	9 763	9 253	7 710	6 524
Krasnoyarsk Krai	5 897	5 751	12 691	3 625
Republic of Sakha (Yakutia)	351	1 168	1 114	652
Chukotka Autonomous Okrug	250	47	38	50

It should be noted that the data in Table 1 reflect the flow of direct investment in the regions according to the place of registration of the subject. The territorial distribution of investments in the Arctic differs significantly from the data presented. Thus, the largest share of investments from abroad in the AZRF accounts for the Yamalo-Nenets Autonomous Okrug (foreign investors take an active part in the implementation of large gas and oil production projects), the Murmansk Oblast (with the attraction of foreign investments, Novatek implements infrastructure projects on the western coast of the Kola Bay as part of the creation of the Murmansk transport hub), Chukotka Autonomous Okrug (foreign investments prevail in the region's flagship project — the construction of the Baimskiy mining and processing plant based on the Peschanka deposit). The Krasnoyarsk Krai and the Republic of Sakha (Yakutia), which are characterized by significant amounts of foreign capital, are difficult to fully consider as Arctic regions, since a fairly large part of foreign investment in them falls on the southern territories.

The largest investment projects currently being implemented in the Russian Arctic are the Vostok Oil production project, as well as two natural gas liquefaction projects, Yamal LNG and Arctic LNG-2. These projects are not only the largest in the Russian Arctic, but also in Russia as a whole [4], the total cost of implementing these three projects is estimated at about 13.5 trillion rubles. All three projects provide for the participation of the largest foreign investors along with Russian companies (Table 2).

[4] 30 krupneyshikh investitsionnykh proektov, realizuemykh v Rossii. Material Vestnika ekonomiki Evraziyskogo soyuza [30 largest investment projects implemented in Russia. Material of the Journal of Economics of the Eurasian Union]. URL: https://eurasianmagazine.ru/ratings/30-krupneyshikh-investitsionnykh-proektov-realizuemykh-v-rossii/ (accessed 14 August 2022).

Table 2

Participation of foreign investors in the largest investment projects in the Russian Arctic (as of 01.01.2022 01.01.2022)

Investment project	Project content	Cost of project implementation, trillion rubles	Russian share of the project	Share of foreign partners
Vostok Oil	Includes the resource base of the largest fields in the Vankor cluster (Vankorskoe, Suzunskoe, Tagulskoe and Lodochnoe), as well as promising oil fields in the north of the Krasnoyarsk Krai (Payakhskaya group of fields and Zapadno-Irkinskiy area).	10.0	PJSC Rosneft (share – more than 51%)	Trafigura (Singapore) — 10.0% Vitol S.A. (Switzerland-Netherlands) and Mercantile&Maritime Energy Pte. Ltd. (Singapore) — 5.0%
Yamal LNG	The second after Sakhalin-2 and the largest operating LNG project in Russia. The resource base of the project is the Yuzhno-Tambeyskoe field in the northeast of the Yamal Peninsula.	2.0	PJSC Novatek (share – 50.1%)	CNPC (China) — 20% TotalEnergies (France) — 20% Silk Road Fund (China) — 9.9%
Arctic LNG-2	Provides for the construction of three technological lines for the production of liquefied natural gas. The resource base is the Utrennee deposit located on the Gydan Peninsula in the Yamalo-Nenets Autonomous Okrug.	1.575	PJSC Novatek (share – 60%)	CNODC Ltd (China) — 10% CNOOC Ltd (China) — 10% TotalEnergies (France) — 10% Mitsui and JOGMEC (Japan) — 10%

Sales of shares in Arctic projects to foreign partners have been among the largest deals with foreign entities in recent years. For example, three deals for the sale of Novatek's shares in the Arctic LNG-2 production gas project in 2019 were among the top ten deals on the Russian M&A market [5].

It should be noted that most of the projects involving foreign investors are associated with the extraction of natural resources, or with the implementation of related projects for their transportation or exploration. Other industries in the Arctic remain unattractive to foreign partners. The reasons for this are the low level of development of the territories (lack of developed infrastructure and large markets, high delivery and energy supply costs) and remoteness from financial centers. Among all the Russian Arctic regions, the Murmansk Oblast has been characterized by the highest sectoral diversification of foreign direct investment over the past few decades. This is due to the region's border location and its close links with Scandinavian countries. Thus, a number of projects with foreign investment were implemented in the early 2010s on the basis of a business

[5] Eksperty soobshchili o rezkom roste vlozheniy inostrantsev v rossiyskie aktivy [Experts reported a sharp increase in foreign investment in Russian assets]. URL: https://www.rbc.ru/economics/19/02/2020/5e4bf9e29a7947c2be2ed325 (accessed 15 August 2022).

incubator created jointly with the State Industrial Development Corporation of Norway SIVA. Since 2018, Italian investors (energy concern Enel) have been actively involved in the project to create a wind farm in the region (Italian participation was estimated at 273 million euros). However, in general, the Murmansk Oblast is rather an exception to the general rule, and so far, foreign direct investment in the Russian Arctic is almost entirely realized in projects related to the extraction of natural resources.

Attracting foreign investors to Arctic megaprojects amid geopolitical tensions

Undoubtedly, one of the key events that has had and will have an impact on attracting foreign capital to Russian Arctic projects in the coming years is the special military operation in Ukraine and subsequent imposition of sanctions and restrictions against Russia by a number of countries [15, Krasnopolski B.H.]. The events of February 2022 significantly changed the investment fund in the Arctic and led to a considerable change in the predicted dynamics and structure of financial support for the implementation of investment projects. Several major foreign corporations, primarily from Europe, announced their withdrawal from joint projects with Russian companies.

Let us present summary data on the prospects for the participation of the largest foreign partners in the implementation of the largest investment projects in the Russian Arctic (Table 3).

Table 3

Prospects for participation of the largest foreign investors in the Arctic projects

Foreign investor	Arctic projects involving an investor	Russian partners in the Arctic	Prospects for working in Russia
Equinor (Norway)	Development of the Kharyaginskoe oil field	Zarubezhneft	Completely withdrew from all joint projects
British Petroleum (UK)	Vostok Oil, Taas-Yuryakh — Neftegasodobycha	PJSC Rosneft	Declared withdrawal from all Russian projects. As of September 2022, the withdrawal is incomplete
TotalEnergies (France)	Arctic LNG-2, Yamal LNG, Development of the Kharyaginskoe oil field	PJSC Novatek Zarubezhneft	Withdrew from several large joint projects. Currently retains ownership of some Russian assets.
Trafigura international trader	Vostok Oil	PJSC Rosneft	Withdrew from the Russian projects
Vitol S.A. (Switzerland-Netherlands)	Vostok Oil	PJSC Rosneft	Declared a desire to sell the Russian assets, however, no buyer has been found
Wintershall Dea (Germany)	Development of the Achimovskiy deposits of the Urengoyskoe field	PJSC Gazprom	Continues to participate in projects
Mercantile & Maritime Energy Pte. Ltd. (Singapore).	Vostok Oil	PJSC Rosneft	Continues to operate in Russia
Mitsui (Japan)	Arctic LNG-2	PJSC Novatek	Continues to participate in

			projects
JOGMEC (Japan)	Arctic LNG-2	PJSC Novatek	Continues to participate in projects
CNPC (China)	Arctic LNG-2, Yamal LNG	PJSC Novatek	Continues to participate in projects
Silk Road Fund (China)	Yamal LNG	PJSC Novatek	Continues to participate in projects
Oil India, Indian Oil, Bharat Petrore-sources (India)	Vankorskoe oil and gas field, infrastructure projects along the Northern Sea Route	PJSC Rosneft	Continues and expands cooperation with Russian partners

British energy company British Petroleum was one of the first to withdraw from Russian Arctic projects. On February 27, 2022, the company announced the termination of cooperation with PJSC Rosneft. Until February 2022, British Petroleum owned a stake in Rosneft (19.75%), and together with the Russian oil giant owned three companies operating in the Arctic zone of the Russian Federation: Taas-Yuryakh Neftegazodobycha (Republic of Sakha) (British Petroleum owned 20% of the shares), Kharampurneftegaz (Yamalo-Nenets Autonomous Okrug) (British Petroleum owned 49%), and Yermak Neftegaz (registered in Moscow; Arctic geological exploration) (British Petroleum owned 49%). The sale of shares in these companies led to the withdrawal of British Petroleum from one of the largest Arctic oil projects implemented by Rosneft, Vostok Oil, which is expected to account for about 1/5 of Russia's total oil production by 2030. According to the company's top management, the total losses of British Petroleum as a result of termination of operations in Russia could be up to 25 billion dollars.

At the end of February 2022, Norwegian companies announced their termination of participation in the projects in Russia. The largest Norwegian international energy company Equinor has suspended cooperation on joint projects with the Russian corporation Rosneft. The companies have been working together in the Arctic since 2012, when they signed an agreement on joint projects. During its work in Russia, Equinor participated in the development of fields in the Barents (Perseevskiy area) and Okhotsk (Lisyanskiy, Kashevarovskiy and the Magadan-1 areas) seas, the Severo-Komsomolskoe field in the Yamalo-Nenets Autonomous Okrug, the Kharyaginskoe oil field in the Nenets Autonomous Okrug. Despite the fact that some of the Russian Arctic projects, in which Equinor planned to take part, were never implemented for various reasons (non-compliance with environmental requirements, sanctions against Russia of 2014, low commercial attractiveness), the size of the company's assets in Russia at the end of 2021 was estimated at 1.2 billion dollars, and the total losses due to leaving the Russian market, according to the company's financial statements for the first quarter of 2022, amounted to 1.08 billion dollars (of which 251 million are fixed assets and non-material assets, and 832 million — investments) [6]. At the begin-

[6] Norvezhskaya Equinor poteryala bolee milliarda dollarov posle ukhoda iz Rossii [Norwegian Equinor lost more than a billion dollars after leaving Russia]. URL: https://rg.ru/2022/05/04/norvezhskaia-equinor-poteriala-bolee-milliarda-dollarov-posle-uhoda-iz-ros-sii.html?utm_source=yxnews&utm_medium=desktop&utm_referrer=https%3A%2F%2Fyandex.ru%2Fnews%2Fsearch%3Ftext%3D (accessed 17 August 2022).

ning of September 2022, the company announced its complete withdrawal from all Russian projects [7].

In addition to Equinor, other major Norwegian investors announced their withdrawal from Russian projects and the suspension of investment projects. Thus, the Oil Fund of Norway, which has about $3 billion worth of assets in Russian Arctic projects, and Norges Bank Investment Management have started selling off Russian assets since March 2022.

Another major investor in Russian Arctic projects was the French energy corporation TotalEnergies. However, in March 2022, the company announced the gradual suspension of its activities in Russia and the termination of investments in Russian projects. As of September 2022, TotalEnergies sold its 20% stake in the Kharyaginskoe field to the state corporation Zarubezhneft (this allowed the French company to withdraw from its obligations to invest in the project), agreed to sell its 49% stake in Terneftegaz to Novatek (in August 2022, the deal was approved by the Government of the Russian Federation [8]), and also completely abandoned new investments in the Arctic LNG-2 project. At the same time, the company maintains its participation in the Russian gas industry, where TotalEnergies currently owns 19.4% in the capital of the Novatek corporation and shares in joint ventures with it — Yamal LNG (TotalEnergies share — 20%), Arctic LNG-2 (TotalEnergies share — 10%), as well as shares in the LNG transshipment centers being created in Murmansk and Kamchatka [9]. However, TotalEnergies does not eliminate the possibility of complete withdrawal from the Russian market and from joint projects in the future.

The Swiss-Dutch company Vitol, which specializes in oil and oil products trading and invested in the Arctic LNG 2 project until February 2022 as part of a consortium with Mercantile&Maritime Energy Pte. Ltd., announced its withdrawal from the Russian Arctic, as well as the international trader Trafigura (Singapore), which sold its stake in the project in July 2022.

It should be noted that not all foreign partners involved in projects in the Russian Arctic have announced their withdrawal from Russia. So, unlike many of its European counterparts, the German oil and gas company Wintershall Dea stated that it has no plans to exit Russian assets at the moment. The company continues to cooperate with Gazprom in the development of the Yuzhno-Russkoe gas field and holds a 15.5% stake in the Severnyy Potok operator, Nord Stream. Moreover, the company plans to maintain its stake in the joint ventures with Gazprom that are

[7] Energeticheskaya kompaniya Equinor iz Norvegii stala pervoy mezhdunarodnoy neftegazovoy kompaniey, polnost'yu ushedshey s rossiyskogo rynka [Norwegian energy company Equinor became the first international oil and gas company to leave the Russian market completely]. URL: https://smartpress.by/news/28473/ (accessed 18 August 2022).
[8] «Novatek» kupit 49% v «Terneftegaze» u TotalEnergies [Novatek will buy 49% in Terneftegaz from TotalEnergies]. URL: https://tass.ru/ekonomika/15572443?utm_source=yandex.ru&utm_medium=organic&utm_campaign=yandex.ru&utm_referrer=yandex.ru (accessed 19 August 2022).
[9] Total vykhodit iz rossiyskoy nefti [Total exits Russian oil]. URL: https://www.kommersant.ru/doc/5448063 (accessed 20 August 2022).

developing the Achimov deposits of the Urengoyskoe field (Wintershall Dea currently owns 50% of Achimgaz and 25% of AchimDevelopment) [10].

Unlike European and American corporations, after the events of February 2022, many Asian companies not only do not curtail investment activities in the Russian Arctic, but even intensify it. In July 2022, for example, it became known that Trafigura, which held a 10% stake in the Vostok Oil project, had been acquired by Nord Axis Limited, a company registered in Hong Kong [11]. Interest in the implementation of joint projects with the largest Russian companies in the Arctic is shown by Chinese [16, Tulupov D.S.] and Indian [17, Vopilovsky S.S.] investors. In particular, the Chinese CNPC is already the main partner of the Russian company Novatek in the implementation of the largest Arctic projects Arctic LNG-2 and Yamal LNG, while India, represented by large companies Oil India, Indian Oil, Bharat Petroresources, cooperates with Rosneft in the development of oil and gas fields in Yakutia and the implementation of infrastructure projects along the Northern Sea Route (Indian Oil Corporation, ONGC Videsh Ltd., Oil India Limited, Bharat Petroresources own a 49.9% stake in Vankorneft, a subsidiary of Rosneft, which is developing the Vankor oil and gas field; IOC, Oil India Limited, Bharat Petroresources own about 30% in Taas-Yuryakh Neftegazodobycha). In addition, following the announcement of the withdrawal of Western investors from the Arctic projects, companies from these two countries were mentioned as potential buyers of their stakes in Russian projects [12].

Risks and prospects of Arctic megaprojects under geopolitical tensions

Undoubtedly, the imposition of sanctions by Western countries and the withdrawal of many foreign partners have led to a significant increase in the risks of implementing Russian Arctic megaprojects. The main risks associated with the sanctions against Russia by Western countries are shown in Fig. 2.

The first group of risks is financial ones. As practice shows, the development of the Russian Arctic and the implementation of major oil and gas and infrastructure projects on its territory are currently undergoing significant changes due to the withdrawal of major Western corporations from joint projects with Russian companies. According to the most conservative estimates, in the first half of 2022, foreign partners announced the curtailment of investment activities in the Russian Arctic and the withdrawal of assets worth more than 5 billion dollars. In order to mitigate the situation with the withdrawal of major investors from joint projects, the Government of the Russian Federation adopted a set of measures aimed at strengthening control over transactions with

[10] Nemetskaya neftegazovaya kompaniya Wintershall Dea ostanetsya v Rossii [The German oil and gas company Wintershall Dea will remain in Russia]. URL: https://www.forbes.ru/biznes/472729-nemeckaa-neftegazovaa-kompania-wintershall-dea-ostanetsa-v-rossii (accessed 21 August 2022).

[11] Trafigura vyshla iz proekta «Vostok Oyl [Trafigura withdrew from the Vostok Oil project]. URL: https://regnum.ru/news/economy/3646738.html (accessed 22 August 2022).

[12] Analitiki nazvali Kitay naibolee veroyatnym pokupatelem 20% «Rosnefti» u BP [Analysts called China the most likely buyer of BP's 20% stake in Rosneft]. URL: https://www.forbes.ru/biznes/457329-analitiki-nazvali-kitaj-naibolee-veroatnym-pokupatelem-20-rosnefti-u-bp (accessed 23 August 2022).

citizens and companies from non-friendly countries, as well as creating the possibility to seize shares or property of companies that are found to be contrary to Russian interests or threatening the energy or other types of security of our country [13]. However, neither significant financial losses nor risks of initiating legal proceedings due to violation of Russian law could prevent the exit of the largest Western corporations and the withdrawal of invested capital.

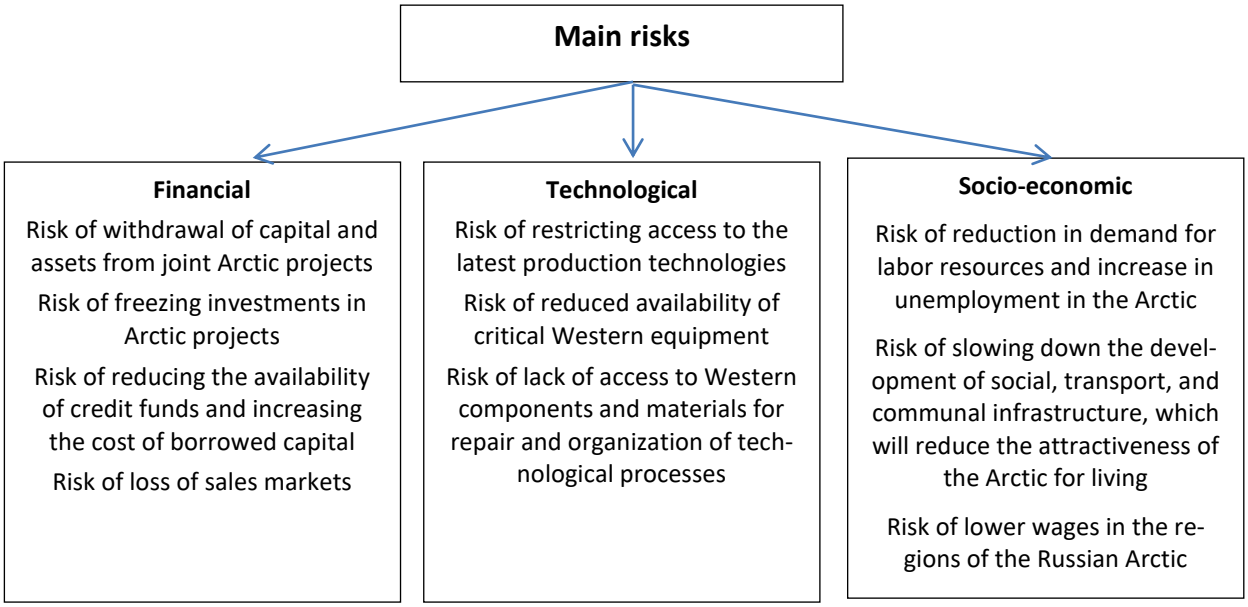

Fig. 2. Main risks in the implementation of Russian Arctic megaprojects due to the withdrawal of the largest Western international corporations [14].

It should be noted that current efforts of the Russian Government and business community are aimed at replacing major Western corporations that have announced their withdrawal from Russian Arctic projects with Asian partners. This was stated, in particular, by the Deputy Chairman of the Security Council of the Russian Federation Dmitriy Medvedev [15], as well as the heads of Russian companies implementing projects in the Arctic. However, at the moment, the investment activity of the largest Chinese corporations in the Arctic is limited by expectations of further development of the geopolitical situation and the possibility of getting under secondary sanctions for cooperation with Russia [16]. In any case, it will be possible to compensate for the outflow of funds from Arctic projects due to the departure of European and American corporations only if the role of the state is intensified by the framework of further building a system of preferences and bene-

[13] O primenenii spetsial'nykh ekonomicheskikh mer v finansovoy i toplivno-energeticheskoy sferakh v svyazi s nedruzhestvennymi deystviyami nekotorykh inostrannykh gosudarstv i mezhdunarodnykh organizatsiy: Ukaz Prezidenta RF ot 5 avgusta 2022 g. № 520 [On the application of special economic measures in the financial and fuel and energy sectors in connection with the unfriendly actions of certain foreign states and international organizations: Decree of the President of the Russian Federation of 5 August 2022. No. 520].

[14] Source: compiled by the author.

[15] Medvedev nazval "mezhdusoboychikom" vozobnovlenie raboty Arkticheskogo soveta bez RF [Medvedev called the resumption of the work of the Arctic Council without the Russian Federation a "closed-door deal]. URL: https://www.interfax.ru/russia/846233 (accessed 25 August 2022).

[16] SCMP uznala o vozmozhnoy priostanovke uchastiya kitaytsev v «Arktik SPG 2» [The SCMP has learned of a possible suspension of Chinese participation in Arctic LNG 2]. URL: https://www.rbc.ru/business/22/05/2022/628a15569a7947702824b736 (accessed 26 August 2022).

fits for companies investing in Arctic projects and direct financing of the development of the Arctic using program mechanisms of state regulation. At the same time, it should be noted that the prospects for the adoption of new measures of state support for Arctic projects largely depend on macroeconomic indicators, primarily prices in the commodity markets, the duration and intensity of the special military operation in Ukraine, as well as the degree of budgetary sustainability and economic growth potential.

It should be noted that the withdrawal of Western partners leads not only to a direct outflow of financial resources, but also exacerbates other significant risks of the implementation of Arctic megaprojects. In particular, they are technological risks and, above all, the loss of access to many technologies and unique equipment that were used in the implementation of Arctic megaprojects. However, it will be possible to fully assess the criticality of international corporations leaving Arctic projects only in the medium term.

In addition, the outflow of foreign capital has an indirect impact on the growth of socio-economic risks. This is explained by the fact that large megaprojects significantly affect the socio-economic processes in the Arctic regions, including employment, development of auxiliary industries, formation of a settlement structure, etc. The departure of foreign investors will negatively affect the development of infrastructure in the areas where projects are implemented, which, of course, will reduce the attractiveness of the Arctic territories for living.

It should be noted that the degree of influence of sanctions risks on the development of the largest Russian megaprojects varies significantly. The prospects for each of the three largest Arctic projects are presented in Table 4.

Table 4

Risks and prospects for the implementation of the largest megaprojects in the Russian Arctic

Project	Foreign partners who left (announced their withdrawal) after 24.02.2022	Implementation risks	Development prospects
Vostok Oil	Consortium of companies Vitol S.A. (Switzerland-Netherlands) and Mercantile&Maritime Energy Pte. Ltd. (Singapore). Trafigura international trader. British Petroleum (UK)	Insignificant. Equipment for drilling in the Far North is produced in Russia. Withdrawal of capital upon exit of foreign partners is offset by interest from Asian investors (China / India / Qatar)	Declared the preservation of the timing and pace of the project
Arctic LNG-2	Departure of contractors – engineering companies Technip, Saipem, Linde, equipment supplier Baker Hughes	Significant. Associated with the ban on the supply of equipment for large-capacity plants. Difficulties in the construction of gravity-type LNG lines and energy supply for the project	TotalEnergies (France), CNPC (China), Mitsui and JOGMEC (Japan) remain involved in the project, however, they have refused new investments. Nova energies controlled

			by NIPIGAZ, Green Energy Solutions LLC (UAE), Karpowership (Turkey) were involved as contractors. Due to technological risks, the timing of the project implementation has been shifted
Yamal LNG	Departure of Western process contractors, including equipment supplier Baker Hughes	Medium. Associated with limited maintenance capabilities of the equipment used, a reduction in demand for LNG, as well as the refusal of Western partners to invest in new fields	CNPC (China), TotalEnergies (France), Silk Road Fund (China) retain their participation in the project. Announced the preservation of the volume of production and shipment of LNG

Sanctions and withdrawal of Western partners, according to the management of Rosneft, will not have a significant impact on the timing and pace of implementation of one of the largest Arctic projects, Vostok Oil [17]. Currently, the project is being implemented as planned, and 98% of the equipment and resources required for it are produced in Russia. This information can be confirmed by the announcement of the start of production drilling at the Payakhskoe field of the Vostok Oil project, which was published in the official sources of Rosneft in July 2022 [18]. However, not all analytical agencies are so confident in the favorable prospects of the project. Thus, the consulting company Rystad Energy predicted that the Payakhskoe field would be launched only in 2029, and not in 2024, as planned [19].

In contrast to the Vostok Oil project, Novatek is experiencing considerable difficulties in supplying the necessary equipment for the Arctic LNG-2 project after Western partners and contractors left. Withdrawal of major engineering contractors Technip, Saipem and Linde, as well as the American equipment supplier Baker Hughes, led to difficulties in the supply of equipment for large-capacity plants and the construction of LNG lines, as well as problems with the project's power supply. Currently, Novatek is looking for possible alternative options for the supply of equipment, including through cooperation with the Turkish company Karpowership and companies representing the UAE [20]. However, in any case, according to experts [21], it will be almost impossible to carry out the earlier planned implementation of the project. The capacities of Nova

[17] Zarubezhnye investory vykhodyat iz «Vostok Oyla» [Foreign investors are leaving Vostok Oil]. URL: https://ngs24.ru/text/business/2022/07/06/71467541/ (accessed 27 August 2022).
[18] Na Payyakhskom mestorozhdenii proekta «Vostok Oyl» nachalos' ekspluatatsionnoe burenie [Production drilling has begun at the Payakhskoye field of the Vostok Oil project]. URL: https://www.rosneft.ru/press/news/item/211319/ (accessed 28 August 2022).
[19] Neftyanoy treyder Vitol vykhodit iz krupneyshego proekta Rosnefti [Oil trader Vitol pulls out of Rosneft's largest project]. URL: https://neftegaz.ru/news/companies/742997-neftyanoy-treyder-vitol-vykhodit-iz-krupneyshego-proekta-rosnefti/ (accessed 29 August 2022).
[20] «Arktik SPG-2» zapitayut s vody [Arctic LNG-2 will be powered by water]. URL: https://www.kommersant.ru/doc/5503226 (accessed 30 August 2022).
[21] Ukhodya iz-pod sanktsiy: «Novatek» menyaet koney na pereprave [Leaving sanctions: Novatek changes horses in midstream]. URL: https://expert.ru/2022/07/28/ukhodya-iz-pod-sanktsiy-novatek-menyayet-koney-na-pereprave/ (accessed 31 August 2022).

energies, controlled by NIPIGAZ, are clearly not enough to fully replace the departed Technip and Saipem, and the parameters of the power equipment that Turkish partners are ready to supply are significantly worse than those of Baker Hughes. Despite Novatek's statements that the share of Russian equipment at the Arctic LNG-2 project will be higher than at Yamal LNG, in practice, most facilities are built using equipment assembled in China from imported components, which, given complicated logistics, also does not help to maintain the planned project deadlines.

The main risks of the Novatek's large Arctic project Yamal LNG are currently associated with the possible withdrawal of major buyers from the gas supply contracts concluded earlier (in 2021, the main foreign buyers of gas from Yamal LNG were the French TotalEnergies, the Chinese CNPC, GM&T (came under control of the German government in summer 2022) and the Spanish Naturgy Energy Group) and the termination of service for Western equipment in use. Taking into account the fact that the main equipment for LNG plants is supplied and serviced by American and European companies (Siemens compressors, Baker Hughes turbines, Linde heat exchangers, Saipem gravity bases for platforms), and the share of foreign equipment at Yamal LNG is about 70% [22], considerable work will be needed in import substitution and finding partners able to provide alternative equipment to ensure continuous operation in the future. In addition, projects aimed at developing Yamal LNG production, primarily Novatek's Ob GCC and Ob LNG project complex, known as the Arctic Cascade, are currently in question.

Conclusion

The events of February 2022 and the subsequent sanctions by Western countries led to a significant change in the investment climate in the Russian Arctic and the departure of Western partners and investors. While the outflow of financial resources from Arctic projects can still be partially compensated by the entry of new investors, ready to buy shares of American and European corporations leaving Russia, the technological risks associated with the unavailability of Western technologies and equipment remain high and can hardly be fully mitigated by supplies from Asian countries and import substitution programs without loss of reliability and productivity.

Currently, the scientific community is dominated by optimistic views on the prospects for the implementation of Russian Arctic megaprojects and the replacement of Western investors with partners from Asia, Turkey and other friendly countries [23] [18, Balashov A.M.]. However, as practice shows, the arrival of new large investors is currently hampered by the fear of falling under secondary sanctions from Western countries, as well as the uncertainty of the financial and legal situation in Russia. At the same time, the scale of the capital needed to implement Arctic projects (for example, Novatek's capital expenditures on the Yamal LNG project amounted to 27 billion dol-

[22] Rossiyskoe oborudovanie dlya zavodov SPG [Russian equipment for LNG plants]. URL: https://www.cdu.ru/tek_russia/issue/2022/4/1012/ (accessed 01 September 2022).
[23] «Oni otstrelili sebe nogi…» Na shel'fovye proekty v Arktike pridet Kitay. Interv'yu s A.M. Fadeevym ["They shot off their legs…" China will come to offshore projects in the Arctic. Interview with A.M. Fadeev]. URL: https://www.fontanka.ru/2022/03/02/70481786/ (accessed 02 September 2022).

lars, financed by loans from European, Chinese and Russian banks, as well as by the sale of project shares to foreign partners) shows that sustainable development of the Arctic is possible only in conditions of a significant inflow of financial resources. In any case, it is currently possible to ensure such an inflow of resources only with the active participation of the state. On the one hand, it is necessary to adopt and implement large-scale internal state programs and mechanisms aimed at developing the infrastructure of the Arctic, creating a social base that will attract the necessary labor resources to this region. The financial basis for the implementation of such programs and mechanisms should be the funds received from the extraction and sale of the resources of the Arctic deposits. On the other hand, it is necessary to create conditions for the development of import substitution processes in the field of technological support and the production of unique equipment for industrial enterprises operating in the harsh conditions of the Far North. Their implementation will require significant investment resources, which can only be attracted with the further development of the system of benefits and preferences for companies operating in the Russian Arctic and actively investing in R&D.

In recent years, there has been a shift in the emphasis of the state Arctic policy in Russia from direct financing based on the program method to creating conditions for increasing the investment activity of private companies. Today, in the context of increasing geopolitical tensions and sanctions pressure, when the resources of private investors are limited, it is necessary to strengthen direct state support for the Arctic territories. The level of public funding for the Russian Arctic, which has been declining in recent years, should be increased several times. Emphasis should be placed on the construction of infrastructure projects that can subsequently be transferred to the use of companies operating in the Far North. This will attract investors to the Arctic, the implementation of projects of which in the current conditions is limited by the impossibility of building related infrastructure (engineering networks, communication lines, etc.). In addition, by creating certain development clusters, the state can help increase the investment attractiveness of the Arctic territories for potential investors who are ready to invest resources not only in projects related to the extraction of oil and gas resources, but also in other industries that are currently, for objective reasons (high costs production, low market capacity, lack of access to facilities) are not of interest to foreign partners.

In the near future, we should expect further withdrawal of Western partners from Russian Arctic megaprojects. At the same time, the success of replacing Western capital by attracting partners from friendly countries will largely depend on the development of relations and agreements with countries such as China, India, Turkey at the state level. The continued risk of secondary sanctions against companies participating in Russian projects, as well as the high level of uncertainty in the Russian markets, could substantially slow down the processes of attracting investment from companies from friendly countries and even lead to their withdrawal from joint

projects [24, 25]. In this context, in our opinion, it is necessary to pay more attention to the development of investment mechanisms based directly on interstate agreements, in particular, the creation of joint state investment funds (Russia and China have experience in creating such funds). They can be formed on a bilateral or multilateral basis within the established and successfully functioning interethnic structures (BRICS, SCO). The activities of such funds, on the one hand, will attract the necessary investment resources to the Russian Arctic, and on the other hand, will ensure the participation in Arctic projects of countries that are territorially remote from the Arctic Circle, but wish to increase their energy security by developing relations with Russia.

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Formation of Territorial Heat Supply Systems in the Northern and Arctic Regions of Russia

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Abstract. The article deals with the most important problems of the communal complex in the subjects of the Far North and the Arctic zone of the Russian Federation. The main attention is paid to the aspects of formation of territorial heat supply systems, which are the basic components of the infrastructure of life support in harsh polar natural and climatic conditions. The impact of the growth of utility tariffs on the structure of consumer spending of households in the northern and arctic regions is assessed. It is shown that the state of the municipal energy sector determines the formation of the socio-economic environment and investment attractiveness of the Arctic municipalities. Its renewal and modernization are the main conditions that contribute to reducing the rate of migration outflow of the local population, increasing industrial production and the state military–strategic presence in this important macro-region. Despite the predominance of energy sector specialization in the list of leading industrial enterprises, the presence of the necessary fuel and raw materials base and increased inflow of investment resources in the energy sector, there is further obsolescence and reduction of fixed assets of municipal energy supply units as well as the highest level of utility consumer costs in comparison with all-Russian indicators. The conclusion about the loss of previously available territorial infrastructure advantages of the Russian Arctic regions is substantiated: there has been a reduction in the total number of heat sources, territorial energy production, the length of heat communication networks. The increase of these energy threats is a factor limiting the socio-economic growth of Russia's northern and arctic territories.
Keywords: *Arctic, Far North, infrastructure, public utility, tariff on utility service, heat supply, system*

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Introduction

The issues of resource provision, organization of services, the level of prices and quality of services provided by housing and communal energy enterprises have been in the focus of public attention throughout the entire modern history of Russia. An important factor in their functioning in the Russian Far North and in the Arctic is the insufficient infrastructural development of these territories. There are no large oil refining facilities in the Arctic zone of Russia, so the considerable

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energy needs of local industry, thermal power plants and boiler houses are met by long-distance fuel supplies from the Leningrad Oblast, the Komi Republic, the Khanty-Mansi Autonomous Okrug, the south of the Krasnoyarsk and Khabarovsk krais. There are also no enterprises producing complex energy equipment. Regional supply chains of fuel and energy complex enterprises (FEC) have a pronounced imported and predominantly seasonal nature, characterized by the unevenness, low rhythm of cargo deliveries, and enormous transport distances. Underdevelopment of transport and transport-energy infrastructure, dependence on seasonal patterns of operation and the state road networks determine the use of multimodal transport schemes, the organization of intermodal fuel storage facilities and the accumulation of irreducible reserves. The slow pace of implementation of programs for territorial gasification, construction of main gas transmission and gas distribution systems lead to the dominance of outdated technologies for delivery and use of energy carriers, limiting the opportunities for economic development of heat and power companies. The high level of physical deterioration of their equipment greatly complicates the solution of local energy problems, affects the cost of supplied heat energy and the formation of utility tariffs. Due to the high social significance of the sustainable operation of the public utilities sector, the regional state authorities and local self-governments are empowered to monitor the preparation and passage of the winter heating season, to coordinate the joint activities of the economic entities, and to limit the growth rate of utility tariffs through the application of price regulation mechanisms. The increase in the cost of imported fuel resources leads to the need for additional subsidizing of heat supply organizations from the budgets of the Arctic and northern regions, since the consequences of establishing economically justified energy tariffs and a sharp rise in the cost of heat supply services for the population have so far been recognized as unacceptable. Thus, an appropriate way to understand the essence of the problems considered in this article can be a definition that allows us to outline the main issues of regional heat supply in the Far North as “investment-intensive, with non-market tariffs, complex socially significant infrastructure in need of urgent technological renewal”. At the same time, it seems decisively insufficient to limit them to any single sector of the regional economy, for example, fuel and energy or housing and communal sectors. Overcoming these territorial energy problems is indeed a complex national economic task, the solution of which in the northern and Arctic regions is complicated by the presence of close links with many other systemic threats due to unfavorable natural and climatic features of residence and economic activity, as well as known features of socio-economic development [1, p. 39]. Therefore, studies aimed at finding possible common approaches to improving the key elements of the territorial infrastructure, both in the central regions, with more developed infrastructure, and in the peripheral ones, with their special features, are of particular scientific value. It should be expected that the development of a scientifically based methodology that contributes to the solution of the above socially significant problems will have a positive impact on the state of the economy, investment attractiveness, and the comfort of people living in areas with the most severe natural and climatic conditions.

The Arctic, the Far North and the Far East of Russia are considered by the federal authorities as strategically important macro-regions. Moreover, they are singled out as separate independent subjects of state administration. In 2019, the Ministry of the Russian Federation for the Development of the Far East (Minvostokrazvitiya) was reorganized with additional functions for the development of the Arctic and was renamed into the Ministry of the Russian Federation for the Development of the Far East and the Arctic — so significant is the contribution of the Arctic and Far Eastern industries to the national economy. The Ministry has developed plans for the accelerated development of the infrastructure complex, which, in addition to ensuring economic objectives, should become the foundation for further socio-economic growth, improving the quality of life of northerners. It should be admitted that there has been some progress in this direction — over the past few years, six major projects have been implemented in the Arctic zone of the Russian Federation (hereinafter referred to as AZRF), specializing in the transport and energy sectors (for more details [2, Biev A., Serova N.]) . The most large-scale and significant events for the entire Russian Far North were the construction and launch of a gas pipeline branch at the section of the main gas pipeline "Bovanenkovo (Yamal-Nenets Autonomous Okrug) —Ukhta (Komi Republic)", the construction of gas distribution infrastructure and the conversion to natural gas of TPP- 2, Central hot water boiler house in Vorkuta (Komi Republic). The start of commercial operation of the floating nuclear thermal power plant of project 20870 "Akademik Lomonosov" in the city of Pevek (Chukotka Autonomous Okrug) can be considered the first example of such a high-tech solution to the problem of territorial energy supply of the AZRF based on the use of non-stationary mobile platforms. The ambitious gasification project of the Murmansk Oblast, which provides for the construction of the Volkhov–Murmansk gas pipeline route, as well as the creation of an appropriate gas distribution infrastructure with connection of the largest industrial enterprises and heat sources located not only on the Kola Peninsula, but also in the northern part of the Republic of Karelia, has received a new impetus. These projects are directly linked to the long-term plans for the modernization of public utilities in the Arctic and subarctic regions. However, despite the attention and financial support from the federal center, the pace and scale of updating transport and energy infrastructure networks lag far behind the planned stages of their commissioning. In this regard, experts recognize the need to develop a separate state program for them, without which the reality of further economic development of the Arctic is questioned [3, Saneev B., Ivanova I., Izhbuldin A., Tuguzova T., p. 95]. Most scientific opinions on the causes and consequences of the "shift of schedules to the right" do not come into sharp conflict with the conclusions of federal officials regarding the priority of the implementation of critically important Arctic investment projects. Of practical interest are separate additions to the general positions, consisting in the fact that the regional energy subsystems will contribute to a greater autonomization of the sphere of territorial life support, overcoming the consequences of interregional economic differentiation and infrastructure gap [4, Zmieva K.A., p. 6]. One can fully agree with them, given that the Arctic transport complex is now a fairly highly specialized type of infrastructure designed to

ensure, in the current paradigm of managing the development of the Arctic and the Far North, first of all, the stable functioning of the raw material industry and the seasonal replenishment of transient inventories. Northern delivery, transportation of extracted raw materials along the Northern Sea Route, export and interregional transportation of commercial products and building materials for the construction of new industrial facilities occupy the largest share in the total indicators of regional transport services [5, Baranov S.V., Bazhutova E.A., Biev A.A. et al., p. 75]. At the same time, the Arctic communal energy and heat supply, based on the expanded application of new technologies of local and renewable resources use, as their desirable vision for the perspective until 2030 is described in the fundamental strategic documents [1], are much more focused on strengthening territorial self-sufficiency, inflow of qualified labor force, improvement of stationary living conditions. The development and implementation of comprehensive investment plans for the modernization of the municipal energy sector, the introduction of innovative energy-saving and environmentally friendly technologies should contribute to stabilization of the socio-economic situation, the size of the local population in remote depressed areas by providing affordable public services, meeting the basic needs of people with reference to the conditions of a particular territory.

The issues of updating socially significant infrastructure in the Far North and the Arctic, in addition to departmental control, are also the focus of attention of the country's top leadership. The principled position of the head of state on maintaining the unconditional priority of the previously approved plans for the economic development of the Russian Arctic territories and ensuring their military security, taking into account the radically changed geopolitical situation, is well known. It was very clearly stated at the Government meeting on the development of the Russian Arctic on April 13, 2022 [2]. During the meeting, the importance of implementing proposals related to the development of the housing and communal sector of closed administrative-territorial units (CATUs) of the Arctic zone was especially emphasized. The President gave instructions to ensure the comprehensive modernization of energy, residential and social facilities in the Murmansk Oblast CATU, where large military bases, enterprises of the military-industrial complex and ship repair facilities are located, by the end of 2024.

The strategic documents of the Russian Federation, as the main tools for implementing communal renovation programs in the Arctic, provide for organizational mechanisms for "state guarantees to support projects for the modernization of energy and engineering infrastructure, stimulating the participation of state corporations, private investors and companies with state participation" [3]. Most of the funds for these purposes are allocated by the Government of the Rus-

[1] Energeticheskaya strategiya Rossii na period do 2030 goda: utv. Raspor. Pravitel'stva RF ot 13.11.2009 № 1715-r [Energy strategy of Russia for the period up to 2030: approved by Decree of Government of the Russian Federation dated November 13, 2009 No. 1715-r]. URL: https://minenergo.gov.ru/node/1026 (accessed 15 February 2022).
[2] See in more detail the transcript of the Government meeting on the development of the Arctic zone of the Russian Federation. April 22, 2022. URL: http://prezident.org/tekst/stenogramma-soveschanija-putina-po-voprosam-razvitija-arkticheskoi-zony-13-04-2022.html? (accessed 10 May 2022).
[3] Strategiya razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda (s izmeneniyami i dopolneniyami), utverzhdena Ukazom Prezidenta RF ot 26 oktyabrya 2020 g. № 645

sian Federation from the federal budget as part of the state program "Socio-economic development of the Arctic zone of the Russian Federation" [4]. Several state funds are used: first of all, the target Fund to promote reform of the housing and utilities sector (reorganized in 2022 by joining the public law company "Territorial Development Fund"). In 2021, it was decided to additionally use the funds of the National Welfare Fund (NWF), the share of which in the financing of Arctic infrastructure projects should increase significantly — up to 80% of their total cost [5]. In January 2022, the Government Commission for regional development approved the allocation of 386 million rubles of NWF loan money to the Murmansk Oblast to upgrade the boiler plant in Olenegorsk (total funding should be 483 million rubles). Pre-approval of applications for the financing of boiler equipment upgrade projects in four other municipalities of the region (Kandalaksha, Revda, Lovozero, Vysokiy) for a total amount of more than 2 billion rubles was successfully passed. For projects in the Republic of Yakutia, a loan in the amount of 273.3 million rubles was provided from the NWF for the same purpose. However, due to the beginning of the active phase of the Russian-Ukrainian conflict in February 2022, the amount of funds raised from the NWF is likely to be adjusted.

The tightening of the US sanctions policy, as well as the introduction of unprecedented military and economic countermeasures by a number of European Union states have significantly exacerbated the issues of modernizing the enterprises of the Russian energy complex. The most immediate consequences of the actions of the US and the EU for the domestic thermal power industry was the rise in the cost of banking services, the provision of borrowed resources, and insurance of project risks. There has been a reduction in the possibility of importing key components of technological equipment of TPPs and boiler houses, which our country does not yet produce in sufficient quantities and range. Russia has not yet managed to develop serial production of gas turbines with a capacity exceeding 110 MW — the main equipment for TPPs with a combined cycle, although such strategic objectives were set by the Government back in 2014–2016. According to the results of industry surveys conducted at that time, experts identified steam-gas turbines and turbine generators, compressor units, high-pressure circulating pumps, heat exchangers, electronic modules for automated control, instrumentation and diagnostics, temperature sensors, complex assemblies of shut-off and control valves for water supply, water disposal and water

[Strategy for developing the Russian Arctic zone and ensuring national security until 2035 (with amendments and additions), approved by Decree of the President of the Russian Federation of October 26, 2020 No. 645]. URL: https://base.garant.ru/74810556/? (accessed 10 April 2022).

[4] Kompleksnaya gosudarstvennaya programma Rossiyskoy Federatsii «Sotsial'no-ekonomicheskoe razvitie Arkticheskoy zony Rossiyskoy Federatsii» (s izmeneniyami i dopolneniyami ot 30 oktyabrya 2021 g.), utverzhdena Postanovleniem Pravitel'stva RF ot 30 marta 2021 g. № 484 [The Comprehensive state program of the Russian Federation "Social and economic development of the Arctic Zone of the Russian Federation" (as amended and supplemented on October 30, 2021), approved by Decree of the Government of the Russian Federation of March 30, 2021 No. 484]. URL: https://base.garant.ru/400534977/? (accessed 15 February 2022).

[5] Rasporyazhenie prem'er — ministra Pravitel'stva RF M. Mishustina, utverzhdennoe 25 yanvarya 2022 g. № 82-r [Order of the Prime Minister of the Government of the Russian Federation M. Mishustin, approved on January 25, 2022 No. 82-r]. URL: http://static.government.ru/media/files/ilSRhWpKfIgS3ZFpyYPVrT2BKH55veky.pdf (accessed 27 April 2022).

treatment, rubber products and equipment as critical types of thermal power equipment that should be localized in our country. The importance of the development of specialized software was also mentioned [6]. The continued dependence of Russian Arctic projects in the field of renewable energy on the products of foreign suppliers is noted by foreign researchers [6, Mortensen L., Hansen A.M., Shestakov A., p. 175]. In addition, there are significant logistical difficulties in using multimodal transport schemes for the delivery of large-sized energy equipment from abroad, especially to areas with seasonal transport accessibility, which often caused a long delay in territorial development plans [7, Antonenkov D., Kiushkina V., p. 240]. At present, the supply and service support of industrial equipment of Western production has stopped for an indefinite period of time, and the possibilities of search for alternative suppliers, parallel import of certain categories of goods, such as gas turbines, boilers, turbo generators, manufactured individually for each project, are limited. Therefore, from the perspective of assessing the prospects for the further development of import substitution as one of the institutions of national technological sovereignty, it is of particular interest to study the Russian experience of developing competitive models of equipment for low-power energy sources. To the fullest extent, the operating conditions in the gasified regions of the Far North, the Arctic part of Eastern Siberia and the Far East meet the production characteristics of block-modular gas boilers — the most efficient, cheap to construct, environmentally safe [8, Mikhaylova L.Yu., Germanova T.V., Kurilenko N.I., Shcherbakova E.N., p. 95–96]. In Russia, there are examples of successful creation and practical testing of their standard equipment [9–10], however, overcoming the difficulties of organizing mass production and maintenance will require significant investment, time and material resources, which will cause an accelerated growth in industry tariffs. This systemic problem of the Far North and Arctic regions should be discussed in more detail.

Social aspect of the problem of tariff disproportions and utility tariff regulation in the Far North and the Arctic

Solving the problems of tariff imbalances in utilities, providing investment resources for programs and projects of housing and communal services modernization, overcoming the technological backwardness of the industry, introducing public-private partnerships in municipal energy sector are the main tasks of regional management of heat supply development [11, Chayka L.V., p. 78.]. Federal authorities also form additional financial support instruments that take into account the specifics of the operation of existing heat supply sources in special climatic conditions. The accelerated growth of operating costs and the need to improve the economic performance of large thermal power plants operating in the Russian Arctic in the so-called “forced” mode, led to further development of the initiative of the Russian FAS to use a special procedure for calculating sector

[6] Aktual'nye voprosy importozameshcheniya v teplosnabzhenii i energetike Rossii [Topical issues of import substitution in the heat supply and energy sector of Russia]. Aqua-Term. URL: https://aqua-therm.ru/kruglyy-stol/spec-proekty_8.html? (accessed 15 April 2022).

tariffs, taking into account the climate coefficient (30%) [7]. As steps to improve the investment attractiveness of utility projects and to ensure the return of substantial financial resources from the state budget, the Government proposed in 2021 to consider the possibility of mitigating the effect of tariff regulation mechanisms, which is generally not typical for the domestic practice of organizing work with natural monopolies, established over the past decade. On behalf of the Deputy Prime Minister of the Government of the Russian Federation M. Khusnullin, the industry scenarios that allow for gradual increase and establishment of so-called economically justified tariffs in those constituent entities of the Federation, where investment projects in the utilities sector are actively implemented, continue to be actively studied. Such views, promoted once again both at the level of expert positions of top state representatives and at the level of adoption of conceptual planning documents, leave quite a contradictory impression. On the one hand, the interest in stimulating the growth of investment attractiveness and creating the necessary conditions for payback of the plans of socially significant infrastructure renovation is declared (under the policy of maximum tariff restraint, there are really few people who want to invest in housing and communal services in the Arctic and northern municipalities). On the other hand, these provisions run counter to the national security interests, aimed at maintaining state sovereignty, control over vast sparsely populated areas, because it becomes more and more difficult to ensure it by maintaining a sufficient number of economically active population in the Arctic in the conditions of increasing tariff pressure and reducing the availability of public utilities. According to the estimates of regional authorities, the current growth rate of tariff levels has become a systemic factor stimulating migration outflow [8]. The opinions widespread among the scientific community are also very unambiguous: the underdevelopment of the communal infrastructure of the Far North, its unsatisfactory condition, leading to the growth of utility costs, high cost of the minimum consumer basket are among the main motives for the decision to move to the regions with more comfortable living conditions as in Russia [12, Mkrtchyan N.V., Florinskaya Yu.F., p. 149–150] and abroad [13, Withers S.D., Clark W.A.V., p. 286–288]. The results of sociological research conducted by scientists of the North-Eastern Federal University (NEFU) have shown that the growing share of mandatory payments and utility costs is not only a purely internal factor of increasing social tension in the Russian Far North and the Arctic, but also a global trend that affects the social well-being of residents in the Arctic communities of the largest foreign countries — the USA and Canada. The general pattern of socio-demographic processes in our country and in other Arctic states is that in

[7] Smertina P. Arkticheskim TES nachislyat severnye [Arctic thermal power plants will be credited with northern ones]. Newspaper "Kommersant". No. 56 of 01.04.2021, p. 7. URL: https://www.kommersant.ru/doc/4752680 (accessed 15 April 2021).

[8] On July 22, 2020, the Governor of the Murmansk Oblast Andrey Chibis during a meeting of the Federation Council on gasification of the constituent entities of the Russian Federation, said that the increase in the cost of housing and communal services is “one of the factors stimulating the departure of people from the territory”. IA TASS Source: The Murmansk region may become a pilot region for the transfer of heat supply systems to LNG. July 22, 2020. URL: https://tass.ru/ekonomika/9028823?utm_source=yandex.ru&utm_medium=organic&utm_campaign=yandex.ru&utm_referrer=yandex.ru (accessed 25 April 2022).

extreme living conditions, the increase in the cost of socially important services causes a sharper manifestation of negative social effects, in particular, the growth of poverty [9]. So far, there are only separate departmental assessments of how adequate should be the response expansion of the list of measures of targeted social support from the federal and regional authorities, capable to compensate the aggravation of this major social problem. The experts agree that there is an objective need for a significant increase in the volume of subsidies for low-income categories of citizens, whose share in the Far North remains consistently high [14, Korchak E.A., p. 54]. It remains unclear how exactly the above-mentioned attempts of the federal government to change the established approach to the formation of utility tariffs will be able to stimulate the redistribution of regional investment flows and accelerate long overdue transformations in the utility sector. Theoretically, they could lead to the formation of the basic conditions for the investment attractiveness of the industry. However, in practice, it is necessary to meet a number of conditions [15, Loktionov V.I., Mazurova O.V., p. 1312]. The main one is a multiple increase in the share of socially oriented investments directed to the public utility sector, to the communal energy sector, accompanied by an increase in income of the local population, able to pay for higher quality, but also more expensive services, to ensure sustainable effective demand for energy. There is no clarity on how the federal and regional authorities are going to achieve it against the backdrop of crisis manifestations and further sanctions on the Russian economy, which will undoubtedly intensify in the near and medium term. Meanwhile, the scenario of an accelerated increase in the tariff burden on utility consumers under the plausible pretext of “the need to ensure the uninterrupted operation and development of the housing and communal services infrastructure across the country” (Head of the Ministry of Economic Development Maxim Reshetnikov, September 23, 2022) began to be implemented. The government announced the early postponement of the annual indexation of tariffs for gas, electricity, water and heat supply from July 1, 2023 to December 1, 2022. In 2022, utility tariffs in the Russian Federation were indexed twice. Annual growth may exceed 15.5%, which will significantly accelerate inflationary processes, further accumulation of consumer debt for services, and lead to an aggravation of the social situation in the northern and Arctic regions of Russia.

The principle of prioritizing the social aspects of the regional energy systems development and the interests of the population — a special category of consumers in the regional heat markets — is absolutely justified, since households form the main indicators of energy demand and are a key object of socio-economic assessment. Despite the increased attention of federal authorities to the Arctic social agenda, the results of studying the dynamics of a number of economic and statistical indicators of the state of housing and communal services (growth of debt for consumed energy resources, number of utility accidents, share of dilapidated heating networks, emergency housing stock, etc.) should be interpreted as a manifestation of signs of a systemic deterioration in

[9] Vyyavleny obshchie prichiny bednosti v arkticheskikh regionakh Rossii, Kanady i SShA [Common causes of poverty in the Arctic regions of Russia are identified, Canada and the USA]. IA TASS — Nauka. August 19, 2021. URL: https://nauka.tass.ru/nauka/12166507? (accessed 15 April 2022).

living conditions and the availability of public services in the Far North and the AZRF. One of the most frequently used indicators of social well-being and assessment of investment attractiveness of the territory is the indicator of the share of household expenditures allocated to pay for housing and communal services, which is, at the same time, a characteristic marker of the growth of the "high cost of living" in the North. The main part in the structure of their cost is the utility component — the cost of fuel, electricity and heat. Due to climatic features, it is traditionally high: in the Arctic regions of the Far East, the share of utility bills in the total cost of housing and communal services reaches 84.5% [16, Naiden S.N., p. 41]. Therefore, the impact of increased marginal costs of territorial fuel and energy supply — one of the well-known manifestations of the "northern rise in prices" phenomenon and a special condition for the functioning of regional fuel and energy systems — exerts strong pressure on the formation of the dynamics of the indicator proposed for consideration. Fig. 1 shows the trends of its change over the past twenty years.

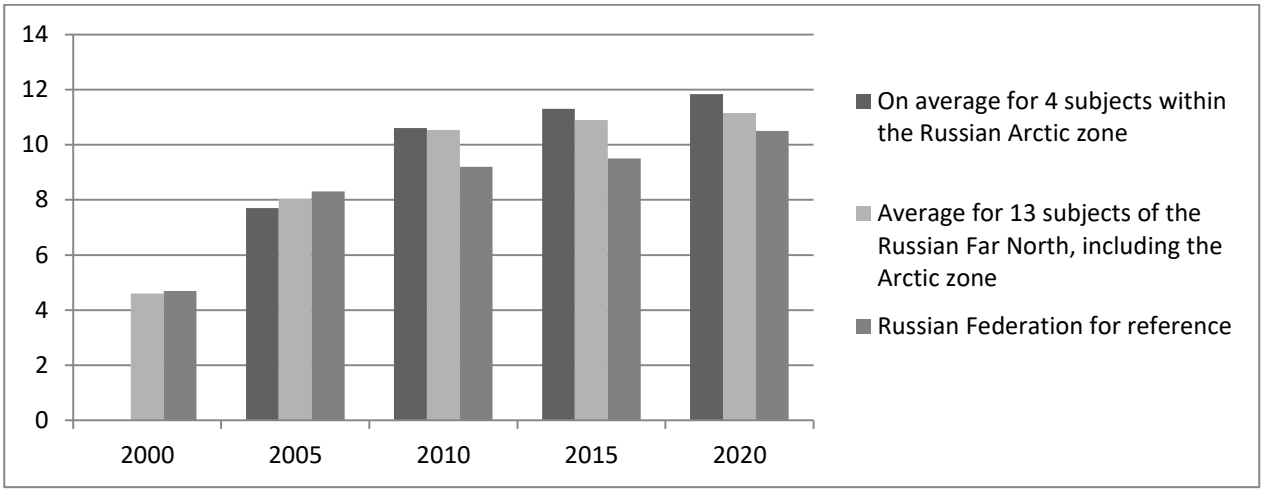

Fig. 1. Dynamics of the share of household expenditures in the northern and Arctic regions of the Russian Federation allocated to pay for housing and communal services, in % of the total amount of consumer spending [10].

The increase in the share of this type of consumer spending is noted as an irreversible trend, which is quite clearly expressed both in a narrow regional context of the Far North and the Arctic, and on a federal scale. Attention is drawn to the sharp, almost two-fold increase in the indicator that occurred over the period from 2000 to 2010, which marked the beginning of the sectoral reform of heat supply. At that time, the growth rate of utility costs of the population in the Arctic regions was significantly ahead of the Russian average, thereby "pulling" up the values of all the "northern" ones. It can be noted that there is a temporal relationship between the period of the most intensive growth of utility tariffs (in 2000–2010) and the change in the vector of tariff policy in the infrastructure sector of Russia, which since 2002 was determined by the scenario conditions of the "Forecasts for the socio-economic development of the Russian Federation", which provided for a significant increase in economic indicators of regional production. They also largely determined the dynamics of tariff rates for households. As economic growth slowed down,

[10] Source: calculated by the author based on UISIS data.

tariff indexation began to be carried out at a rate below inflation [11], which subsequently prompted representatives of the FAS to argue that "... compliance with this principle in regulatory and supervisory activity prevents the indexation of citizens' payments by more than the rate of inflation" [12]. Indeed, independent studies show that, as of 2021, the utility tariff setting system was at its lowest rate of growth over the past 19 years [13]. Obviously, ten years is the answer to the question of how long it was possible to continue the policy of maximum containment of utility tariffs in the conditions of almost complete physical depreciation of the main assets of housing and communal services; now the situation is changing. Entering a new stage of the utility reform aimed primarily at revising the tariff setting principles, and forming new sources of investment in the sector, as in previous years, will be associated with a sharp increase in the tariff burden of consumers. It remains to be hoped that the federal government, embarking on the next phase of restructuring the utility industry, is fully aware of the scale of consequences of the planned changes in state policy regarding the development of critically important territorial infrastructure, errors in the implementation of which in the Arctic and the Far North are fraught with a full-scale escalation of crisis socio-economic manifestations.

The increased level of public utility costs remains the special feature of almost all northern and Arctic regions. In the expert community, opinions are very widespread that as the Arctic climate steadily warms and energy technologies are improved, regional climatic features will have less and less influence on the cost of production of the most energy-intensive utilities (heating and hot water supply) [17, Nefedova L.V., p. 94]. Socio-economic factors of territorial development have become very important, if not determinative, in ensuring energy security of the Arctic and the North [ibid]. Long-term shortage of financing of socially important projects reflects the obvious exhaustion of the current model of financial and investment support of local municipalities. Experts generally agree with the organizational decisions outlined in the latest version of the Russian Arctic Development Strategy dated October 26, 2020, noting, however, that the main emphasis in overcoming the problem of chronic underfunding of the utility industry in modern conditions should be placed on attracting private investment [18, Shakirov V.A., Tuguzova T.F., Muzychuk R.I., p. 110] and joint public-private partnership [19, Potravnyy I.M., Yashalova N.N., Borukhin D.S., Tolstoukhova M.P., p. 158–159]. Such opinions are absolutely fair, since the systemic problem of the lack of public investment in the development of social infrastructure in the Far North is well known. It has touched the Arctic municipal energy sector in full measure, and now one of the basic

[11] Since 2017, tariff regulation has been established by indexing them to the level of forecast (target) inflation using sectoral efficiency ratios (inflation minus). Source: Tariff policy in the Russian Federation in the utilities sector: priorities, problems, prospects: report on 21st Apr. internat. scientific conf. on the problems of economic and social development]. Moscow, 2020.

[12] Vitaly Korolev, Deputy Head of the FAS Russia, January 26, 2021. Source: FAS Russia: the "inflation-minus" principle made it possible to avoid an unlimited increase in tariffs for housing and communal services in 2020. Federal Antimonopoly Service of Russia. 26.01.2021. URL: https://fas.gov.ru/news/31093 (accessed 15 April 2022).

[13] According to the international audit and consulting network FinExpertiza. Source: Research: growth in prices for housing and communal services in the pandemic year was the lowest in 19 years. 26.01.2021. URL: https://www.banki.ru/news/lenta/?id=10940515 (accessed 15 April 2022).

criteria for establishing the priority of state support for regional investment projects is the ratio of private investment and budget funds allocated for their implementation [20, Novoselov A., Potravnyy I., Novoselova I., Gassiy v.]. Private companies are also slow to invest in public energy infrastructure. According to the experts of the Institute of economic problems of the Kola scientific center of RAS, the share of plans for the modernization of municipal energy facilities in the AZRF (gasification of boiler houses, construction of new heat sources, renovation and reconstruction of heat networks, engineering communications) accounts for only about 2.25% of the total volume of financial support for investment projects of the fuel and energy complex [21, Skufina T.P., Serova N.A., Bazhutova E.A., Baranov S.V. et al., p. 102]. It can be argued that the chronic underfunding of public utilities, as well as the lack of full understanding in the scientific community, at the regional and top levels of public administration of the directions and sources of funding on which its reform plans will be based, remain a very serious threat to the socio-economic development of the Russian Far North and the Arctic.

Materials and methods

The analysis of the regional heat and power infrastructure includes the study of the characteristics of the quantitative and qualitative structure of territorial heat and power facilities, heat communication networks, operational and production parameters of their functioning. In the text of this article, they are reviewed in more detail. Below we present the results of comparative analysis of heat and power infrastructure formation processes in the Russian Arctic, both separately and as part of the Far North macro-region. In order to preserve the possibility of their comparison with the scientific results obtained at earlier stages of the study, a list of 13 constituent entities of the Russian Federation is considered as a macro-region of the Far North, the territories of which are fully or partially assigned to the regions of the Far North and equated areas, according to the Decree of the Government of the Russian Federation of 16.11 .2021 No. 1946 [14].

Four indicators available in the UISIS system were taken as the basis for the methodology of the regional heat and power infrastructure analysis. The dynamics of their changes during the current historical period of Russia's development, from 2000 to 2020, is demonstrated. The first indicator, territorial generation of thermal energy, characterizes the volume of energy production and trends in energy demand. The second one — the change in the number of heat sources — is a quantitative indicator of energy supply and economic development of the territory. The third one is the total installed heat capacity of thermal power facilities, a quantitative criterion demonstrating the territorial energy potential and the ability of energy systems to meet current and future demand. The fourth indicator is the length of heating networks, another quantitative characteris-

[14] This study considers a list of 13 constituent entities of the Russian Federation, the territories of which are fully or partially attributed to the Far North and equivalent areas by current legislation: Magadan, Murmansk, Arkhangelsk, Sakhalin oblasts, the republics of Komi, Tyva, Karelia, Sakha (Yakutia), Kamchatka Krai, Nenets, Yamalo-Nenets, Khanty-Mansi and Chukotka Autonomous okrugs.

tic that allows determining the degree of infrastructure development of the territory, as well as the level of equipment of consumers and the population with centralized heat supply systems.

When assessing the factors that most strongly influenced the change in the quantitative and qualitative composition of heat generation sources, the factor of a prolonged demographic decline was identified, which determines the acceleration of the infrastructural contraction processes. That is why the scope of research data in the framework of this work was chosen quite broadly, with a focus on specific indicators, based on the existence of a set of relationships between migration processes, population decline in the Far North subjects, in the AZRF, and the transformation of the utility sector of these territories — gradual degradation of communal infrastructure, an increase in the unprofitability of district heating systems in conditions of reduced energy demand from the population. The main hypothesis of the study was the assumption that negative demographic processes, along with climate change, are becoming the main reasons for the decrease in demand for thermal energy and the corresponding transformation of territorial heat supply systems in the Far North. The reduction in the number of residents is directly related to the narrowing of the choice of possible sources of project financing, the limited required investment inflow directed by large business structures, primarily to the development of the raw materials industry, the extractive sector of the economy.

Results and discussion

Table 1 shows changes in the quantitative composition of heat supply sources in the Russian Arctic. During the period 2000–2015, there has been a significant reduction in their total number, and the share of northern and arctic heat generation facilities in the federal scale has decreased. The predominance of liquidation processes over commissioning of new heating capacities, until relatively recently, led to a significant strengthening of the competitive positions of district heating in the AZRF. Until 2015, the Russian Arctic showed a steady increase in the number of inhabitants per one heat supply source on average. In the Far North, this trend continued in 2015–2020. In the Russian Arctic, by contrast, the situation has begun to change over the last five years. The commissioning of new small modular sources, mainly in the Murmansk Oblast, the Nenets and Chukotka Autonomous okrugs, caused a sharp decline in the 2020 specific indicators, returning them almost to the baseline level (2000), which can partly be explained by the phenomenon of population loss — acceleration migration outflow, simultaneously accompanied by an increase in the total number of sources.

Table 1

Number of heat supply sources in the subjects of the Russian Arctic and the Far North, units [15]

Subjects of the Arctic zone of the Russian Federation	2000	2005	2010	2015	2020
Nenets Autonomous Okrug	56	57	51	65	109
Murmansk Oblast	117	147	139	121	142
Yamalo-Nenets Autonomous Okrug	357	305	274	250	241

[15] Source: calculated by the author based on UISIS data.

Chukotka Autonomous Okrug	88	74	49	44	71
Russian Arctic zone, total	618	583	513	480	563
Russian Far North (including Russian Arctic zone) *	6444	5926	5132	4948	4978
Russian Federation, for reference	67 913	64 895	73 120	75 955	76 696
Share of the Russian Arctic zone on a national scale, %	0.9	0.9	0.7	0.6	0.7
Share of the Russian Far North (including Russian Arctic zone) on a national scale, %	9.5	9.1	7.0	6.5	6.5
Number of residents per heat supply unit in the Russian Arctic Zone	2492	2513	2762	2915	2456
Number of residents per heat supply unit in the Russian Far North (including Russian Arctic zone)	1318	1397	1551	1600	1580
Number of residents per heat supply unit in the Russian Federation	2163	2211	1954	1926	1905
*Note: ** calculated by the author using additional data for 13 subjects of the Federation, the territories of which are fully or partially assigned to the regions of the Far North and equivalent areas					

It is obvious that in the medium term, as the demographic situation continues to deteriorate, the connected heat load will gradually decrease. A similar trend can be observed in the all-Russian cross-section — the decentralized energy potential is being actively built up. This conclusion is also confirmed by the results of studies conducted at the Institute of economic forecasting of RAS [22, Nekrasov A.S., Voronina S.A., Semikashev, V.V., p. 132–133]. At the same time, it was found that among the fifteen most powerful operating heat supply facilities in the Russian Arctic, only one (Noyabrskaya steam-gas power plant, 2010) was built in the post-Soviet period. Their total installed heat capacity is more than 90% of the total capacity of all heat supply sources located in the Russian Arctic. In the near future, some of them (Vorkutinskaya TPP-1, Chaunskaya TPP, Egvekinotskaya GRES) are planned to be decommissioned. However, despite the lower economic efficiency of large thermal power plants compared to modern small modular TPPs, excessive capacity in the context of declining energy demand, moral and physical obsolescence, there will be no full-fledged alternative to most of them in the Russian Arctic for a long time. Therefore, modernization of the remaining plants and the possibility of putting some of their technological equipment into reserve are the main conditions for maintaining a reliable energy supply and deploying new industrial production facilities in the near future. The decrease in the number of permanent residents in the Russian Arctic and the Far North has the most negative impact on the economic efficiency of the sources with the highest productivity, reducing the possibility of obtaining “scale effects” [16], which is the basis of all centralized models of territorial heat supply. The inclusion of additional costs in the tariff to maintain the operation of excess energy capacity quite naturally leads to a further increase in the cost of territorial heating services. In this regard, the author considers it necessary to develop organizational mechanisms for integrating decentralized

[16] First of all, reducing the specific production costs of a heat source during technological connection to its networks of the maximum possible number of consumers, which is limited by the available heat capacity.

energy supply systems in the regional heat and power complexes of the North and the Arctic on the basis of industry investment programs aimed to preserve their energy potential and optimize the composition of technological equipment. They should consider new technologies that can complement the existing functionality of traditional systems where it is economically feasible, taking into account the territorial specifics.

Table 2 shows the dynamics of changes in the total installed capacity of territorial heat supply sources in the Russian Arctic in comparison with the general situation at the federal level, as well as in comparison with the macro-region of the Far North of Russia. As can be seen, after a slight decrease, the energy potential of the AZRF remains approximately at the same level due to the implementation of plans to extend the active operation of large energy facilities built back in Soviet times. In addition to them, as mentioned above, projects are being implemented for the construction of new low-capacity sources aimed at modernizing or replacing some of the unprofitable boilers and heating plants using petroleum products and solid fuels as the main fuel resource (in the Murmansk Oblast and the Chukotka Autonomous Okrug). There is a gradual decrease in the current values of the total installed heat capacity from the maximum level reached in 2000 in the Far North. This indicates a serious reduction in the overall energy potential on the scale of all northern regions, which is generally typical for the all-Russian situation, when the increase in the efficiency of using the installed capacity of generation facilities is due to the withdrawal of excess capacity. However, in the particular case of the Russian Arctic, on the contrary, it remains quite high. The overall result, based on the data presented, was a decrease in the total thermal capacity of heat supply sources in the entire Far North by 5.5 thousand Gcal/h (the reduction was 9%). The most intensive decommissioning of heat generating capacities was in the Komi and Tyva Republics (reduced by almost half), as well as in the northern regions of the Far East (Magadan Oblast and Kamchatka Krai). In the Russian Arctic, the reduction in the installed capacity of sources occurred only in the Yamalo-Nenets Autonomous Okrug.

Table 2

Total capacity of heat supply sources in the subjects of the Russian Arctic and the Far North, Gcal per hour [17]

Subjects of the Arctic zone of the Russian Federation	2000	2005	2010	2015	2020
Nenets Autonomous Okrug	191	176	178	206	217
Murmansk Oblast	5299	5706	5834	5071	5610
Yamalo-Nenets Autonomous Okrug	5672	5270	4962	4793	5208
Chukotka Autonomous Okrug	689	627	711	276	832
Russian Arctic zone, total	11851	11779	11685	10346	11867
Russian Far North (including Russian Arctic zone) *	60413	59841	54956	52878	54955
Russian Federation, for reference	664862	623211	581777	609239	582984
Share of the Russian Arctic zone on a national scale, %	1.8	1.9	2.0	1.7	2.0
Share of the Russian Far North (including Russian Arctic zone) on a national scale, %	9.1	9.6	9.5	8.7	9.4
Average installed heat capacity of sources in	19.2	20.2	22.8	21.6	21.0

[17] Source: calculated by the author based on UISIS data.

the Russian Arctic zone					
Average installed heat capacity of sources in the Russian Far North (including Russian Arctic zone)*	9.4	10.1	10.7	10.7	11.0
Average installed heat capacity of sources in the Russian Federation	9.8	9.6	8.0	8.0	7.6
*Note: ** calculated by the author using additional data for 13 subjects of the Federation, the territories of which are fully or partially assigned to the regions of the Far North and equivalent areas					

The lower part of the table 2 is of particular interest. It shows that in the Far North, during the gradual transformation of the energy infrastructure, the average indicators of the installed capacity of heat supply sources are growing. In turn, at the federal level, there is a decreasing trend in the average capacity of heat sources throughout the entire study horizon. In general, the main emphasis in the North is on the continued use of highly centralized heat supply schemes for utility consumers, in which the majority of the heat load is based on several dozen thermal power plants with a capacity of over 500 Gcal per hour. The implementation of plans for further preservation of sources with high thermal capacity as part of the heat and power complex is linked to the need for additional large-scale investments aimed at their modernization, reducing the energy costs of consumers, which they are now forced to bear in the form of an increased tariff burden. In the Russian Arctic, there are signs of a change in the general trend — the average indicators have stabilized and are gradually declining. Thus, we note the increasing redundancy of the available capacities of heat sources in the Russian Arctic, primarily in the Murmansk Oblast, as well as in the Chukotka Autonomous Okrug, where it will be necessary to decommission some of the sources, or reconstruct them with appropriate optimization of the coverage areas of new heat supply sources in the near future.

Table 3 shows the dynamics of territorial heat production in the regions of the Russian Arctic and the Far North. The indicators of the table show a steady trend of a long-term decline in the territorial production of thermal energy. In the AZRF, the decline was more than 29% compared to the baseline in 2000. The decline in production was the largest then. In the entire Far North, heat production decreased by 24%. The reduction in energy production at the federal level was 22%. The share of energy production in the Arctic regions on a national scale decreased by 0.2 p.p., and the share of the Far North — by 0.4 p.p. Comparison of the specific values of heat generation per capita in the Russian Arctic and the Far North with the federal level shows more than a twofold excess. It is noted throughout the entire observation period of the current 20-year historical stage of the development of the Russian Arctic, indicating the preservation of specific features of the functioning of life support systems in the northern and Arctic regions. Thus, despite the objectively existing changes in the average annual temperature regimes, which have most affected areas located in the Arctic and subarctic climatic zones over the past few decades, the need for increased energy costs aimed at ensuring the stay of people and economic activity in the extreme conditions of the Russian Far North and the Arctic remains. At the same time, the overall dynamics of specific production per capita is negative. Average indicators of heat production per unit of heat supply, shown in the bottom part of Table 3, also show a decrease. Thus, the demand for equipping heat

sources with even less productive, but more technologically advanced and economically affordable equipment as part of the implementation of investment projects aimed at increasing energy efficiency, localizing zones of efficient heat supply and reducing heat losses during its transmission to the consumer through networks , confirms the conclusion about the increasing relevance of programs for the development of small-scale distributed energy, their preference in the context of a prolonged reduction in energy demand.

Table 3

Heat energy production in the subjects of the Russian Arctic and the Far North, thousand Gcal [18]

Subjects of the Arctic zone of the Russian Federation	2000	2005	2010	2015	2020
Nenets Autonomous Okrug Murmansk Oblast Yamalo-Nenets Autonomous Okrug Chukotka Autonomous Okrug	385 10 362 10 154 967	379 9 772 8 563 1105	409 9 580 8 308 971	368 7 958 7 080 1 009	335 8709 5897 953
Russian Arctic zone, total	21 868	19 819	19 268	16 415	15 894
Russian Far North (including Russian Arctic zone) *	106738	104858	94035	83202	80983
Russian Federation, for reference	998 678	952 210	872 847	792 314	787 010
Share of the Russian Arctic zone on a national scale, %	2.2	2.1	2.2	2.1	2.0
Share of the Russian Far North (including Russian Arctic zone) on a national scale, %	10.7	11.0	10.8	10.5	10.3
Heat energy generation per capita in the Russian Arctic zone, Gcal	14.2	13.5	13.6	11.7	11.5
Heat energy generation per capita in the Russian Far North (including Russian Arctic zone)*	12.6	12.7	11.8	10.5	10.3
Heat energy generation per capita in the Russian Federation, Gcal	6.8	6.6	6.1	5.4	5.3
Heat energy generation per heat supply unit in the Russian Arctic zone, thousands Gcal	35.4	33.9	37.6	34.2	28.2
Heat energy generation per heat supply unit in the Russian Far North (including Russian Arctic zone)*	16.6	17.7	18.3	16.8	16.3
Heat energy generation per heat supply unit in the Russian Federation, thousands Gcal	14.7	14.6	11.9	10.4	10.3

The decrease in energy demand and the corresponding reduction of heat energy production in the northern regions have a decisive influence on the heat energy transportation subsystems, i.e. heat and steam networks. Table 4 shows the indicators of the length of heat and steam pipeline communications in the subjects of the Far North and the Russian Arctic. Similar trend of refraction of the dynamics of indicators after 2015 can be seen, which is also observed in Table 1. It can be explained by their direct relationship — an increase in the number of heat supply sources is accompanied by the commissioning of new heat utilities. The largest increase in their length in the Russian Arctic has recently been observed in the Murmansk Oblast. It is related to construc-

[18] Note: * calculated by the author using additional data for 13 subjects of the Federation, the territories of which are fully or partially assigned to the regions of the Far North and equivalent areas.

tion of new and renovation of some existing boiler houses, located in the northern and central parts of the Kola Peninsula. There is still more than a twofold excess of specific indicators of network coverage per capita (it is calculated per thousand people in Table 4). At the same time, in a long-term twenty-year retrospective, on the contrary, one can see a general decrease in the indicators of infrastructure provision in all northern and Arctic regions, as well as in the Russian Federation in general.

Table 4

Length of heat networks in two-pipe terms in the subjects of the Russian Arctic and the Far North, km [19]

Subjects of the Arctic zone of the Russian Federation	2000	2005	2010	2015	2020
Nenets Autonomous Okrug Murmansk Oblast Yamalo-Nenets Autonomous Okrug Chukotka Autonomous Okrug	100 1 346 2 256 293	89 1 388 2 029 230	71 1 091 2 033 301	82 1 068 1 985 291	96 1 203 1 978 280
Russian Arctic zone, total	3 994	3 735	3 497	3 426	3 557
Russian Far North (including Russian Arctic zone)*	20591	19814	18449	18249	18921
Russian Federation, for reference	186 586	177 175	171 276	171 448	173 650
Share of the Russian Arctic zone on a national scale, %	2.1	2.1	2.0	1.9	2.0
Share of the Russian Far North (including Russian Arctic zone) on a national scale, %	11.0	11.2	10.8	10.6	10.9
Length of heat networks per thousand of the population of the Russian Arctic zone	2.6	2.6	2.5	2.5	2.6
Length of heat networks per thousand of the population of the Russian Far North (including Russian Arctic zone)*	2.4	2.4	2.3	2.3	2.4
Length of heat networks per thousand of the population of the Russian Federation	1.3	1.2	1.2	1.2	1.2
Length of heat networks per thousand square kilometers of the territory of the Russian Arctic zone	2.2	2.1	1.9	1.9	2.0
Length of heat networks per thousand square kilometers of the territory of the Russian Far North (including Russian Arctic zone)*	2.7	2.6	2.4	2.4	2.5
Length of heat networks per thousand square kilometers of the territory of the Russian Federation	10.9	10.4	10.0	10.0	10.1

Reduced lengths of heat and steam networks in the Russian Arctic and in the Far North amounted to 437 and 1670 km, respectively. Thus, despite the multidirectional, but generally positive growth dynamics of absolute values at the final time period of observations (2015–2020), the relative shares of indicators of the length of the heat networks of the Russian Arctic and the Far North became less on the national scale. There was a reduction in the territorial availability of heat and steam networks in the Russian Arctic and in the Far North. We note in particular that the described infrastructural decline processes are commensurate with population decline. Therefore,

[19] Note: * calculated by the author using additional data for 13 subjects of the Federation, the territories of which are fully or partially assigned to the regions of the Far North and equivalent areas.

the numerical series of the line “Length of networks per thousand people” in Table 4 is practically unchanged — it confirms the relationship between changes in the number of population and heat supply infrastructure serving it. At the same time, the specific indicator of availability of networks per unit area is expected to decrease, because, unlike the population, the area of the Far North and the Russian North was taken as a constant in the calculations. The image of the so-called infrastructural discrimination of the North and the Arctic remains; it is expressed in almost fivefold lag of specific parameters of network provision per unit area of the territory. The noted processes of infrastructure reduction represented both in absolute and specific indicators are of a long-term nature, showing a general downward trend in infrastructure development of the Arctic and the northern territories.

Conclusion

1. The decision made by the Government of the Russian Federation to move to a new stage of the municipal reform, the implementation of which was launched in 2022 with an extraordinary indexation of utility tariffs, was not accompanied by the creation of the necessary prerequisites for the growth of the investment attractiveness of the communal sector. Already in the next five years, the growth in the share of utility costs of households in the Far North and the Russian Arctic may reach an average of 13–14% in the total amount of consumer spending. The necessary investment support for the renewal of public utilities is possible through the creation of specialized funds formed from tax deductions from residents of the territories of advanced socio-economic development of the Arctic zone of the Russian Federation.

2. In recent years, the territorial heat supply systems of the Far North and the Arctic have undergone significant changes in infrastructural and organizational aspects. It is associated with the reduction in energy production, the number of heat sources, the length of heat communications, and their relative share in the total communal heat and power infrastructure of the country. This may have an impact on the development of district heating schemes and the possibility of additional connection of consumers to networks.

3. The formation of energy supply systems in the Arctic and Northern regions takes place in different directions, which complicates the implementation of long-term plans for territorial development. In order to unify organizational mechanisms for modernization of the territorial energy infrastructure, it is proposed to develop a state energy development program in the Far Eastern Federal District and in the Russian Arctic for the period up to 2035. Its target indicators should be linked to existing regional programs for the development of fuel and energy, housing and communal, transport, industrial complexes in terms of investment plans relating to projects for the construction of main gas pipelines, territorial gasification facilities, new local oil and gas processing enterprises, and the renovation of public utilities.

In the regional energy subsystems, prerequisites for the development of a territorial heat supply model have been created.

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Industrial Development of the Territories of the Arctic Zone of Yakutia and Ethnological Expertise of Investment Projects

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Abstract. The purpose of the work is to assess the consequences of the industrial development of the territories of traditional nature management of the indigenous peoples of the North. In order to achieve the goal, the investment projects planned on the territory of the Arctic and considered in the ethnological expertise of the Yakutia are analyzed. The structure of the Yakutia economy is dominated by the mining industry. The Arctic and northern territories of Yakutia are characterized by high vulnerability to technogenic impacts. In 2012–2021, 39 investment business projects were considered in the republic's ethnological expertise, including 12 ones in the Arctic and northern regions. In order to improve the health and quality of life of indigenous peoples in the areas of industrial development, it is necessary to conclude a trilateral Cooperation Agreement between the project customer, state authorities and authorized representatives of indigenous peoples. In order to monitor the quality of life of indigenous peoples, it is necessary to adopt the Program of ethno-ecological monitoring in the territories of traditional nature management. The study was carried out using historical-geographical, analytical, synthetic, statistical methods. The results of the work can be applied by specialists of state structures, scientists, students.
Keywords: *indigenous peoples of the North, investment project, traditional nature management, mining industry, ethnological expertise*

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Introduction

Modern industrial development of the Arctic is the next stage in the exploitation of natural resources, mainly minerals and raw materials. Mining in the Arctic leads to an unavoidable intrusion into the lives of indigenous peoples. As a result of the development of industrial enterprises, along with all infrastructure facilities, the constant commissioning of new deposits, significant territories fall into their sphere of influence. The development of hydrocarbons is a striking example

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of this process [1, Popkov Yu.V.]. At the same time, indigenous peoples cannot count on fair, from their point of view, compensation for damage because the legal systems of states do not take into account the specifics of the traditional way of life of the natives when calculating the payment of damage.

From the economic point of view, the Arctic and northern regions are considered to be a region rich in mineral and raw materials, including hydrocarbons. Thus, the Arctic territory is now becoming demanded, but at the same time conflicting area, as previously unannounced claims for rights to Arctic possessions are emerging. According to many researchers, claims to the Arctic territory of Russia are based on the fact that the Arctic is the wealth of all mankind [2, Sleptsov A.N.; 3, Silkin V.Yu. and etc.]. At the same time, the biological resources of the Arctic used by indigenous peoples are very limited. According to [4, Poiseev I.I.], a new industrial step, focused only on profit without regard for ecological and social priorities, can cause an environmental crisis, which can deepen to catastrophic proportions.

Currently, 7 subjects (municipal entities) of the Russian Federation with direct access to the Arctic Ocean are classified as Arctic territories: Murmansk Oblast, Arkhangelsk Oblast, Nenets Autonomous Okrug, Komi Republic (Vorkuta city district), Yamalo-Nenets Autonomous Okrug, Krasnoyarsk Krai (Norilsk city district, Taimyrskiy Dolgano-Nenetskiy municipal district, Turukhanskiy district) and 5 uluses (districts) of the Republic of Sakha (Yakutia) (hereinafter – RS (Ya)) [1].

The legislation of the RS (Y) includes 13 uluses into the Arctic zone: Abyyskiy, Allaikhovskiy, Anabarskiy, Bulunskiy, Verkhnekolymskiy, Verkhoyanskiy, Zhiganskiy, Momskiy, Nizhnekolymskiy, Olenekskiy, Srednekolyimskiy, Ust'-Yanskiy, Eveno-Bvtantayskiy. Of these, 4 uluses have the status of a “national administrative-territorial ulus (district)” — Anabarskiy national Dolgan-Evenk, Zhiganskiy Evenk national, Olenekskiy Evenk national, Eveno-Bvtantayskiy national [2]; indigenous minorities of the North (Small Indigenous Peoples of the North, SIPN) live there.

According to the Russian legislation, the authorities establish territories of traditional nature use (TTNU) [3] — specially protected areas for the traditional use of nature by the peoples of the North, where the activities of industrial companies are limited and possible only with the prior consent of the natives. The territories of these uluses refer to absolutely extreme discomfort zones for living. The average duration of the heating season exceeds 9 months. They are characterized by specific Arctic features: a) focal nature of industrial and economic development of the

[1] Ukaz Prezidenta Rossiyskoy Federatsii ot 02.05.2014 g. № 296 № «O sukhoputnykh territoriyakh Arkticheskoy zony Rossiyskoy Federatsii» [Decree of the President of the Russian Federation of 02.05.2014 No. 296 No. “On land territories of the Arctic zone of the Russian Federation”]. URL: http://www.kremlin.ru/acts/bank/38377 (accessed 02 October 2022).

[2] Shtyrov V. A. Vosem' rayonov Yakutii vklyuchat v sostav Arkticheskoy zony [Eight districts of Yakutia will be included in the Arctic zone]. URL: http://yakutiakmns.org/archives/5410 (accessed 20 October 2022).

[3] Postanovlenie Pravitel'stva RS (Ya) ot 22 iyunya2006 g. N 267 «Ob utverzhdenii polozheniya o territoriyakh traditsionnogo prirodopol'zovaniya korennykh malochislennykh narodov Servera Respubliki Sakha (Yakutiya)» [Decree of the Government of the Republic of Sakha (Yakutia) dated June 22, 2006 N 267 "On approval of the regulation on the territories of traditional nature management of the indigenous peoples of the Server of the Republic of Sakha (Yakutia)"]. URL: https://docs.cntd.ru/document/802070067 (accessed 02 October 2022).

territories, low population density; b) remoteness from industrial centers; c) dependence of the economic activities of the population on supplies of fuel, food, essential goods from the central regions of Russia [5, Burtseva E.I., Potravnyy I.M., Gassiy V.V. et al.].

As of January 31, 2018, the register of TTNUs of local importance included 54 municipalities of the RS (Ya). In the conditions of active industrial development of the natural resources of the Russian Arctic, the creation of the TTNU plays an important role in protecting the interests and rights, preserving the original habitat of the indigenous peoples of the North, and can serve as a certain deterrent for industrial enterprises [6, Potravnyy I.M., Gassiy V.V., Afanasyev S.M.].

Literature review and research methodology

According to A.A. Tranin [7], industrial expansion increases not only the anthropogenic impact of mining companies on the vulnerable ecosystem of the North, but also creates many conflict situations in relations with the aboriginal population. As one of the options for solving the problems of traditional natural resource use by indigenous peoples, he suggests an approach, well-known in international practice: a combination of certain types of specially protected natural areas (SPNA) and TTNU. In some cases, as in the USA and Canada, they are included in national parks, biosphere reserves, etc., in others, as in Russia, they are classified as specially protected areas.

Industrial development of TTNU abroad is often accompanied by the emergence of conflict situations [8, Stephenson S.R.]. Conflicts can also arise in conditions of resource depletion and exhaustion, closure of industrial enterprises, which is associated with the problem of employment, elimination of accumulated damage and provision of environmental conditions for the population [9, Gengut I., Alnukina E., Davaakhuu N., Potravnyy I.]. In some countries, where such projects are implemented, certain experience has been gained in concluding agreements between mining companies and indigenous peoples on providing compensation [10, Sosa I., Keenan K.]. The Republic of Sakha (Yakutia), as one of the leading regions in terms of legal support of the rights of the indigenous peoples of the North, is also of particular interest to foreign researchers. The problems of traditional nature management in the Arctic regions, in particular in the RS (Ya), have been studied in many works, among which the works of foreign authors can be mentioned: [11, Fondahl et al.; 12 Wilson et al.; 13, Balzer et al.].

Yakutia is included in four geographical zones: Arctic desert, tundra, forest-tundra and taiga forests [14, Pakhomova L.S., Savvinova A.N.]. According to the results of the 2010 census, the number of 5 indigenous peoples (Evens, Evenks, Chukchi, Yukagirs, Dolgans) in the republic is 39936 people. According to the geographical areas of traditional nature management, the Evenks amounted to 21008 people, the Evens — 15071 people (Table 1).

Table 1

Geographical zoning of the territory of traditional nature use of the Republic of Sakha (Yakutia)

Geographical zones	Subzones	Evenks	Evens	Total
Tundra	Typical (tundra)	124	2545	2669
Forest-tundra	Tundra-northern taiga	3055	1497	4552
Total		3179	4042	7221

Taiga	Northwestern taiga	5479	71	5550
	Northeastern taiga	2282	4808	7090
	Total	7761	4879	12640
	Central Yakut alas-middle taiga	4410	4978	9388
	Western middle taiga	1173	436	1609
	Southwestern middle taiga	1289	303	1592
	Southern mountain taiga	3196	433	3629
Total		10068	6150	16218
Total for RS(Ya)		21008	15071	36079

For natural and economic zoning, the factor intensity index (*ИНФ*, FTI) recommended by E.I. Burtseva was used [15], which is calculated as the share of the indicator in the republic average. The index is quite free from subjectivity, it represents a deviation from the average state of the object in relative terms and is determined by the formula:

$$ИНФ_i = \frac{a_i}{M}$$

where: a_i – the absolute value of the *i*-th indicator; *M* — the absolute average value of the set of indicators. Subsequently, using the FTI, the territory of the Republic of Sakha (Yakutia) was zoned according to the vulnerability of natural complexes to anthropogenic impacts (Table 2) [16, Burtseva E.I. et al.].

Table 2

Natural and economic zoning of the territory of the Republic of Sakha (Yakutia) according to the vulnerability of natural complexes to anthropogenic impacts

Natural and economic zones/subzones		Zones		Subzones	
Zones	Subzones	FTI	Level of vulnerability	FTI	Level of vulnerability
Subarctic tundra-northern taiga	Typical	3.43	Extremely high	3.43	Extremely high
Northern taiga	Northwestern plain	1.18	High	1.10	High
	North-Eastern mountain-taiga			1.15	High
	North-Eastern lake-taiga			1.31	Very high
Middle taiga	Western	0.95	Medium	0.89	Medium
	Central			0.85	Medium
	Southwestern			0.88	Medium
	Southern			1.17	High

On the territory of the Republic of Sakha (Yakutia), 3 zones and 8 subzones of resistance of natural complexes to technogenic impacts have been identified. In general, on the territory of the Republic, the vulnerability of subzones to anthropogenic impacts increases from south to north by 2–3 times; in the Subarctic tundra-northern taiga zone, the vulnerability of natural complexes to technogenic impacts is extremely high, in north taiga — very high.

As noted by V.A. Kryukov [17], a distinctive feature of the “high latitude economy” is that it consists of two types of environmental management: the traditional activities of the indigenous people of the North and the Arctic and the development of natural resources, cities and settle-

ments. On the territory of Yakutia, indigenous minorities account for 4.2% of the total population of the republic and specialize mainly in traditional industries: reindeer herding, hunting, fishing and gathering wild plants [18]. Table 3 presents the natural and economic zones of Yakutia by their specialization.

Table 3

Natural and economic zones of the territory of Yakutia and their specialization by economic sectors

Natural and economic zones by background sector	Specialization of territories by sectors of the economy
Arctic tundra-farming-reindeer-breeding	Reindeer breeding, fishing and hunting, diamond-tin-gold mining
North-Western northern taiga reindeer-breeding	Reindeer breeding, fishing and hunting, local development of the diamond mining industry
North-Eastern lake-taiga reindeer-breeding-horse-breeding-cattle-breeding	Reindeer breeding, fishing, local development of the coal mining industry
North-Eastern mountain-taiga reindeer-breeding-horse-breeding-cattle-breeding	Animal husbandry, horse breeding, reindeer breeding, fishing, local development of the gold mining industry
Western middle taiga horse-breeding-cattle-breeding	Gas and diamond mining industry, animal husbandry, horse breeding, hunting, poultry farming
Central alas-middle taiga agricultural-cattle-breeding	Animal husbandry, horse breeding, reindeer breeding, fishing, agriculture, local development of the coal mining industry
Southwestern middle taiga agricultural-cattle-breeding	Forestry, oil industry, hunting, animal husbandry, horse breeding, agriculture
Southern mountain-taiga agricultural-trading-reindeer-breeding	Gold, coal mining, transportation hub, reindeer herding, hunting, agriculture

Traditional natural resource management

The Arctic has long been inhabited by the indigenous peoples of Russia, including Dolgans, Evens, Evenks, Yukagirs and Chukchi. More than half of the SIPN live in the Arctic zone of Russia, two thirds of them — outside urban areas [19, Pavlenko V.I., Petrov A., Kutsenko S.Yu., et al.]. In the Arctic uluses of the RS (Ya), the number of permanent population as of January 01, 2020 was 67652 people, 41355 of them (61.1%) — rural population. The population density of 0.04 persons/km^2 is the lowest in Russia. The uluses are characterized by a low standard of living of the population, for example, the ratio of average per capita income to the subsistence minimum decreased from 244% in 2007 to 167% in 2019 (the last place among the territories of the Russian Arctic). At the same time, the population with incomes below the subsistence level decreased from 25.6% in 2007 to 17.9% in 2019, which is the highest indicator in the Russian Arctic and significantly higher compared to the Russian Federation as a whole [20, Kovshov A.A., Novikova Yu.A., Fedorov V.N., et al.].

Other urgent problems of the indigenous peoples of the Arctic zone are:

- providing the population with quality water; the solution of which is related to the implementation of measures of the federal project “Clean Water”;

- tendency of the permanent population reduction due to migration outflow;
- high level of unemployment;
- insufficient number of doctors of all specialties;
- increased risk of alcoholism and tuberculosis [21, Naberezhnaya A.T.].

The main ethno-preserving sector of the traditional nature management of the indigenous peoples of the North is reindeer herding, its associated industries are hunting, fishing and gathering wild herbs. Reindeer husbandry in Yakutia appeared first in the taiga and northern taiga zones, and later — in the tundra zone. By the end of the 19th century, domestic reindeer breeding covered almost the entire territory of Yakutia [22, Kurilyuk A.D.].

According to V.A. Tishkov and co-authors [23], there are a number of acute social problems among SIPN associated with the industrial development of the TTNU:

a) health care organization in remote areas of the Russian Arctic, which is associated with the nomadic lifestyle of the population;

b) alcoholism, which is one of the causes of increased mortality and low life expectancy;

c) issues of ethnic languages, which have been replaced by the dominant language, mainly Russian.

For the long-term development goals of the Russian Arctic, the authors consider it necessary to establish a partnership between all participants in nature management and economic activity under the state control and the presence of the activity of the natives themselves.

Mining industry

The industrial development of the arctic and northern regions of Yakutia began in 1935 with the development of coal in the Verkhnekolymskiy ulus. The development of a tin deposit was carried out in the Verkhoyanskiy (beginning in 1941) and Ust-Yanskiy (beginning in 1952) uluses. Diamond mining began in the early 1960s: the Aikhal mine in the Mirninskiy district (1961), the diamond placer in the Anabarskiy, Zhiganskiy and Olenekskiy uluses (1994). Gold mining was carried out in the lower reaches of the Yana River: the Kular gold mine (1963) in the Ust-Yanskiy ulus, the northernmost mine in the country (Table 4).

Currently, diamond mining remains one of the main branches of the mining industry of the republic. Until the 1980s, diamond mining was carried out only in the Mirninskiy district. In 1998, OJSC Almazy Anabara (Anabarskiy ulus) was established to mine the world's largest diamond placer of the Ebelyakh River. In 2004, the enterprise was transformed into JSC Anabar, a subsidiary of ALROSA. Today, the company is one of the largest industrial enterprises in the Republic of Sakha (Yakutia) and one of the major payers to the republic's budget.

Table 4

Development of mineral deposits in the Arctic zone of Yakutia

Minerals	Year of development	District
Coal	1935	Verkhnekolymskiy
Tin	1941	Verkhoyanskiy
Tin	1952	Ust-Yanskiy

Almaz (Aikhal mine)	1961	Mirninskiy
Gold	1963	Ust-Yanskiy, Kular mine
Diamond (placer deposits)	1994	Anabarskiy, Zhiganskiy Olenekskiy
Fields currently being developed [1]		
Coal	CJSC "Zyryanskiy coal mine"	Verkhnekolymskiy
Diamond (placer)	"Ebelyakh"	Anabarskiy
Gold (placer)	"Vyun", "Sentachan"	Verkhoyanskiy

The gold mining industry in the Arctic developed in the Soviet era in Ust-Yanskiy (Kularzoloto MPP) and Verkhoyanskiy (Adychankiy placer) uluses, tin-mining industry — in Ust-Yanskiy (Deputatskiy MPP) ulus [24, Efremov E.I., Nikiforova V.V.]. Currently, alluvial gold is mined in the Arctic uluses by Yanzoloto LLC, the Plamya miners artel, Novaya LLC, Orion Group+ LLC, Zolotoy Region LLC in the Verkhoyanskiy district and others; diamond mining — Almazy Anabara in the Mirninskiy district, coal — Zyryanskiy mine in the Verkhnekolymskiy ulus [25, Nikiforova V.V.].

Today, as a result of the activities of industrial facilities in the Arctic, an unfavorable environmental situation has developed. For example, the water bodies of the Lena River basin in 2019 in the area of the Neelova Bay (delta of the Lena River), the basins of the Anabar, Indigirka, Kolyma rivers were assessed as 3rd “a” and “b” pollution classes (“polluted” and “very polluted”) [4].

In general, the industrial development of the TTNU has a negative impact on the livelihoods of the indigenous peoples: the area of reindeer pastures, hunting and fishing resources are reducing, environmental pollution is occurring, which causes deterioration in the health and quality of life. On the other hand, the development of industry in the TTNU plays an important role in the socio-economic development of tribal communities, the creation of conditions for a decent life for indigenous peoples, and the preservation of their culture and language. In other words, it is necessary to objectively compare and evaluate all aspects of the interaction of mining companies with the tribal communities of the indigenous peoples of the North, with local and regional authorities [5, Burtseva et al.].

Ethnological expertise

In 2010, the law of the Republic of Sakha (Yakutia) “On ethnological expertise in places of traditional residence and traditional economic activities of the peoples of the Republic of Sakha (Yakutia)” [5] was issued. It is so far the only one in Russia. The concept of “ethnological expertise” is

[4] Gosudarstvennyy doklad o sostoyanii i okhrane okruzhayushchey sredy Respubliki Sakha (Yakutiya) v 2019 godu [State report on the state and protection of the environment of the Republic of Sakha (Yakutia) in 2019]. Government of the Rep. Sakha (Yakutia), Ministry of Ecology Rep. Sakha (Yakutia)], 2020. 660 p. URL: https://minpriroda.sakha.gov.ru/uploads/ckfinder/userfiles/2021/04/13/files/%D0%93%D0%94%20-2019.pdf (accessed 02 October 2022).

[5] Zakon Respubliki Sakha (Yakutiya) «Ob etnologicheskoy ekspertize v mestakh traditsionnogo prozhivaniya i traditsionnoy khozyaystvennoy deyatel'nosti i na territoriyakh traditsionnogo prirodopol'zovaniya korennykh malochislennykh narodov Severa Respubliki Sakha (Yakutiya)» ot 14 aprelya 2010 g. N 820-Z- N 537-IV [Law of the Republic of Sakha (Yakutia) "On ethnological expertise in places of traditional residence and traditional economic activity and in

defined in Article 1 of the Federal Law of April 30, 1999, No. 82-FZ6 [6] as "a scientific study of the impact of changes in the native habitat of small peoples and the socio-cultural situation on the development of an ethnic group". The objects of the state ethnological expertise of the RS (Y) are: 1) normative legal acts, materials and other documentation on the implementation of the planned economic and other activities in the places of traditional residence and traditional economic activities of small peoples; 2) small peoples located in the zone of influence of the planned economic and other activities; 3) original habitat of small peoples; 4) socio-cultural situation in the zone of influence of the planned economic and other activities [26].

The procedure of ethnological expertise consists of the following main stages:

1. Development of the document "Ethnological Environmental Impact Assessment (EEIA) in the places of residence and economic activity of the indigenous peoples of the North".
2. Ethnological expertise of projects. The expert commission includes representatives from different specialties: biologists, economists, hydrologists, ichthyologists, sociologists, lawyers, etc.
3. Public hearings. Participants of public hearings: representatives of industrial companies, representatives of indigenous peoples of the North, developers of the EEIA, members of the expert commission, representatives of public organizations and government agencies, etc.
4. Conclusion of the expert commission. The final decision on the permission or prohibition of the planned economic activity of industrial companies on the TTNU is made by the Government of the Republic of Sakha (Yakutia).

For 2012–2021, 39 investment business projects were considered in the ethnological expertise of the Republic of Sakha (Yakutia), including 12 projects in the Arctic and northern regions. The ranking of projects by natural and economic zones showed that the largest number of investment projects were considered in the Southern mountain-taiga agricultural-trading-reindeer breeding zone — 19 projects, the Western horse-breeding and cattle-breeding zone is in 2nd place — 6 projects, 2 zones are in 3rd place: Arctic tundra commercial and reindeer breeding zone — 5 projects and the North-Eastern mountain-taiga reindeer-breeding-horse-breeding-cattle breeding zone — 5 projects, North-Western northern taiga commercial and reindeer breeding zone is on the 4th place — 2 projects, as well as the Central Alas-middle taiga agricultural-horse-breeding-cattle-breeding — 2 projects. Tables 5–6 present investment projects in the Arctic natural and economic zone, considered in the ethnological expertise of the RS (Y) for 2015–2021.

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the territories of traditional nature management of the indigenous peoples of the North of the Republic of Sakha (Yakutia)" dated April 14, 2010 N 820-Z-N 537-IV]. URL: https://base.garant.ru/26716249/ (accessed 02 October 2022).

[6] Federal'nyy Zakon «O garantiyakh prav korennykh malochislennykh narodov Rossiyskoy Federatsii» (s izmeneniyami i dopolneniyami) ot 30 aprelya 1999 g. № 82-FZ [Federal Law "On guarantees of the rights of indigenous minorities of the Russian Federation" (with amendments and additions) dated April 30, 1999 No. 82-FZ]. URL: http://www.consultant.ru/document/cons_doc_LAW_22928/ (accessed 02 October 2022).

Table 5

Investment projects in the Arctic tundra-commercial-reindeer-breeding zone of Republic of Sakha (Yakutia)

District	Project	Economic entity	Year of expertise	Beneficiaries	Amount of compensation, roubles
Bulunskiy, Anabarskiy	Complex geological and geophysical works in the area of the junction of the Lena-Tunguska oil and gas fields and Laptevskaya oil and gas fields. Exploration and production	SSC FSUGE "Yuzhmorgeologiya" — Russian Federation, M.	2015	8 beneficiaries	5 930 102
	Exploration and production of alluvial gold in the area of the Suor Uyalah creek mining site *(see the text for the full name of the project).*	ADC LLC 2018	2020	1 beneficiary	952 935
Ust-Yanskiy	Exploration and production of alluvial gold of the "Achchyg creek deposits. Kumakh-Yuryue and Pravyy-Kumakh-Yuryue" and others *(the full name of the project is in the text).*	Janzoloto LLC 06.06.2019	2020	2 beneficiaries	5 057 303
Anabarskiy	Development of a placer diamond deposit of the Ebelyakh River of the Anabarskiy ulus.	Almazy Anabara JSC	2021	1 beneficiary	4 119 905
Bulunskiy	Mining of alluvial diamonds in the area of the Molodo River mining sites on the territory of the Bulunskiy ulus within the licensed site Yaku 15887 KE	Almazy Anabara JSC	2021	4 beneficiaries	218 992 802
Total					288 424 047

The first project considered in the ethnological expertise for the Arctic tundra-commercial-reindeer-breeding zone (2015) is "Comprehensive geological and geophysical work in the junction of the Lena-Tunguska oil and gas field and the Laptev potential oil and gas field" in Bulunskiy, Anabarskiy and Ust-Yanskiy uluses. Eight tribal communities will be affected by the geological and geophysical works (Agricultural Cooperative Nomadic Clan Community "Wottaakh-Khaya", Agricultural Cooperative Nomadic Clan Community "Ulakhan-Kyuel", Clan Community Indigenous Minorities "Uelya", Clan Community Indigenous Minorities "Terpyai", Municipal Unitary Reindeer Herding And Fishery Enterprise "Arktika", Municipal Unitary Reindeer Herding And Fishery Enterprise "Named after Ilya Spiridonov", Municipal Unitary Enterprise "Taymylyrskiy", Peasant Farm Enterprise "Skrybykin I.G.").

The comments of the expert commission mainly relate to the assessment of the amount of damage caused to the tribal communities of the indigenous peoples of the North: the calculations were made on the basis of outdated materials (1980s) without geo-botanical research, there are many inaccuracies in the calculations, etc. Extraction of rare-earth metals at the Tomtorskoe deposit, which has inferred resources of over 150 million tons of ore, is planned to start in 2027 [7].

In 2020, 2 investment projects were considered in ethnological expertise:

1. "Exploration and mining of alluvial gold in the mining area of the Suor-Uyalakh creek: Kristall, Sdvig, Krotkiy, Mamonya, Ulakhan-Yuryuye, Alenka on the territory of the Ust-Yansky municipal district of the Republic of Sakha (Yakutia) within the license area YAKU 05277 BE". Information about the deposits: a) the Kristall deposit was discovered in 1972, currently partially depleted; b) Suor-Uyalaakh (opened in 1963); c) Sdvig creek (prospecting work was carried out in 1982–1985); d) Krotkiy creek (opened in 1970); e) Mamonya creek (1983–1984); e) Ulakhan-Yuryuye creek (opened in 1963); g) Alenka creek deposit was discovered in 1963 and given for commercial development to Kularzoloto plant.

One tribal community of the Nomadic Clan Community of Indigenous Minorities of the North of the Evens "Omoloy" will be affected by the industrial enterprise. The amount of compensation for the development of gold amounted to 952,935 rubles. The economic entity is ADK LLC, 2018. According to the design and estimate documentation, the project is expected to use the alluvial gold mining method by processing the accumulated waste (sludge pits), as well as the shaft method. The proposed approach to the processing of technogenic placers, together with the use of technologies for the transition to a method of mining on pillars, allows not only to provide additional volumes of valuable metal, but also makes it possible to reclaim previously disturbed lands and significantly reduce the technogenic impact on the native habitat of the peoples of the North [27].

2. "Exploration and mining of alluvial gold deposits "Achchygy-Kumakh-Yuryue and Pravyy-Kumakh-Yuryue creeks", "Taryng-Yuryakh creek, right tributary of the Sygyndzha creek (Uyandino river basin)" and "Khonikukichan creek, left tributary of the Taring-Yuryakh river in the Ust-Yanskiy ulus"". Two beneficiaries will be affected by the enterprise: the Silyannyakhskiy National Nasleg Municipality and the Nyoolten Nomadic Clan Community of the Indigenous Minorities. The amount of compensation is 5,057,303 rubles. The economic entity is Yanzoloto LLC. Mining technology: open pit with repeated ripping, hilling and thawing of sands in permafrost conditions.

For a period of 7 years, 71.0 hectares of forest fund lands are withdrawn on the territory of the municipality "Silyannyakhskiy national nasleg" for the development of placer gold reserves of the deposits "Achchygy-Kumakh-Yuryue and Pravyy-Kumakh-Yuryue creeks". The total number

[7] Tomtor (deposit). URL: https://ru.wikipedia.org/wiki/%D0%A2%D0%BE%D0%BC%D1%82%D0%BE%D1%80_(%D0%BC%D0%B5%D1%81%D1%82%D0%BE%D1%80%D0%BE%D0%B6%D0%B4%D0%B5%D0%BD%D0%B8%D0%B5) (accessed 02 October 2022).

of domestic deer in the municipality "Ust-Yanskiy ulus" amounted to 24203 heads at the beginning of 2019. Two farms are engaged in reindeer breeding: the agricultural consumer cooperative "Taba-Yana" and the agricultural production cooperative nomadic tribal community "Omoloy and K".

In 2021, 2 investment projects were considered in the ethnological expertise:

1. Project "Development of a placer diamond deposit of the Ebelyakh River of the Anabarskiy ulus of the Republic of Sakha (Yakutia)". The Anabar National (Dolgan-Evenki) ulus will be affected by the industrial enterprise. The amount of compensation is 4,119,905 rubles, which will be received by the Anabar National (Dolgan-Evenki) ulus. The economic entity is Almazy Anabara JSC.

The Anabar ulus is a historically established territory of the settlement of Dolgans, Evenks, Evens and Yukaghirs. Traditionally, the inhabitants of the ulus are engaged in reindeer herding, hunting and fishing. In 2019, the number of deer in the Anabarskiy ulus was 17682 heads, of which 14576 were in agricultural enterprises, and 3106 — in tribal communities.

The main hunting resources in the nasleg are elk, wild reindeer and sable. Tribal communities are engaged in hunting for commercial meat, which is a product of their own consumption. In addition, the main direction of hunting for members of the community is fur trade (for sable). This is the only source of income for clan communities. The period of validity of the conclusion of the Expert Commission of Ethnological Expertise on the materials of the EEIA is 5 years.

2. Project "Extraction of alluvial diamonds in the Molodo River mining areas in Bulunskiy ulus within the licence area of Yaku 15887 KE". Four enterprises will be affected by the industrial enterprise: MUE "Bulunskoe", APC "Algys", APC "Bayanay", APC "Chekurovka". The amount of compensation is 10,944,168 rubles per year in equal shares of ¼ in the form of a lump sum payment in prices at the end of 2016, for 20 years — 218,992,802 rubles. The economic entity is Almazy Anabara JSC. The license expires on June 30, 2035.

The beneficiaries of compensation payments as a result of damage to the original habitat of the indigenous peoples of the North are MUE "Bulunskoe", APC "Algys", APC "Bayanay", APC "Chekurovka". The payer of compensations to associations of small peoples under the project "Extraction of alluvial diamonds in the Molodo River mining areas in Bulunskiy ulus within the licence area of Yaku 15887 KE" is Almazy Anabara JSC.

The total amount of compensation in the Arctic zone for the violation of natural complexes for 5 projects amounted to 288,424,047 rubles, while the largest amount of compensation was 218,992,802 rubles. They accounted for the extraction of alluvial diamonds in the area of the Molodo Bulunskiy ulus. The economic entity is Almazy Anabara JSC.

In 2016, 2 investment projects were considered in the North-Western north-taiga commercial and reindeer breeding zone: "Development of the Verkhne-Munskoe deposit" and "Development of a placer diamond deposit in the Bolshaya Kuonamka and Talakhtakh rivers area" (Table 6).

Table 6

Projects of the North-Western north-taiga commercial and reindeer breeding zone of high vulnerability

District	Project	Economic entity	Year of expertise	Beneficiaries	Amount of compensation, roubles
Olenekskiy	Development of the Verkhne-Munskoe deposit	ALROSA (PJSC)	2016	2 beneficiar-ies	23 985 130
Olenekskiy	Development of a placer diamond de-posit in the Bolshaya Kuonamka and Ta-lakhtakh rivers area	Nizhne-Lenskoe JSC	2016	2 beneficiar-ies	4 186 000
Total					28 171 130

1. Project *"Development of the Verkhne-Munskoe deposit"* was considered in the ethnological expertise in 2016. The economic entity is PJSC ALROSA. Two enterprises — MUE "Zhilindinskiy" and MUE "Olenekskiy" — will be affected by the industrial facility. The amount of compensation for the period of operation is 23,985,130 rubles in 2016 prices. The development of the unique Verkhne-Munskoe diamond deposit in Yakutia is a strategic diamond mining project of the ALROSA Group. The deposit is located in the Olenekskiy ulus, 180 km from the Udachnyy MPP, and consists of 4 kimberlite pipes. The field is one of the largest discovered in recent years. The field is being developed by the ALROSA group. The deposit was commissioned on October 31, 2018. It is planned to be developed by open pit method.

The first version of the EEIA contained gross errors, for example, certified documents of the Clan Nomadic Community "Amin" ("Amga") of the Aldanskiy district were used to estimate market prices for products of traditional nature management, and their use resulted for the Olenekskiy ulus in gross errors both in terms of species (presence of bighorn sheep, wapiti, cedar, which are not found in the Olenekskiy ulus) and real market prices of wild-growing, hunting and fishing resources. Only after correction of the comments, the expert commission gave a positive conclusion.

2. Investment project *"Development of an alluvial diamond deposit in the promising area "Bolshaya Kuonamka and Talakhtakh rivers"* was considered in the ethnological expert review in 2016, the economic entity JSC Nizhne-Lenskoe. Two enterprises — MUE "Zhilindinskiy" and MUE "Olenekskiy" — will be affected by the industrial facility. The amount of annual damage is 4,186,000 rubles.

The calculation of the losses of the indigenous minorities is mainly based on the data of the Olenekskiy ulus administration (the book value of the deer, the purchase value of hunting and commercial species), rather than on market prices, as recommended in the Methodology (2009). At the same time, the production and economic indicators of tribal communities (the cost of production, material and technical costs for maintaining traditional types of nature management) are not sufficiently used; for this reason the amount of losses of the indigenous peoples is underesti-

mated. One of the positive results of the work is a geobotanical survey of the current state of productivity of reindeer pastures in 2015. In previous works submitted for ethnological expertise, the losses of the indigenous peoples of the North were calculated on the basis of materials from the 1980s–1990s. After correction of the comments of the experts, the work received a positive conclusion.

In the North-Eastern mountain-taiga zone, 4 investment projects were considered in ethnological expertise: 3 projects for Verkhoyanskiy ulus, 1 — for Momskiy ulus. Projects considered in ethnological expertise:

1. Project “Concentration plant for processing gold-antimony ore of the Sentachan deposit” was considered in the ethnological expertise in 2019. The amount of compensation for the construction period is 1,234,453 rubles, for the operation period (10 years) — 3,827,190 rubles, total — 5,061,643 rubles. The municipality “Tabalakhskiy nasleg” will receive the compensation. The economic entity is Zvezda JSC, 2018. As of January 01, 2017, 168 Evens live here, as well as 3 representatives of the Evenks, including 94 men, 77 women, united in 48 families. The main place of compact residence of the Evenks of Verkhoyanskiy district is the village of Ulakhan-Kyuyel Tababa of the Tabalakhskiy nasleg.

The Sentachan gold-antimony deposit is characterized by rich ores with an antimony content of 24.6%, gold 38.2 g/t and silver 13.4 g/t. Antimony reserves by category C1 amount to 171.6 thousand tons, in category C2 — 22.9 thousand tons, off-balance reserves — 32.2 thousand tons. The project provides for the processing of ores at the Sentachan deposit (Table 7) according to the technological scheme: a) gravitational enrichment of ore with the withdrawal of the primary gold concentrate; b) flotation enrichment of gravity tailings. The final products are gold-bearing ingots (Dore gold), meeting the requirements of TU 117-2-7-75, in the amount of 0.87 kg per day. Black gold bars are sold to the refinery. In the preliminary Conclusion, the experts gave quite a lot of comments on the EEIA, which were partially corrected, but there are a number of remarks that are recommended to be resolved during ethnological monitoring, which should be conducted every 5 years.

Table 7

Projects of the North-Eastern mountain-taiga reindeer-breeding-horse-breeding-cattle breeding zone with relatively high vulnerability

District	Project	Economic entity	Year of expertise	Beneficiaries	Amount of compensation, roubles
Verkhoyanskiy	Concentration plant for processing gold-antimony ore of the Sentachan deposit	Zvezda JSC	2019	1 benefi-benefi-ciary	5 061 643

Verkhoyanskiy	Exploration and production of a mining and processing enterprise on the basis of the Vyun gold deposit, Republic of Sakha (Yakutia)	Dalzoloto LLC	2020	1 benefi-benefi-ciary	5 763 585
Momskiy	Development of a placer gold deposit in the upper reaches of the Artyk river with tributaries of Udarnik creek, Mars creek, Shpat creek, Fart creek, Pioneer creek, Zayem creek	Vostok LLC 2019 752062,17	2020	3 beneficiaries	15 521 983
Verkhoyanskiy	Opening and processing of the deep horizons of the Sentachan deposit	Zvezda JSC	2021	2 beneficiaries	8 713 379
Total					35 060 590

2. Project “Exploration and production of a mining and processing enterprise on the basis of the Vyun gold deposit, Republic of Sakha (Yakutia)” was considered in the ethnological expertise in 2020. The amount of compensation is 5,763,585 rubles, which should be received by 1 beneficiary: integrated agricultural production company “Khara Salaa Community”. The economic entity is Dalzoloto LLC. The site of extraction and processing complex of gold-quartz ores of the Vyun deposit is located at the TTNU of local significance “Tabalakhskiy” of the Verkhoyanskiy district of the Republic of Sakha (Yakutia). There is one registered nomadic clan community on the territory of the Tabalakhskiy nasleg — the IAPC Khara-Salaa, the main activity of which is deer breeding. The tribal communities receive their main income from sable hunting and subsidies to support domestic reindeer breeding. Geological survey, mining and processing of gold-quartz ore at the Vyun deposit is carried out by Dalzoloto LLC.

3. Project “Opening and processing of the deep horizons of the Sentachan deposit” on the territory of the Verkhoyanskiy district of the Republic of Sakha (Yakutia)” was considered in the ethnological expertise in 2021. The amount of compensation is 8,713,379 rubles; it should be received by 2 tribal communities: IAPC “Khara Salaa Community”, ACPC Indigenous Minorities “Talba-Taba”. The economic entity is Zvezda JSC.

The Sentachan field was discovered in 1969. In 1970–1980, geological exploration of the deposit was carried out. From 1989 to 1995, it was industrially exploited by the Yakutzoloto Production Association. Open pit mining was carried out in the period 1989–1992, underground mining — in 1993–1995. In 2005, JSC Zvezda resumed underground mining at the field. Currently, there are reindeer pastures of Khara-Salaa Community farming company and Talba-Taba Indigenous Minority farming company near the Sentachan field. They are located to the east of the

Sentachan field. The cartographic material tentatively shows the boundaries of the land plot used as reindeer pastures by the Khara-Salaa Community.

4. Project "Development of a placer gold deposit in the upper reaches of the Artyk river with tributaries of Udarnik creek, Mars creek, Shpat creek, Fart creek, Pioneer creek, Zayem creek, Gnezdovoy creek, Djukchan creek by open pit method" in Momskiy ulus was considered in the ethnological expertise in 2020. The amount of compensation is 15,521,982.99 rubles, which should be received by 3 tribal communities: Clan Nomadic Community of the Indigenous Minorities (Evens) "Kukuin", Clan Nomadic Community of the Indigenous Minorities (Evens) "Sarkichan", Clan Nomadic Community of the Indigenous Minorities (Evens) named after S.G. Sleptsov. The economic entity is Vostok LLC. It carries out work on geological study, exploration and production of minerals on the territory of the licensed area YAKU 05465 BR with an area of 19.33 sq. km.

The Ulakhan-Chistaiskiy national nasleg is the largest reindeer herding site in the municipality "Momskiy district". Historically, reindeer breeding is a priority type of traditional farming in the village of Sasyr. Reindeer herding farms of various forms of ownership operate in the village: Bukchan LLC, CNC Erikit, CNC IM (Evens) named after S.G. Sleptsov, CNC IM (Evens) "Sarkichan" and others.

The total amount of losses to small peoples in the territory of the planned economic activity for geological study, prospecting, evaluation of minerals, mining in the Artyk River basin will be 15,521,983 rubles, including a one-time payment to CNC IM (Evens) "Kukuin" — 5,173,994.33 rubles; CNC IM (Evens) "Sarkichan" — 5,173,994.33 rubles; CNC IM (Evens) named after S.G. Sleptsov — 5,173,994.33 rubles. In total, in the North-Eastern mountain-taiga reindeer-breeding-horse-breeding-cattle breeding zone, compensation for the losses of the indigenous peoples of the North amounted to 43,967,447.99 rubles.

Conclusion

The implementation of major investment projects in the Arctic zone of the Republic of Sakha (Yakutia) will have a significant impact on the development of territories: both positive and negative. Positive impact of industrial development of the TTNU:

a) Russia pays special attention to ensuring environmental safety: the national project "Clean Country" currently includes an action to eliminate the tailing dump of the Kular gold processing plant in the Ust-Yansk ulus. Work is underway to include the measure "Cleaning the territory of the village of Tiksi in Bulunskiy ulus from accumulated scrap metal".

b) The republic has a high ecological potential: Mount Pobeda (3003 m), the highest peak in the north-east of Siberia, is located in the Momskiy ulus, and the tourist projects "Verkhoyansk — the Pole of Cold of the Northern Hemisphere", "Conquerors of Cold" are being implemented in the Verkhoyansk district. The special feature of the region is the Arctic cruise along the Lena River to the Arctic Ocean "Yakutsk — Tiksi — Yakutsk", which is in demand among foreign tourists.

Negative impact of industrial development of the TTNU:

a) The planned industrial development of the Arctic zone, which is characterized by a high vulnerability of natural complexes to technogenic impacts and low assimilation capacity, can cause large-scale disturbances of the land surface, pollution of the original habitat of the indigenous peoples of the North.

b) The depletion and exhaustion of natural resources for the traditional types of nature management on the territory of the TTNU as a result of exploration and extraction of minerals can cause conflict situations between indigenous peoples and industrial enterprises.

Measures to improve the environmental and socio-economic situation in the territories of residence and traditional activities of the indigenous peoples of the North:

a) in order to protect the rights and interests of the indigenous population, the law "On Ethnological Expertise" is in force, so far the only one in Russia.

b) in order to compensate the social damage of the indigenous peoples, it is necessary to conclude a tripartite agreement on cooperation and promotion of the sustainable development of the indigenous peoples in the area of influence of the project between the project customer, state authorities of the Republic of Sakha (Yakutia) and authorized representatives of the indigenous peoples for the improvement of the quality of life of the indigenous peoples in the form of cash or other social measures.

c) in order to recalculate the normative indicators of damage assessment and to specify the extent of damage, both environmental and socio-economic, it is necessary to adopt the Program of ethno-ecological monitoring to conduct surveys in the areas of industrial development of the TTNU every 5 years on the basis of certain indicators.

Measures for the implementation of a unified state policy for the development of the Arctic zone of the Republic of Sakha (Yakutia) [8]:

- promotion of the creation of social infrastructure, including transport infrastructure;
- development of the economy of renewable natural resources;
- introduction of advanced technologies, development of international cooperation.
- ensuring environmental safety.

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Innovation Processes in the Energy Sector of the Arctic Region

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Abstract. Moving forward, striving for perfection of any human activity is associated with innovative development of technologies, manufactured products, labor relations and other factors. The study presents the results of the joint activities of educational, scientific and industrial organizations in the energy sector of the country. It has been established that with the acceleration of scientific and technological progress, innovations and investment technological processes are becoming key components of government and business activities that contribute to the development of energy sector companies to ensure their long-term competitiveness, which is especially important when implementing Arctic projects. The importance of developing and creating an innovative technological product is especially acute in the energy industry that provides life support for people, businesses, and the country. The energy sector is a rather conservative industry in terms of innovations (this is due to the long life cycle of the main equipment, which is several dozens of years), created by domestic enterprises using exclusively domestic components. Modernization and construction of new facilities in the Arctic zone of the Russian Federation in the energy sector requires significant investments with long payback periods, which is a significant factor in decision-making. Small and medium-sized businesses operating in the energy sector are set to make a profit in the short or medium term, but such companies are characterized by a low level of research and development. Nevertheless, the reconstruction of the energy sector is an urgent topic for the industry today, due to the fact that the wear and tear of equipment exceeds its service life. The key results of investment activities and key trends in the development of the energy sector, including in the Arctic, are highlighted. The purpose of the study is to identify long-term trends in innovative technological solutions in various areas of the country's energy sector and to determine methods for their application in Arctic projects.
Keywords: *economics, energy, technology, Russian Arctic zone, innovation, investment, renewable energy source, nuclear energy, scientific and technological progress, generation*

Introduction

Energy supply for industrial and socio-economic exploration and development of territories is a key issue, and for the Arctic zone of the Russian Federation (AZRF) it is particularly significant and of paramount importance: heat and electricity are the main necessity for life [1, 2]. Conceptually, the processes of technological development and security of the energy sector in the Arctic need to be considered from the perspective of such key aspects as:

- The Arctic territory and water area is the dominant source of fossil energy for the economic interests of the entire state;
- AZRF as a vast area where large economic activities take place, requiring impressive energy resources;

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- The energy sector of the Arctic zone is a major investment project of the state and business.
- It is useful to consider these aspects together and in line with the general trends that have emerged since the February events in the energy sector and the country.

It is useful to consider these aspects together and in line with the general trends that have emerged since the February events in the energy sector and the country.

The objective reality of the current stage is the division of the world into “friendly” and “unfriendly” countries, which leads to stagnation of international cooperation in all political, economic and socio-cultural aspects between these countries. Companies from “unfriendly” countries are leaving Russia, losing their profitable business in a market built over decades, which had the status of one of the most important and in-demand in the global economy, and suffering great financial losses. A situation with Russian business leaving the markets of these countries is mirror-like. Joint economic and scientific projects are put on pause; in extreme cases, they are closed. The energy sector of Russia, as the “sharpest indicator”, has demonstrated the failure of the theory of the international division of labor (with “unfriendly” countries), and Russia relies on its own resources in its development [3]. Nevertheless, Russia does not put down the “iron curtain”, but, on the contrary, makes serious efforts to maintain ties with the leading economies of the Eastern world in order to create and possess innovative competencies and technologies [4].

High-tech processes in the energy sector of the country form the global competitiveness, and consolidation and exchange of scientific developments based on innovative competencies are becoming a determining indicator in the implementation of unique technologies.

Innovations and innovative technologies

Unique technological innovation systems (TIS) are widely used in the development of innovations, increase the reliability of heat and power supply, improve the economic performance of energy systems, and determine the political and social factors of the citizens of the country-developer [5].

Federal Law No. 127-FZ “On science and state scientific and technical policy” [1] defines the basic concepts (Article 2) in the field of scientific, innovative activities, etc.

Innovative activity — activity (including scientific, technological, organizational, financial and commercial ones) aimed at the implementation of innovative projects, as well as the creation of innovative infrastructure and ensuring its activities.

Innovative infrastructure — set of organizations that contribute to the implementation of innovative projects, including the provision of management, logistics, financial, information, consulting and organizational services.

[1] Federal'nyy zakon ot 23.08.1996 g. № 127-FZ «O nauke i gosudarstvennoy nauchno-tekhnicheskoy politike» [Federal Law No. 127-FZ of August 23, 1996 “On Science and State Science and Technology Policy”]. URL: http://www.kremlin.ru/acts/bank/9973 (accessed 05 January 2023).

Innovation — new or significantly improved product (good, service) or process, new method of sales or new organizational method in business practice, workplace organization or in external relations.

Technological innovations are developed and used in the widest range of the energy sector: generation, transportation, conversion, diagnostics, system mode control, automation and digitalization, etc.

The determining condition is the level of research and development (R&D) and the level of scientific and technological progress (STP), in particular in the energy sector, in the broadest sense, of the country as a whole [6, 7].

Key results of investment activity in 2020

According to the results of the study "Innovative development of the Russian Federation in 2020" by the Federal State Budget Scientific Institution RI FRCPECS [2] data on macroeconomic indicators, innovative potential, infrastructure and human resources are presented, as well as financial support of innovation, results of the innovation activity of the Russian Federation in 2020.

Analyzing macroeconomic indicators, we note the key ones:

- population: as of January 1, 2021, the population of the Russian Federation amounted to 146,171.0 thousand people (in 2020, compared to 2021, the population decreased by 577.6 thousand people);
- industry: in 2020, the industrial production index decreased and amounted to 97.9% compared to 2019. Growth was noted in the Central (+ 9%) and North Caucasus (+ 8.4%) federal districts;
- investments: in 2020, 20,302.9 billion rubles of investments were attracted to develop the economy and social sphere of the Russian Federation. The dynamics of investments in fixed assets for comparable purposes in 2020 amounted to 99.5% compared to 2019;
- infrastructure potential: in 2020, 11386 organizations were involved in innovative activities in the Russian Federation, which is 15.7% more than in 2019;
- financial support for innovations: financing of internal costs for R&D in 2020 in the Russian Federation amounted to 1,174,534.3 million rubles; in the structure of internal expenditures in 2020 in the Russian Federation, 92.9% accounted for internal current costs and 7.1% — for capital ones; in terms of socio-economic goals in 2020, R&D in the field of industrial production was the most financed — 28%, and the general development of science — 19.1% of the total domestic research and development costs (Table 1); expenses for technological innovations (innovative activity) in 2020 in the Russian Federation amounted to 2,134.0 billion rubles (Table 2);

[2] Federal State Budgetary Scientific Institution "Research Institute – Republican Research Scientific and Consulting Center of Expertise". URL: https://www.miiris.ru/digest/analitika_RF.pdf (accessed 05 January 2023).

- results of innovative activities: in 2020, enterprises and organizations of the Russian Federation shipped innovative goods, works, services worth 5,189,046.2 million rubles; the following intellectual property objects were used: 20636 inventions, 16920 computer programs, 7098 utility models, 2825 industrial designs, etc.; the coefficient of inventive activity in the Russian Federation in 2020 amounted to 1.63 patent applications filed per 10 thousand people. Since 2015, the innovative activity of scientists has decreased by 18.5%.

Table 1

Internal expenditure on research and development in the Russian Federation for socio-economic goals in 2020, million rubles; %

Scientific research and development	Million rubles	%
Industrial production	329 248.2	
General development of science	223 783.0	19.1
Production, distribution and rational energy use	32 888.6	2.8
Social purposes	70 988.4	6.0
Use of space for peaceful purposes	48 882.6	4.2
Agriculture, forestry, fishing	30 140.8	2.6
Exploration and use of the Earth and atmosphere	44 365.8	3.8
Other purposes	394 236.8	33.6

Table 2

Spending on technological innovations by socio-economic goals in the Russian Federation in 2020, million rubles; %

Scientific research and development	Million rubles	%
Research and development of new products, services and methods of their production (transfer), new production processes	945 623.9	44.3
Purchase of machinery, equipment, other fixed assets	713 523.8	33.4
Engineering	149 772.7	7.0
Development and purchase of computer software and databases	87 331.9	4.1
Other costs related to innovation activities	237 786.2	11.1

The energy industry of Russia is undergoing its rebirth, developing and introducing new technologies, it is being modernized at a rapid pace, since the population of the country is concerned about energy security, economical and safe use of energy resources [8].

Electricity production

In the Murmansk Oblast, which is fully included in the AZRF, the Arktika hydroelectric power plant (HPP) is being built as part of the concept of development of environmentally friendly electricity generating capacity with a minimal “carbon footprint” (the design capacity of the plant will be 16 MW). PJSC TGK-1 (“Territorial Generating Company No. 1”) [3] plans to launch the HPP using the latest technologies in 2026. HPP “Arktika” will be the eighth station of the Pazskiy cascade. Construction on the Paz River (Patsoyoki), flowing from Inari Lake (Finland) in the northwestern part of the Kola Peninsula, began in 1955 as part of the Soviet-Finnish-Norwegian cooperation involving the joint use of water resources [9, 10].

[3] PJSC TGK-1 (Territorial Generating Company No. 1). URL: https://www.tgc1.ru/about/ (accessed 05 January 2023).

State Corporation "Rosatom" [4] implements the concept of two-component nuclear energy using high-power reactors with a closed nuclear fuel cycle (CNFC) [11]. In 2022, Russian nuclear scientists brought the 4th power unit of the Beloyarskaya NPP in the Sverdlovsk Oblast to a 100% capacity level with a full load of innovative MOX fuel [5,6]. This fact demonstrates a technological breakthrough towards the closed nuclear cycle, and the use of MOX fuel will make it possible to increase the fuel base of nuclear energy by several times — reuse, after appropriate processing, the irradiated nuclear fuel of other NPPs and accumulated in nuclear "repositories" (storage facilities in Russia contain approximately 14.000 tons of SNF, which can be used for the production of MOX fuel and fast neutron reactors) [7].

In this case, the "peaceful atom" will work for the benefit of mankind and will be able to provide consumers with cheap electricity without harming the environment. The concept, for which the BN-800 was designed, was implemented. A unique power unit and automated fuel production at the mining and chemical plant (MCP) were built [8]. Beloyarskaya NPP plans to begin testing the BN-1200M reactor in 2023, which can become a serial project and close the nuclear fuel cycle in Russia's nuclear power industry.

Unique technologies in the nuclear power industry are being used by Rosatom in the Proryv project with the BREST concept [9] (Natural Safety Fast Reactor / Natural Safety Fast Reactor with Lead Coolant), which has the properties of eliminating accidents requiring evacuation, taking significant areas out of economic use, through unique design methods.

At the current stage, small modular nuclear reactors (SMRs) represent a promising development of nuclear energy. Existing SMRs and new ones under construction allow us to talk about their projection application.

- Operating. In 2020, the Russian floating power unit (FPU) Akademik Lomonosov was delivered to the Arctic sea port of Pevek in 2020 for the sustainable development of the northern remote territories with electricity and heat. A floating nuclear thermal power plant (FNPP) is a new class of mobile energy sources based on modern Russian nuclear technologies; its launch has become a real breakthrough in the generation of electricity and heat. It includes a network of unique infrastructure: FPU — equipped with two KLT-40S reactors; special hydraulic structures — to provide safe anchorage in the seaport;

[4] Gosudarstvennaya korporatsiya po atomnoy energii «Rosatom» (Goskorporatsiya «Rosatom») [State Corporation for Atomic Energy "Rosatom" (State Corporation "Rosatom")]. URL: https://www.rosatom.ru/index.html (accessed 05 January 2023).
[5] MOX fuel (Eng. Mixed-Oxide fuel) is nuclear fuel containing several types of oxides of fissile materials.
[6] Reaktor BN-800 polnost'yu pereshel na MOKS-toplivo [The BN-800 reactor has completely switched to MOX fuel]. URL: https://strana-rosatom.ru/2022/09/09/reaktor-bn-800-polnostju-pereshel-na-moks/ (accessed 05 January 2023).
[7] Chamuet G. Beskonechnaya energiya: v Rossii pridumali sposob sdelat' atomnye elektrostantsii «vechnymi» [Infinite energy: in Russia they came up with a way to make nuclear power plants "eternal"]. URL: https://hi-tech.mail.ru/review/59791-beskonechnaya-energiya-v-rossii-pridumali-sposob-sdelat-atomnye-elektrostancii-v/#a03_59791 (accessed 05 January 2023).
[8] Mining and chemical plant. URL: https://ru.wikipedia.org/wiki/Горно-химический_комбинат (accessed 05.01.2023).
[9] Gerasimenko V. Reaktor BREST-300 i zamknutyy tsikl v yadernoy energetike [BREST-300 reactor and a closed cycle in nuclear power engineering]. URL: https://habr.com/ru/company/macloud/blog/563830/ (accessed 05 January 2023).

onshore platform with special facilities — to ensure the delivery of electricity and heat to consumers. The Akademik Lomonosov is a completely Russian development, project 20870 with an electric power capacity of 70 MW, and a thermal power of 50 Gcal/h [1].

- New. OJSC Atomenergomash [10] plans to build four FNPPs for the Baimskiy Mining and Processing Plant in the waters of Cape Nagleingyn in the Chukotka Autonomous Okrug (fully part of the AZRF) with eight RITM-200M reactors, optimized floating power units capable of generating 100 MW of electricity and 350 Gcal/h of thermal energy. The operating life of the upgraded units is up to 60 years. In the Chukotka Autonomous Okrug, a project will be implemented for the electrification of an industrial cluster using FNPP in the field of "green" generation; this project is also a pilot project for the serial production of nuclear floating power units of different capacities and different designs. New floating power units will be produced for different climatic conditions — for the Far North and for tropical latitudes — based on the RITM-200 and RITM-400 (more powerful version) reactors [11]. In general, an innovative and breakthrough solution for connecting consumers to electrical and thermal energy in remote areas is expected.

The construction of facilities at the Biamskiy MPP for the development of the Peschanka copper-porphyry deposit is the northernmost of the world's largest deposits and may become one of the most technologically advanced.

Rosatom State Corporation is one of the technology leaders in the clean energy sector. The company is actively working to create a high-tech basis in all areas: for example, at the Kola NPP (Murmansk Oblast), a new electrolysis plant of Russian production generated the first hydrogen necessary for cooling turbine generators. This unit produces hydrogen with a purity of 99.999%, and a special deionization system and other technical solutions ensure the reliability and safety of operation. Hydrogen energy is a priority area of scientific and technological development of Rosatom, and the experience of the Kola NPP in handling hydrogen has made it a pilot site for hydrogen production in the country.

The plans of Rosatom include the construction of more than three dozen units in different countries. The plants of the state corporation at different stages of production have modern technological equipment for the Indian Kudankulam NPP, the Turkish Akkuyu, the Chinese Xudapu and Tianwan NPP, the Rooppur plant in Bangladesh, the Egyptian El Dabaa, etc. [12].

The World Nuclear Performance Report 2022 [12] summarizes the results of 2021 in the global nuclear industry, based on data compiled by the International Atomic Energy Agency (IAEA)

[10] OJSC "Nuclear and Power Engineering". URL: https://www.atomic-energy.ru/Atomenergomash (accessed 05 January 2023).
[11] Plavuchie AES: mobil'nye atomnye resheniya dlya energosistem budushchego. Energeticheskiy forum «Tomekspo-2022» [Floating Nuclear Power Plants: Mobile Nuclear Solutions for the Energy Systems of the Future. Energy Forum "Tomexpo-2022"]. URL: https://www.atomic-energy.ru/news/2022/11/24/130533 (accessed 05 January 2023).
[12] World Nuclear Performance Report 2022. URL: https://www.world-nuclear.org/our-association/publications/global-trends-reports/world-nuclear-performance-report.aspx (accessed 05 January 2023).

for reactors in operation today and those currently under construction. This Report assesses the contribution of nuclear power to the world's energy supply.

The following statistics in nuclear power are noted.

Nuclear reactors generated 2653 TW/h in 2021, an increase of 100 TW/h by 2020. In 2021, nuclear generation increased in Africa, Asia, Eastern Europe, Russia, and South America. Generation has increased in Western and Central Europe, but the overall trend in this region remains downward. In North America, generation declined for the second year in a row as more reactors were shut down in the USA.

The global average installed capacity utilization factor (ICUF) of plants was 82.4% in 2021 (80.3% in 2020). An increase in ICUF on average around the world is observed in reactors of all ages, and not only in reactors of modern design.

Analyzing the Report of the Unified Energy System of Russia [13], the following key indicators should be highlighted:

- volume of electricity generation by UES power plants in Russia in May 2022 amounted to 85,834.1 million kWh. The main load in meeting electricity demand was carried by thermal power plants, which generated 41,671.5 million kWh. The generation of HPPs for the same period amounted to 19,380.8 million kW/h, the generation of NPPs — 18,511.8 million kW/h, the production of electricity by renewable sources of WPPs, SPPs — 451.6 million kW/h and 307.2 million kW/h respectively, the production of power plants that are part of the technological complexes of industrial enterprises and are designed mainly to supply them with electricity (power plants of industrial enterprises) — 5,511.0 million kWh [13].
- structure of generating equipment inputs at power plants of the UES of Russia (Table 3).

Table 3

Structure of generating equipment inputs at power plants of the UES of Russia in 2020–2022 (MW)

Year	Total	TPP total	TPP gas	TPP coal	TPP other	HPP	APP	WPP	SPP
2020	1 865.2	636.9	310.0	327.0		20.9		843.4	364.0
2021	2 716.1	286.1	286.1				1 188.2	1 008.9	232.9
01.06.2022	214.6	112.0	12.0	100.0					102.6

As a result, nuclear energy is perceived as an important measure for climate protection — it is recognition of nuclear power's role in achieving decarbonization goals.

Construction of power lines, transformation of power equipment

Construction of power facilities in the Russian Arctic is carried out in the extremely difficult natural and climatic conditions; therefore, the approach to construction work in these conditions should be based on the implementation of the basic principles of environmental safety, economic

[13] Edinaya energeticheskaya sistema Rossii: promezhutochnye itogi [Unified Energy System of Russia: interim results]. URL: https://www.so-ups.ru/fileadmin/files/company/reports/ups-review/2022/ups_review_0522.pdf (accessed 05 January 2023).

efficiency and technical reliability. At the current stage, the construction of a new 100 kV power transmission line (PTL) “Pevek — Bilibino” is underway. It will replace the existing transmission line, which is characterized by high wear and tear, and will ensure reliable power supply to the largest infrastructure energy center in Bilibino. The first phase of the project involves the installation of a 490.6 km single-circuit TL, the construction of a 110 kV Komsomolskiy substation and a Bilibino distribution point. The second stage will include the installation of the second circuit of the transmission line, the construction of the Betta switching station and the reconstruction of the Yuzhnyy substation. The implementation of the project involves the application of innovative high-tech solutions that are widely used in various areas of the energy sector. In particular, during the construction of 110 kV substations that provide the energy capacities of the Amur Gas Chemical Complex, the Moscow Elektrozavod designed a new modern three-phase block transformer with increased power of 80 MW and 160 MW. Advanced design solutions and innovative manufacturing technologies were used in the production of this power equipment. As a result, electrical devices comply with domestic and international standards in terms of technical characteristics, the equipment has become more convenient in installation and operation, and Russian-made intelligent monitoring and diagnostic systems allow to control the parameters of power units and to form an online forecast about their technical condition in advance for timely maintenance. To ensure efficient operation of the new power lines, it is possible to use an integrated monitoring system for overhead lines, which was developed and implemented by employees of the Kazan State Power Engineering University. The electrical device included in the system operates autonomously on the energy of the power line wire, reads and transmits its parameters necessary for online dispatch control: short circuit, breakage, ice formation, temperature measurement and much more.

In the Murmansk Oblast, proposals for the construction of a power transmission line for the technological connection of objects of the priority development area (PDA) “Capital of the Arctic” and the Arctic zone on the western coast of the Kola Bay are being worked out; according to preliminary calculations, approximately 3 billion rubles are needed.

When implementing the Vostok Oil project (north of the Krasnoyarsk Krai) [14], energy facilities are of key importance. It is planned to build 13 power plants with a total installed capacity of about 3.5 GW, about 200 electrical substations and more than 7000 km of transmission lines. These power supply facilities of the largest investment project of the Russian economy will be built using high-tech solutions to ensure maximum use of reliability and environmental safety conditions.

In the Arctic zone of the Russian Federation, the implementation of projects is mainly aimed at using “clean” energy with zero greenhouse gas emissions [15]. Companies implementing projects in the Russian Arctic strive to use wind energy globally. In the Murmansk Oblast, in December 2022, the first stage (capacity 170 MW) of the largest wind power plant in Russia, the Kolskaya WPP, was put into operation with a design capacity of 201 MW (the commissioning of the second final stage of the remaining capacity is scheduled for the 1st quarter of 2023). The pro-

ject is implemented by PJSC Enel Russia, more than 65% of the equipment and works were produced in the Russian Federation by local plants and specialized companies. On an area of 257 hectares, 57 wind turbines have been installed; for the technical connection of the project to the Unified Energy System (UES) of Russia, a 150 kV transmission line with a length of about 70 km was built, the blades of wind turbines are equipped with ice detection systems that allow early detection of the risk of ice formation and automatic stopping the rotation; SG 3.4-145 wind generators with a nominal capacity of 3.465 MW and a rotor diameter of 145 meters (manufactured by Siemens Gamesa) were installed.

Automated control systems have been widely used in the construction of power equipment of power stations and substations — one of the areas of breakthrough technologies application. Increased implementation of intelligent electrical devices, introduction of flexible monitoring systems open up opportunities to raise the economic effect of power facilities [16, 17]. Advanced technologies allow for greater use of mechatronic service devices, pick-and-place robots and drones. In particular, advanced robotic solutions are used in large oil transformers — a compact device with remote control — a robot with a hermetic trunk, the functionality of which allows to shoot the transformer from the inside and to transmit video to the operator via wired communication channels, which enables a rapid analysis of the problem with the involvement of highly specialized professionals. The undeniable advantage of implementing automated devices using innovative technologies is the economic component — the robot can operate 24/7 [18].

Science and higher education

Active participation of domestic science in developing knowledge-intensive products, services and ensuring the competitiveness of our country in the field of high technologies makes it possible to materialize the solutions demanded by the economy and introduce unique samples of industrial products. One of the most important areas where breakthrough scientific discoveries are needed to strengthen technological sovereignty is electronics [19]. The Government of the Russian Federation has set objectives for the development of its own specialized electronic engineering industry, production of components, technological and auxiliary equipment; an updated concept for the development of Russian microelectronics until 2030 has been developed [14], and funding of about 2.74 trillion rubles has been allocated. Nevertheless, leading scientific institutions are already working on solving problems related to the launch of new technologies [20].

Scientists from the A.V. Rzhanov Institute of Semiconductor Physics SB RAS and the A.V. Nikolaev Institute of Inorganic Chemistry SB RAS have developed a technology for creating a new generation of electronics devices. The innovative technology makes it possible to grow high-quality M-phase VO2 single crystals. M-phase crystals are capable of switching from the semiconductor state to the metallic state at close to room temperatures. Russian scientists have been able

[14] Minpromtorg podgotovil kontseptsiyu razvitiya otechestvennoy mikroelektroniki do 2030 goda [The Ministry of Industry and Trade has prepared a concept for the development of domestic microelectronics until 2030]. URL: https://www.gazeta.ru/business/news/2022/09/13/18549703.shtml (accessed 05 January 2023).

to synthesize not only single nanocrystals and their arrays, but also more complex VO2 structures in the form of three-dimensional arrays of nanorings. As a result of the research, a nanodevice formation technology was created for nanophotonics, which has found application in the creation of logical nanoelements in “smart” materials, neuromorphic computers, sensors and optical photonic devices [15].

Zelenograd Nanotechnology Center (ZNTC) is a resident of the Technopolis Moscow special economic zone (SEZ); it plans to launch the production of photonic integrated circuits and modules for telecommunications equipment. Photonic technologies are in demand among leading manufacturers and customers of high-speed equipment; they allow increasing the speed of information transfer by more than 100 times [16].

Scientists of Tomsk State University have studied photoconductive dipole antennas and characteristics of terahertz radiation [17]. As a result, the researchers of the Faculty of Radiophysics managed to increase the power of terahertz radiation by five times. The method of irradiating a terahertz antenna with high-energy electrons will expand the field of application of the developed antennas. These antennas have been successfully used in industry for spectroscopy to diagnose material quality; in medicine — for tomography; in communications — for creating terahertz wireless communication systems, etc. The frequency spectrum of submillimeter THz radiation is between the infrared and microwave ranges. Therefore scientists aim to discover new ways to improve its characteristics, which will create the opportunity to qualitatively increase and significantly expand the range of application of antennas.

National Research Center “Kurchatov Institute” — Central Research Institute of Structural Materials “Prometey” developed polymeric composite materials (PCM) for the energy industry — hydroelectric power plants (HPPs), nuclear power plants (NPPs), oil and gas, space industries, shipbuilding and other important strategic areas of industry and economy.

At the Innoprom–2022 exhibition, the Roselectronics holding of Rostec State Corporation demonstrated a sample of monocrystalline silicon created from Russian materials — an innovative technology that will completely replace foreign raw materials in the production of electronic power devices.

The discoveries of Russian science — the high-tech materials, electronic and electrical devices, other unique technological equipment — form a new model for the implementation of Arctic projects in the new economic realities.

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[15] Novosibirskie uchenye sozdali tekhnologiyu formirovaniya priborov dlya elektroniki budushchego [Novosibirsk scientists have created a technology for the formation of devices for the electronics of the future]. URL: https://scientificrussia.ru/articles/razrabotana-tehnologiya-formirovaniya-nanopriborov-dlya-nejromorfnyh-sistem-i-nanofotoniki (accessed 05 January 2023).

[16] Rezident OEZ «Tekhnopolis Moskva» nachnet seriynoe proizvodstvo fotonnykh chipov [Resident of the SEZ "Technopolis Moscow" will start mass production of photonic chips]. URL: https://technomoscow.ru/press/rezident-oez-tekhnopolis-moskva-nachnet-seriynoe-proizvodstvo-fotonnykh-chipov/ (accessed 05 January 2023).

[17] V TGU nashli sposob v pyat' raz uvelichit' moshchnost' teragertsovykh antenn [TSU found a way to five times increase the power of terahertz antennas]. URL: https://rossaprimavera.ru/news/8c1158d6 (accessed 05 January 2023).

Conclusion

Russian modern energy industry is undergoing a serious transformation; it is being modernized at a rapid pace, as this is required by the country's economic growth and consumer demand, as well as the economical and safe use of resources. The process of renewal and improvement is carried out in close cooperation between scientific organizations and industrial enterprises. The development and implementation of innovative technologies in the energy sector open up new opportunities to improve efficiency in the operation of plants, lines, heat supply, control and monitoring in the energy sector. New automatic and automated control systems, network technologies and microgrid complexes will enable efficient management of solar panels, wind turbines, tidal and geothermal energy, biogeneration and low-power nuclear power plants, climate control systems, smart homes, heating elements, etc.

In St. Petersburg, PJSC Gazprom Neft opened a Production Control Center at the Prirazlomnaya offshore oil platform in the Russian Arctic. The high-tech complex provides more efficient management of operations at the Prirazlomnoe field. The digital model and IT tools ensure online control over the main stages of oil production and offloading to tankers, efficient and safe operation of the platform on the Arctic shelf, monitoring of equipment integrity and tracking of vessel movement, taking into account ice conditions, and allow increasing the speed and efficiency of decision-making on management of the platform in the Barents Sea [21].

The leading research institutes [22], advanced enterprises and corporations are constantly working on the creation of new electrical technologies for different sectors of the economy. Modern innovative developments will mark the beginning of a new technological era and the technological sovereignty of Russia.

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Problems and Prospects for Sustainable Development of the Arctic Local Economies: The Case of the Shuryshkarskiy District

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Abstract. The strategic geopolitical importance of the Arctic and its environmental vulnerability require special attention to the sustainability of the Arctic local economies. In this study, we have proposed a system of sustainable development goals (SDGs) and indicators, adapted for the Arctic local economy. The testing of the proposed methodology on the example of Shuryshkarskiy district (Yamalo-Nenets Autonomous Okrug, Russia) allowed analyzing the problems and prospects of development of the local economy in the context of SDGs. The analysis reveals a significant gap between the current state, transformation trends of the Shuryshkarskiy district and the required state, the vector of its sustainable development, in accordance with the SDGs and the Strategy for the Development of the Arctic Zone of the Russian Federation. The proposed analytical methodology has high potential for the analysis of problems and prospects for the sustainable development of Arctic local economies. However, the system of local SDGs and indicators, the data collection system and the structure of municipal databases and municipal management processes require their correlation and integration.
Keywords: *Arctic, sustainable development, local economies, Arctic settlement*

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Introduction

The relationship between the vitality of local economies and sustainable development goals (SDGs) is the mainstream of current research [1, Phillips R., Seifer B., Antczak E.; 2, Shuman

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M.H.; 3, Weizsäcker E.U. von, Wijkman A.]. In particular, M. Shuman believes that the traditional practice of economic development has become ineffective in the context of the SDGs and offers an alternative approach, in which a new generation of special types of business is developing, providing perspective viability of local communities. Through the analysis of case studies, researchers demonstrate how dynamic, healthy and sustainable local economy flourishes through the introduction of innovative economic and social practices [4, Hallsmith G et al.] and the development of prospective viability potential of local communities as a whole [1]. There are very few studies that systematize historical experience and consider the prospects for the development of sustainable local economies and resilient rural communities in Russia. The most comprehensive historical study of the development of local economies in Russia was led by G. Tyurin. Analysis of various historical periods in Russia and other countries, where the economic development was mainly due to the growth of local economies, revealed the great importance of local small-scale production, public support and mutual assistance, the activity of the local community, involvement in self-government processes, balance between economic independence and effective participation in the global economy of local communities [5, Tyurin G., Tyurin V.]. There is also a lack of research on the development of local economies in sparsely populated hard-to-reach areas, especially in small Arctic settlements, which differ greatly in environmental, cultural and economic conditions [6, Pilyasov A.N., Polyachenko A.E.].

Trends in the development of local Arctic communities do not always correspond to the economic development of the Arctic as a whole. Thus, according to the Business Index North report, which includes an analysis of 13 regions of Arctic Europe and the Russian Arctic, economic growth in the Arctic does not necessarily mean an improvement in the economic situation for the local residents, especially in small communities [7, Middleton A. et al.; 8, Middleton A.]. The relevance of the need for an effective policy of sustainable development of the Arctic local economies is growing taking into account the increasing trends of youth migration from Arctic settlements and small towns to large northern cities and southern regions [9, Ljovkin V.E.].

Today, the world and national economies are developing on the basis of the SDGs. These goals cover priority social, economic and environmental issues at every level, from international relations to individual development opportunities. The 2030 Agenda for Sustainable Development was adopted by the United Nations in 2015 as an ambitious universal vision that sets 17 global priorities (SDGs) and 169 related targets. The SDGs address quality of life, health, housing, food and environmental security, inequalities, and social and economic development. Universal in scope, the SDGs should apply to all countries and be implemented at the national level, as well as at the local level [1]. However, the global sustainable development agenda is not focused on any specific region, such as the Arctic. Due to the fact that the Arctic is both fragile and rich in resources, this unique region requires special attention.

[1] Kanuri Ch. et al. Sustainable development solutions network, getting started with the SDGs in cities. 2016. URL: http://unsdsn.org/wp-content/uploads/2016/07/9.1.8.-Cities-SDG-Guide.pdf (accessed 15 November 2021).

In order to achieve the SDGs effectively, appropriate systems of sustainable development indicators (SDI) have been developed, adapted to the specificities of the country (territory) and the level of analysis (international, national, local, macro- or micro-economic, etc.) [10, Fagerberg J.; 8, Middleton A.]. For example, in 2017, the Arctic Council focused only on three key interrelated Arctic issues and launched a project that explores the relationship between SDG 2 (End hunger and achieve food security for all), SDG 6 (Ensure availability and sustainable management of water and sanitation for all) and SDG 7 (Ensure access to affordable, reliable, sustainable and modern energy for all) [2]. This project addresses common Arctic features, but is not intended to monitor the sustainable development of the Arctic local economies. Russian researchers analyzed the Arctic problems and prospects for regional development [6, Pilyasov A.N., Polyachenko A.E.] and urban management [11, Zamyatina N.Yu. et al.], developed separate methods for assessing the management of Arctic cities in the context of ensuring their resilience [12, Pilyasov A.N., Molodtsova V.A.]. However, there are still few researchers and studies focusing on the development of sustainable Arctic local economies. In this study, we propose a system of sustainable development goals and indicators adapted for monitoring, analyzing and planning the sustainable development of local Arctic economies. The methodological purpose of the study is to test the proposed methodology on the example of the Shuryshkarskiy district (Yamalo-Nenets Autonomous Okrug, Russia), to identify its limitations and advantages; the practical goal is to analyze the problems and prospects of development of the local economy in the context of sustainable development goals, taking into account its Arctic specifics on the basis of the proposed methodology.

Method and data

In order to identify problems and prospects for sustainable Arctic local economies, we proposed an adapted system of goals and indicators of sustainable development (Table 6). Based on the generally accepted system of sustainable development indicators [3], we selected individual ones, taking into account:

- relevance to the district level;
- features of the Arctic territories that determine the specifics of the approach to their socio-economic development, in particular, the priority goals and indicators of sustainable development for the Arctic, taken into account in the Business Index North [7, Middleton A.] and in the methodology of the Arctic Council [4];

[2] Arctic Council. Sustainable Development Goals in the Arctic. 2017. URL: https://arctic-council.org/ru/projects/sustainable-development-goals-in-the-arctic/ (accessed 15 November 2021).
[3] Assembly U.G. A/RES/71/313: Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development. 2017. URL: https://ggim.un.org/documents/a_res_71_313.pdf (accessed 15 November 2021).
[4] Arctic Council. Sustainable Development Goals in the Arctic. 2017. URL: https://arctic-council.org/ru/projects/sustainable-development-goals-in-the-arctic/ (accessed 15 November 2021).

- features and typical problems of settlements in the Russian Arctic, national strategic goals and priorities in the Arctic, identified in the development strategy of the AZRF up to 2035 [5].

The proposed system of goals and indicators was analyzed from two perspectives: problems and prospects. This approach allows not only to identify the current state of the territory on a particular problem of sustainable development, often recorded in accepted quantitative indicators, but also to consider qualitative information about specific resources, reserves of sustainable development of the territory. Comparison of the results of the analysis of problems and development reserves increases the effectiveness of management analysis and decision-making processes in the context of sustainable development of territories. This approach provides a scientifically substantiated analysis of the feasibility of existing municipal development programs and effective planning of new measures for the development of the territory.

On the example of the Shuryshkarskiy district, located in the west of the Yamalo-Nenets Autonomous Okrug (YaNAO), an analysis of the problems and prospects for sustainable development was carried out on the basis of the proposed adapted system of goals and indicators and using the available sources of official, documentary and sociological data.

Stages of approbation of the methodology:

1. The currently available analytical information about the Shuryshkarskiy district was systematized in five sections: population and labor resources, infrastructure and housing, budget expenditures and social policy, economy and entrepreneurship, management and strategic planning. On the basis of this information, a descriptive analysis of the state and socio-economic situation of the district was carried out using the methods of descriptive statistics, document analysis and sociological surveys. For the analysis, open documentary data (online — open federal and municipal statistics, information from tax authorities, geographical data, passport of a municipal settlement) and other documentary data (data and comments provided at the request of municipalities) were used. Along with documentary data, analytical reports and empirical studies of the Arctic Research Centre (Salekhard, YaNAO) were used: interviews with the heads of settlements in the Shuryshkarskiy district (February – March 2020) and a survey on life prospects and migration attitudes of local residents (February – March 2020) [13, Gladun E.F.; 14, Gladun E.F.].

2. The problems and prospects for sustainable development of the Shuryshkarskiy district were analyzed on the basis of the proposed system of goals and indicators of sustainable development using systematized analytical information about the district (Table 6).

3. Based on the comprehensive analysis of quantitative and qualitative data on the development of the district within the framework of the proposed system of sustainable development

[5] Pravitel'stvo Rossiyskoy Federatsii. Strategiya Razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda [Government of the Russian Federation. Strategy for developing the Russian Arctic Zone and ensuring national security until 2035]. URL: https://www.garant.ru/products/ipo/prime/doc/74710556/ (accessed 25 October 2022).

indicators, gaps between the current state, development trends of the district and the required state, the vector of its sustainable development were identified.

4. Based on the results of approbation of the proposed methodology, its capabilities and limitations for the development of a scientifically based policy for the sustainable development of the Arctic local economies were identified.

Analysis of the case study
Population and labor resources

According to the latest census, the population of the Shuryshkarskiy district in 2010 was 9814 people, including 4381 Khanty, 1755 Komi-Zyryans, 171 Nenets, 19 Mansi, 11 Selkups, i.e. 6337 (65%) indigenous people [6]. In 2020, the population of Shuryshkarskiy district was 9435 people according to federal statistics [7], and 9449 people according to the municipal settlement passport [8]. The population density of the district is 0.17 people/km. The share of indigenous peoples is 52% [9]. A slight discrepancy in the main demographic indicators in different sources is caused by the use of different methods. Local governments take into account all residents actually living in settlements, which is necessary for adequate life support of settlements, while federal statistical bodies take into account the number of citizens according to their permanent or temporary registration. Both methods consider only registered settlements [10].

Table 1

Basic spatial and demographic characteristics of the Shuryshkarskiy district of the YaNAO [11]

Settlement	Area, km^2 (population density in settlements, people/km^2) 2010; 2020	Population according to the 2010 census	Population according to the municipal settlement passport, as of 2020		
			Total (trend, %)	Indigenous peoples	Indigenous peoples, % of total population

[6] Tyumstat. All-Russian population census 2010 Population and its distribution in the Tyumen Oblast; National composition and citizenship of the population in the Tyumen Oblast. 2011. URL: https://tumstat.gks.ru/perepis_nas2010 (accessed 10 January 2022).

[7] Federal State Statistics Service. Population of the Russian Federation by municipalities as of January 1, 2020, 2021. URL: https://rosstat.gov.ru/storage/mediabank/CcG8qBhP/mun_obr2020.rar (accessed 10 January 2022).

[8] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

[9] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

[10] State Duma of the Yamalo-Nenets Autonomous Okrug. Law of the YaNAO dated October 6, 2006 N 42-ZAO "On the administrative-territorial structure of the Yamalo-Nenets Autonomous Okrug". URL: https://docs.cntd.ru/document/802075611 (accessed 20 October 2022); Federal State Statistics Service. Tyumen Oblast. The total land area of the municipality. 2020. URL: http://www.gks.ru/dbscripts/munst/munst71/DBInet.cgi?pl=8006001 (accessed 20 October 2022); Federal State Statistics Service. Population of the Russian Federation by municipalities as of January 1, 2020, 2021. URL: https://rosstat.gov.ru/storage/mediabank/CcG8qBhP/mun_obr2020.rar (accessed 20 October 2022).

[11] Source: Compiled by the authors based on open online data. Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

1. Azovskoe rural settlement (5):	34.28 (12; 10)	411	335 (-18%)	228	68%
Azovy village		359	318	211	66%
Ilyagort village		8	1	1	100%
Ishvary village		4	0	0	0%
Karvozhgort village		4	4	4	100%
Poslovy village		36	12	12	100%
2. Gorkovskoe rural settlement (2):	43.63 (45; 39)	1973	1702 (-14%)	595	35%
Gorki village		1953	1672	567	34%
Khashgort village		20	30	28	93%
3. Lopkharinskoe rural settlement (3):	80.64 (7; 6)	574	500 (-13%)	422	84%
Lopkhari village		489	434	369	85%
Kazym-Mys village		66	51	38	75%
Sangymgort village		19	15	15	100%
4. Muzhevskoe rural settlement (7):	28.25 (147; 152)	4165	4298 (+3%)	1631	38%
Muzhi village		3609	3663	1243	34%
Anzhigort village		13	23	22	96%
Vershina-Voykary village		34	32	32	100%
Vosyakhovo village		382	436	204	47%
Novyy Kievat village		25	11	4	36%
Ust-Voykary village		100	129	123	95%
Khanty-Muzhi village		2	4	3	75%
5. Ovgortskoe rural settlement (6):	66.88 (20;20)	1327	1321 (0%)	1024	78%
Ovgort village		998	1028	769	75%
Evrigort village		25	14	14	100%
Nymvozhgort village		26	17	15	88%
Ovolyngort village		26	14	13	93%
Tiltim village		20	12	11	92%
Yamgort village		232	236	202	86%
6. Pitlyarskoe rural settlement (1): Pitlyar village	2.03 (247; 233)	501	474 (-5%)	374	79%
7. Shuryshkarskoe rural settlement (3):	53.86 (16;15)	863	819 (-5%)	626	76%
Shuryshkary village		795	757	564	75%
Lochpotgort village		12	8	8	100%
Unselgort village		56	54	54	100%
Total:	309.57 (32; 31)	9814	9449 (-4%)	4900	52%

As of 2020, 27 settlements were officially registered on the territory of the district [12], 17 of which had 100 or less people (villages) (Table 1). The population of the Shuryshkarskiy district has decreased by 4% over 10 years, and the proportion of indigenous peoples has decreased by 9%. The largest number of settlements in the district tends to decrease in population, except for Muzhi village, which is the largest one and has a population increase of 3% (Table 1). The largest population decline was observed in rural settlements with the lowest population density: Azov, Lopkha-

[12] As of 2022, 24 settlements are officially registered. The villages of Ilyagort, Ishvary and Lokhpotgort were abolished due to the complete loss of population. As a result of the municipal reform of 2022, the Shuryshkarskiy district was transformed from a municipal district into the Shuryshkarskiy district municipal okrug, as a result, rural settlements and their governing bodies were abolished, all settlements are included in the municipal okrug.

rinsk, Gorkovskiy, which indicates trends of population consolidation at the level of large settlements.

Field research of the Arctic Research Centre, conducted in 2020, revealed 34 residents actually living in 11 places that are not included in official documents and statistics: Lorovo, Langivozhi, Loragort, Khorpungort, Muvgort, Vytvorgort, Post-Gort, Soram Logas, Tokhotgort, Mekhotpugor, Parovat (Fig. 1).

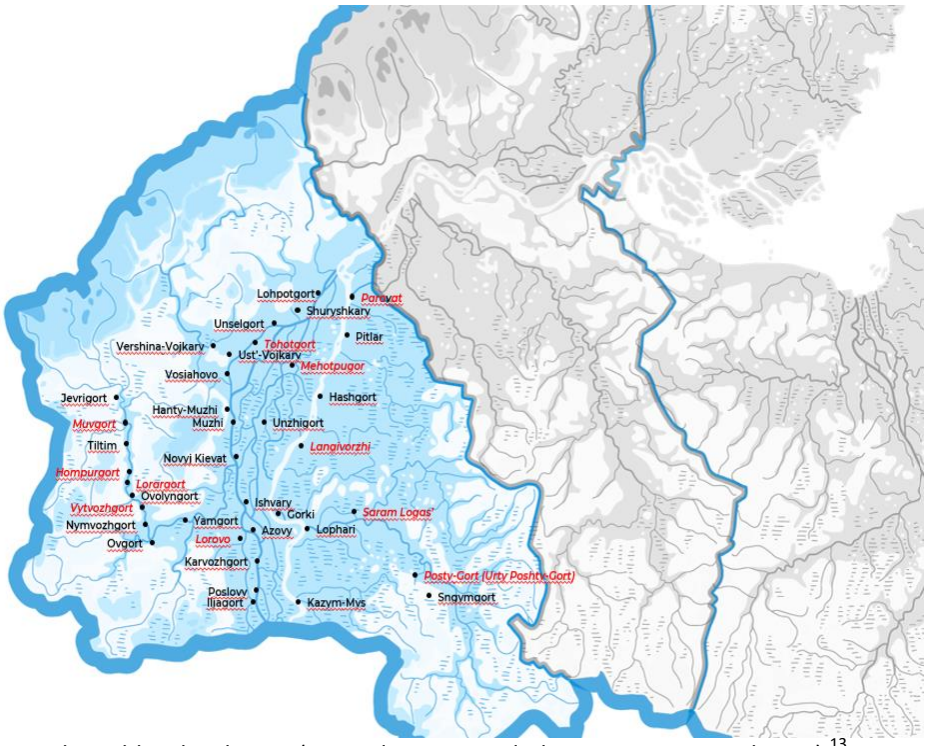

Fig. 1. Shuryshkarskiy district (38 settlements, including 11 unregistered ones) [13].

Residence in unregistered settlements can lead to difficulties in the sphere of housing rights of citizens and their participation in state support programs.

[13] Note: villages in bold type are officially included in the administrative-territorial structure of the district; in italics – liquidated settlements, in red – unregistered places of residence. Source: compiled by the authors based on open online data and the results of field research by the Arctic Research Center conducted in 2020.

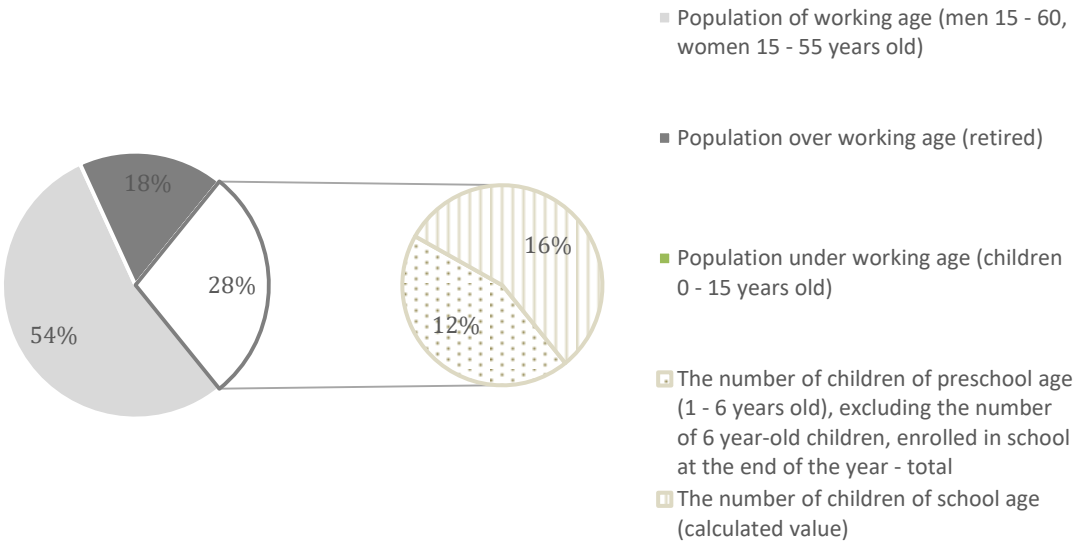

Fig. 2. Age structure of the population of the Shuryshkarskiy district according to data for 2020 [14].

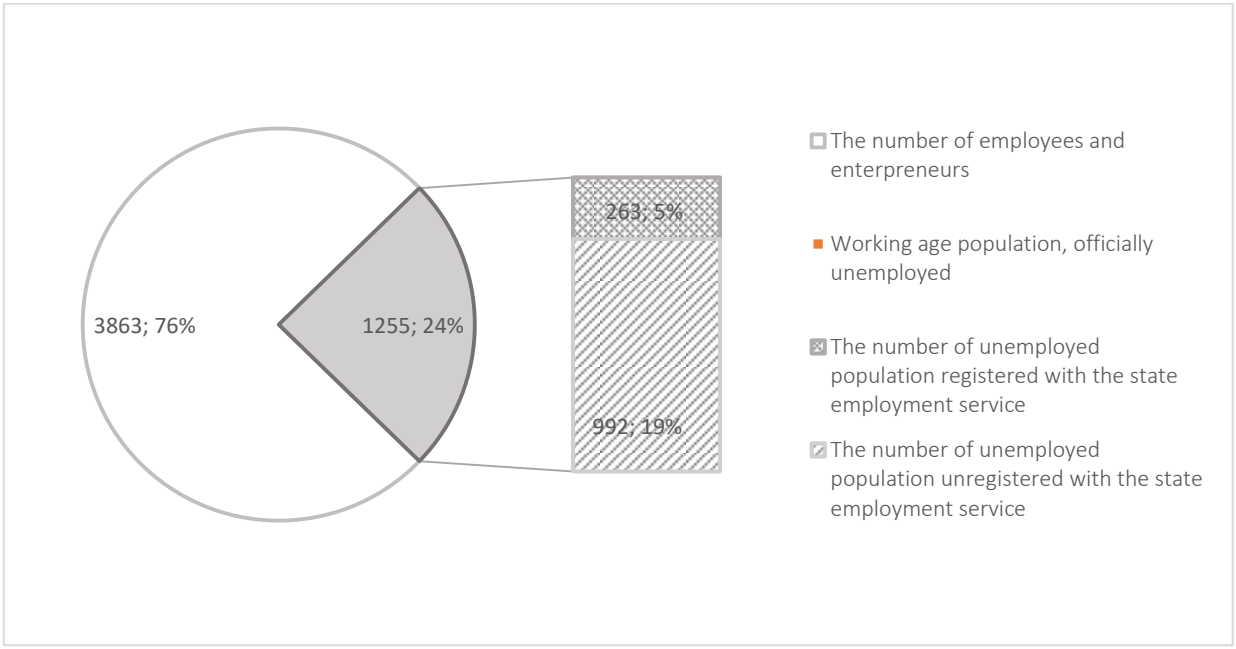

Fig. 3. Labor resources of the Shuryshkarskiy district according to data for 2020 [15].

The potential local labor resources of the Shuryshkarskiy district amount to 5118 people or 54% of the total population (Fig. 2). In 2020, there were 3675 employees working in companies [16], 361 employees working in SMEs, the number of individual entrepreneurs was 165 people [17]. The number of unemployed people registered with the state employment service amounted to 263

[14] Compiled by the authors on the basis of the Passport of Settlements of Municipalities of the YaNAO. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).
[15] Ibid.
[16] Ibid.
[17] The Federal Tax Service. Unified register of small and medium-sized businesses - recipients of state support. 2020. URL: https://rmsp-pp.nalog.ru/index.html (accessed 14 March 2022).

people at the end of 2020, and the official unemployment rate was 4.9% [18]. Thus, 992 people of working age are probably self-employed.

According to additional information from the municipalities, specifically requested in 2020, in 17 small settlements of the YaNAO (with a population of less than 100 people), 2/3 of the inhabitants of working age are officially employed (156 out of 238 people): less than half (69) are employed in small settlements at the place of residence, the remaining 87 people — outside small communities (in district settlements: Muzhi, Gorki, Ovgort, Lopkhari, as well as in the cities: Labytnangi, Salekhard, Tyumen). Thus, the labor migration in small settlements amounted to 56% in 2020 (87 out of 156 people).

Infrastructure and housing

Transport accessibility of small settlements depends entirely on meteorological conditions and seasonality, as the main modes of transport are air and water (in summer). Road transport is provided in winter by temporary "winter roads". Evrigort, Tiltim and Sangymgort are accessible only by snowmobiles in winter. In winter and during the off-season, there are often no transport links at all. Passenger traffic is available only to Kazym-Mys. The volume of annual traffic is 352 people, including by air transport — 44 people, by water transport — 308 people.

Access to the main communications is limited in many small settlements of the Shuryshkarskiy district. Centralized power supply is available only in 8 out of 17 small settlements (Ovolyngort, Anzhigort, Novyy Kievat, Vershina-Voikary, Khashgort, Kazym-Mys, Unselgort, Poslovy), but only 2 of them (Khashgort and Kazym-Mys) have 24-hour electricity supply. All of the district's small communities lack centralized water supply, sewerage and wastewater treatment facilities. Waste management is organized only in Novyy Kievat, in the form of a garbage dump.

The problem of safety is also very relevant for small settlements. Fires are extinguished by volunteer fire brigades, consisting of local residents. Mobile brigades provide medical assistance to residents, and ambulance aviation provides emergency aid. Only in Kazym-Mys there is an equipped paramedic station (room of 43.7 m^2) in a one-story wooden building.

It should be noted that there are no infrastructure facilities for social protection and public services in small settlements of the Shuryshkarskiy district.

Mobile phone services are available in most settlements (Karvozhgort, Poslovy, Ovolyngort, Evrigort, Ovgort, Anzhigort, Khanty-Muzhi, Novyy Kievat, Vershina-Voykary, Kazym-Mys, Unselgort). Communication problems were noted in Nymvozhgort, Tiltim, Evrigort. Other villages have Rostelecom payphones (Tiltim, Nymvozhgort, Khashgort, Lokhpodgort, Sangymgort).

As for educational services, school-age children are collected centrally from settlements and study at boarding schools in the Shuryshkarskiy district from September to May.

[18] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

The long-term policy of the regional authorities in relation to the infrastructural and socio-economic development of the district can be considered through the YaNAO Scheme of Territorial Planning [19] (STP). STP is being developed in accordance with the Urban Planning Code of the Russian Federation and the Urban Planning Charter of the YaNAO [20] in order to create conditions for the sustainable development of the region through the development of engineering, transport, economic and social infrastructures, ensuring safe and favorable conditions for human life, protection and rational use of natural resources. The STP is developed on the basis of data from the federal state information system for territorial planning, strategies and programs for the socio-economic development of the region, decisions of state authorities and local self-government, strategies and programs for the development of economic sectors, investment programs of natural monopoly entities. The planning horizon of the current STP in the YaNAO is 2037, 2027 is the first stage.

The reconstruction and construction of helipads, the reconstruction of fire stations, the construction of medical, ritual and other social facilities in the administrative centers of the rural settlements of the Shuryshkarskiy district, as well as the arrangement of river infrastructure in Muzhi and Gorki are envisaged. Significant infrastructure facilities of long-term socio-economic importance for the district are the planned scheme for gas supply and gasification of the YaNAO, developed by PJSC Gazprom and PJSC Gazprom Promgaz, the construction of high-pressure gas pipelines and other gas distribution infrastructure for the settlements of Muzhi, Vosyakhovo, Gorki and Shuryshkar, as well as the construction of the Labytnangi – Muzhi – Azov – Tegi highway (Khanty-Mansi Autonomous Okrug) 315 km long. The plans for the spatial development of the district can be seen in the creation of mandatory infrastructure in each settlement for the collection and storage of municipal solid waste, which is planned in 15 settlements: Muzhi (3 663) [21], Gorki (1 672), Ovgort (1 028), Shuryshkary (757), Pitlyar (474), Vosyakhovo (436), Lopkhari (434), Azovy (318), Yamgort (236), Ust-Voykary (129), Unselgort (54), Kazym-Mys (51), Khashgort (30), Poslovy (12), Novyy Kievat (11). The already abolished settlements Ilyagort, Ishvary and Lokhpotgort, as well as the existing Vershina Voykary (32), Anzhigort (23), Nymvozhgort (17), Sangymgort (15), Evrigort (14), Ovolyngort (14), Tiltim (12), Karvozhgort (4), Khanty-Muzhi (4) remain without waste collection infrastructure. Agro-industrial facilities (cattle-breeding and crop production complexes) are planned to be constructed in Muzhi, Gorki, Vosyakhovo, Ovgort, Yamgort. Construction of facilities in the field of development and exploitation of hydrocarbon deposits, ore and non-metallic minerals in the area is not planned.

[19] Pravitel'stvo Yamalo-Nenetskogo avtonomnogo okruga. Postanovlenie ot 9 yanvarya 2020 g. N 2-P «Ob utverzhdenii skhemy territorial'nogo planirovaniya Yamalo-Nenetskogo avtonomnogo okruga» [Government of the Yamalo-Nenets Autonomous Okrug. Decree of January 9, 2020 N 2-P "On approval of the territorial planning scheme for the Yamalo-Nenets Autonomous Okrug"]. URL: https://depstroy.yanao.ru/documents/active/59524/ (accessed 21 September 2022).

[20] Zakon Yamalo-Nenetskogo avtonomnogo okruga ot 18 aprelya 2007 goda N 36-ZAO «Gradostroitel'nyy ustav Yamalo-Nenetskogo avtonomnogo okruga» [Law of the Yamalo-Nenets Autonomous Okrug of April 18, 2007 N 36-ZAO "Urban Planning Charter of the Yamalo-Nenets Autonomous Okrug"]. URL: https://docs.cntd.ru/document/423976552 (accessed 21 September 2022).

[21] Here and below, the size of the settlement is indicated in parentheses.

Fixing these objects in the STP is not a guarantee of their implementation; the distant planning horizon implies changes in external and internal factors. The reflection of the ongoing processes can be observed through the state and municipal programs of the region and district. The municipal program "Main directions of the urban planning policy of the Shuryshkarskiy district for 2016–2024" provides for the construction of a number of the above-mentioned, as well as other objects, but no new objects are planned for 2022–2024, which indicates that their construction is implemented on the basis of operational decisions [22]. The municipal program for energy efficiency and energy development [23] provides only for maintenance of public utilities and local roads. Indicators of the municipal program "Providing high-quality housing in the Shuryshkarskiy district for 2016–2024" [24] include the provision of housing for the population, m^2 per person (23) and the annual volume of commissioning of housing (7 thousand m^2), but the quality of housing is not assessed by any parameters. In particular, the use of new energy-saving and heat-saving technologies, smart home technologies and other parameters that are significant for a sustainable local economy are not taken into account. According to the YaNAO municipalities' passport, the number of citizens living in dilapidated houses is 2494 people (26.4%), the number of dilapidated and emergency buildings is 44 thousand m^2; there should not be any dilapidated and emergency housing by 2025 [25].

Budget expenditures and social policy

Total budget expenditures on maintenance of small settlements in the Shuryshkarskiy district for 2020 amounted to 4.6 billion rubles (Table 2), and only 5.3% of these expenses are covered by the resources of local economy: taxes and fees (Fig. 4). They are distributed as follows (Table 2).

Table 2

The structure of budget expenditures of the Shuryshkarskiy district for 2020 [26]

Expenditure of the budget	thousand rubles
Education	1 692 047.30
Social policy	677 340.06
National economy	502 949.10
Housing and communal services	457 398.85

[22] Postanovlenie Administratsii munitsipal'nogo obrazovaniya Shuryshkarskiy rayon ot 17 marta 2017 goda № 220-a. Munitsipal'naya programma «Osnovnye napravleniya gradostroitel'noy politiki Shuryshkarskogo rayona na 2016-2024 gody» [Decree of the administration of the municipal formation Shuryshkarskiy district dated March 17, 2017 No. 220-a. Municipal program "The main directions of urban planning policy of the Shuryshkarskiy district for 2016-2024"]. URL: https://admmuji.yanao.ru/documents/active/196734/ (accessed 21 September 2022).

[23] Postanovlenie Administratsii munitsipal'nogo obrazovaniya Shuryshkarskiy rayon ot 26 fevralya 2018 goda № 127-a [Decree of the administration of the municipal formation Shuryshkarskiy district dated February 26, 2018 No. 127-a]. URL: https://admmuji.yanao.ru/documents/active/198644/ (accessed 21 September 2022).

[24] Postanovlenie Administratsii munitsipal'nogo obrazovaniya Shuryshkarskiy rayon ot 21 fevralya 2017 goda № 131-a [Decree of the administration of the municipal formation Shuryshkarskiy district dated February 21, 2017 No. 131-a]. URL: https://admmuji.yanao.ru/documents/active/163275/ (accessed 21 September 2022).

[25] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. 2020. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

[26] Ibid.

General government issues	426 115.88
Culture	287 013.57
Sport	94 683.48
National security and law	82 041.32
Mass media	65 310.00
National defense	1 988.57
Total:	4 286 888.13

The current socio-economic policy shows that the district will remain subsidized in the long term.

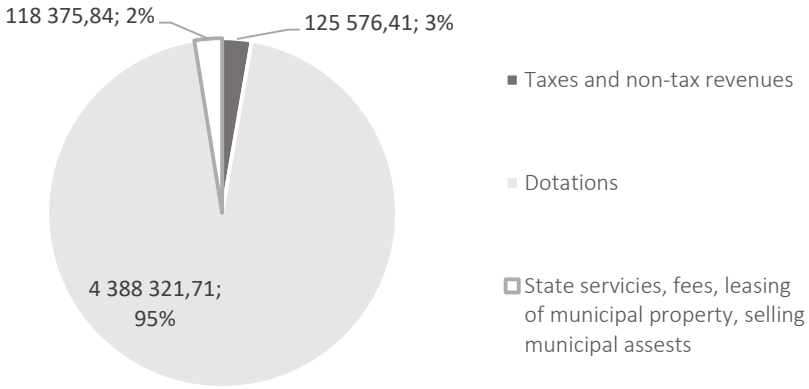

Fig. 4. Sources of budget revenues (Shuryshkarskiy district) [27].

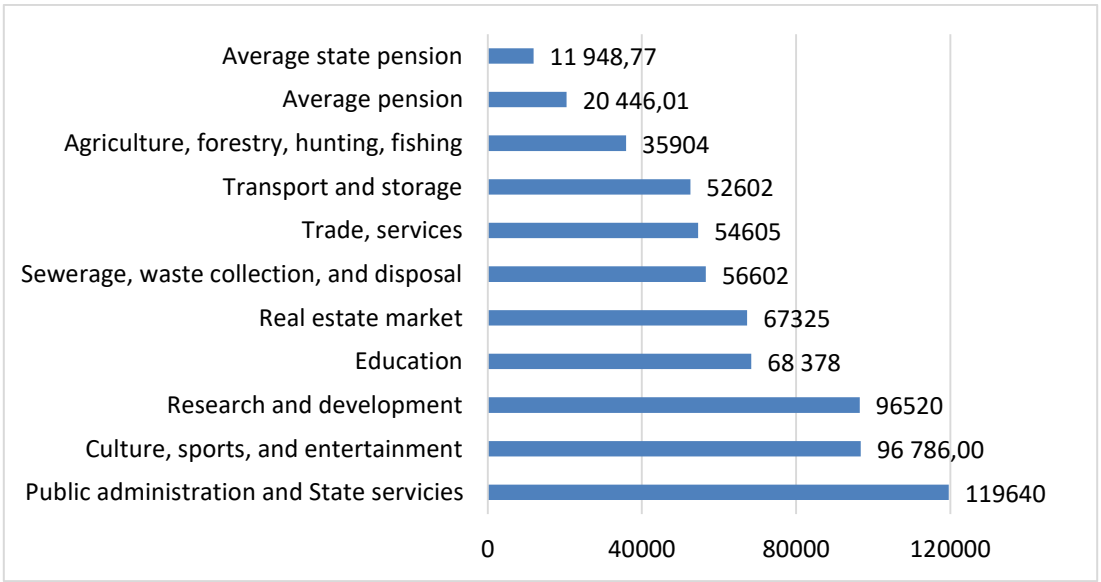

Fig. 5. Average monthly salary of employees by areas of employment, rub. (Shuryshkarskiy district) [28].

[27] Compiled by the authors on the basis of the Passport of settlements of municipalities of the YaNAO. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).
[28] Ibid.

Despite the average monthly wage of employees of organizations (78.168 rubles), the share of the population with cash incomes below the regional subsistence level is very high — 32% [29] ("Yamal Monitoring", 2020). Pensioners are the most vulnerable category: the average state pension is below the regional subsistence level (13.510 rubles in 2020 and 14.033 rubles in 2021) [30]. The lowest level of average monthly wages was recorded in the most significant areas for the sustainable development of local communities: agriculture, forestry, hunting, fishing (35.904 rubles), while the highest level of wages (119.640 rubles) was in public administration and public services (Fig. 5).

Table 3

Some indicators of social municipal programs for 2020 (Shuryshkarskiy district)

"Development of the education system of the Shuryshkarskiy district for 2016–2024"	
Proportion of children enrolled in additional education in the total number of children and young people aged 5–18	71%
Proportion of primary school children provided with free hot meals	100%
Level of satisfaction of recipients of municipal educational services	92%
"Main directions of policy for the development of culture and youth policy in the Shuryshkarskiy district for 2016–2024"	
Number of craftsmen in folk, decorative and applied arts, participation in events aimed at preserving, reviving and popularizing folk arts and crafts	108
Number of visits to cultural and leisure facilities	5 658
"Safe territory for 2016–2024"	
Crime rate in the Shuryshkarskiy district per 1000 inhabitants (for comparison, in the Yamalo-Nenets Autonomous Okrug)	8.4 (7.5)
Percentage of residents who believe that crime (including corruption) is spreading	30%
Percentage of residents who have experienced extremism	5%
"Protection of the population and territory from emergency situations for 2016–2024"	
Number of materials on life safety published in the media	70
Number of schoolchildren who took part in life safety courses	150
Municipal program "Development of physical culture, sports and tourism in the Shuryshkarskiy district for 2016–2024"	
Number of people involved in physical culture and sports (share in the total population, excluding preschool age)	4 558 (55%)
Number of sports facilities	916

Economy and entrepreneurship

The specialization of the region is historically associated with hunting for fur-bearing animals, fishing, reindeer herding – the traditional economic activities of indigenous peoples. During the Soviet collectivization period, fishery was industrialized and fish harvesting and canning were carried out through consumer cooperation. The economy of the region was based on the state pricing policy, favorable for the development of remote areas. Within the framework of market relations, local products have become uncompetitive, and local enterprises became unprofitable and required state support.

[29] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).
[30] Department of Economics of the Yamalo-Nenets Autonomous Okrug. URL: https://de.yanao.ru/activity/64/ (accessed 11 December 2021).

One of the main reasons for inefficiency of local production lies in outdated technologies and equipment. Goods are produced by methods that were used 50 years ago. Technological modernization, diversification of the economy and launching of new enterprises require large investments in production assets and retraining of personnel. However, no information is currently available on the planning of large investment projects for the development and modernization of the district's national economy technologies, which would change the economic situation. Data on investment in R&D and innovative business are not available [31].

Only 6% of investments in fixed assets were financed from the own funds of enterprises (Table 4), which indicates an extremely low level of own potential for their development.

Table 4

Investments in fixed assets (Shuryshkarskiy district), 2020 [32]

Indicator	Cost, thousand rubles	Share in total investment in fixed assets, %
Investment in fixed assets	530 761	100%
Own funds of enterprises	32167	6.06%
Attracted investments, including:	498 594	93.94%
Budgetary funds:	494 420	93.15%
Federal budget	670	0.13%
Regional budget	278 410	52.45%
Municipal budget	215 340	40.57%

The share of SMEs in the total number of people employed in the district is 14%. The highest level of entrepreneurship is in the village of Gorki: 237 SMEs and 8 individual entrepreneurs (Table 5).

Table 5

Entrepreneurship and SMEs in the Shuryshkarskiy district [33, 34]

Village	Population, according to the Passport of settlements of municipalities of the YaNAO for 2020	Number of individual entrepreneurs	Number of SMEs	Number of SME employees	Amount of financial support (thousand rubles)	Number of SMEs that received support	Share of entrepreneurs in the total population	Number of SME employees to population

[31] Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

[32] Compiled by the authors on the basis of the Passport of Settlements of Municipal Formations of the YNAO Department of Economy of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. 2020. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

[33] Compiled by the authors on the basis of data from the state tax authorities. The Federal Tax Service. Unified register of small and medium-sized businesses – recipients of state support. 2020. URL: https://rmsp-pp.nalog.ru/index.html (accessed 14 March 2022); The Federal Tax Service. Unified register of small and medium-sized businesses. 2021. URL: https://ofd.nalog.ru/index.html (accessed 14 March 2022).

[34] Note: the number of entrepreneurs is calculated as the sum of the number of individual entrepreneurs and SMEs.

Unselgort	54	1	0		0	0	2%	2%
Ust-Voykary	129	2	0		150	1	2%	2%
Yamgort	236	2	0		0	0	1%	1%
Azovy	318	3	0		7	1	1%	1%
Lopkhari	434	6	0		0	0	1%	1%
Vosyakhovo	436	5	1	1	0	0	1%	1%
Pitlyar	474	6	1		0	0	1%	1%
Shuryshkary	757	16	1	15	505	3	2%	4%
Ovgort	1028	14	2	4	150	1	2%	2%
Gorki	1672	21	8	237	68211	6	2%	15%
Muzhi	3663	89	17	104	12114	31	3%	5%
Total	9201	165	30	361	81137	43	2%	6%

The correlation between the population of a settlement and the number of entrepreneurs is visually noticeable (Fig. 6); however, the number of entrepreneurs varies significantly in settlements (Table 5).

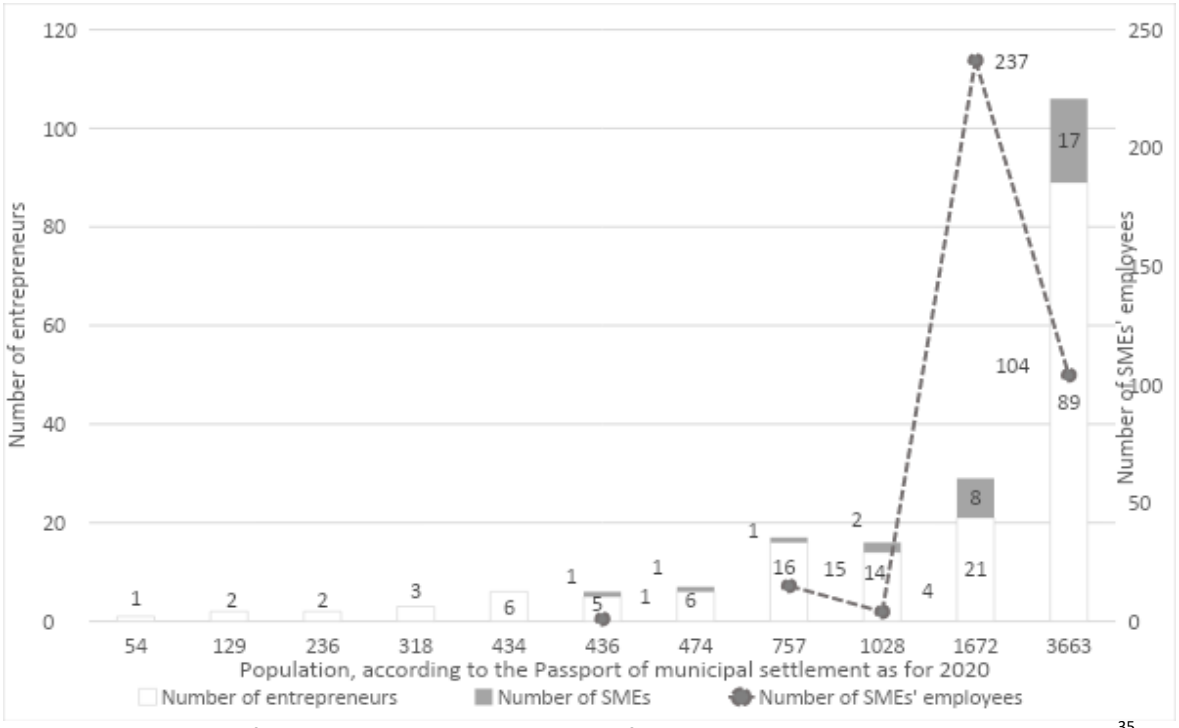

Fig. 6. Correlation of the population and the number of entrepreneurs in the Shuryshkarskiy district [35].

Management and strategic planning

The main prospects for the development of the district are associated with a more complete use of natural resources. The main points of growth outlined in the "Strategy for the socio-economic development of the Shuryshkarskiy district up to 2030" are: agriculture and food industry; tourism. The main economic activities are fishing and reindeer herding, but they are currently subsidized (Duma of Shuryshkarskiy district, 2018). The produced reindeer meat is almost entirely consumed in the dis-

[35] Compiled by the authors on the basis of data from the state tax authorities and the Passport of municipalities. The Federal Tax Service. Unified register of small and medium-sized businesses. 2021. URL: https://ofd.nalog.ru/index.html (accessed 14 March 2022); Department of Economics of the Yamalo-Nenets Autonomous Okrug. IAS Monitoring Yamal. Passport of the municipalities of the Yamalo-Nenets Autonomous Okrug. 2020. URL: https://monitoring.yanao.ru/pasport/ (accessed 14 December 2021).

trict. Tourism cannot get significant development due to the remoteness of the settlements. Thus, the development strategy of the district does not imply fundamental changes; it is aimed at preserving the traditional way of life of indigenous peoples and traditional economic activities.

By 2022, several municipal programs on improving public administration have been fully or partially implemented: "Management of municipal property for 2016–2021", "Management of municipal finances, increasing the sustainability of the budgets of municipalities in the Shuryshkarskiy district for 2016–2024", "Implementation of municipal policy for 2016–2024" and "Satisfaction of residents with the activities of local governments of the Shuryshkarskiy district". All of them concern only operational activities and do not imply any strategic changes in the improvement of municipal management.

Results and discussion

For the analysis of problems and prospects of sustainable development in the Shuryshkarskiy district, an adapted system of sustainable development goals and indicators was used, selected from the general list of global sustainable development goals, taking into account their relevance to the level of the district and the characteristics of the Arctic territories and priorities for their development, and two analytical sections: problems and prospects (for a description of the proposed methodology, see the Method and Data section). The results of the analysis of the available information about the Shuryshkarskiy district are systematized in Table 6.

Table 6

Analysis of problems and prospects for sustainable development of the local economy

SDG	Questions and indicators for analysis	Problems	Prospects
1.1. End poverty.	1.1. Number and proportion of the poor. 1.2. Social policy, benefits and subsidies for the poor. 1.3. Equal rights to economic resources. 1.4. Regional and municipal programs to support the poor and vulnerable segments of the population. 1.5. Development strategies to support accelerated investment in poverty eradication activities.	• High proportion of the poor (32%). • Low level of provision of large families with free land plots. • Sufficient gap between the average wages of civil servants and agricultural workers. • Average state pension is below the regional subsistence level. • Regional and municipal programs to support the poor and vulnerable segments of the population are ineffective and mainly based on subsidies.	• Large amount of unused and vacant land suitable and in demand for house building, business and agricultural use. • Natural resources can be used to develop the local economy through their processing based on the latest technologies and R&D. • Traditional art, technology and knowledge can be capitalized in products in demand. • Development strategies and municipal support programs based on SME development and self-sufficient local economy. • Development of a system for accounting

			for the actual income of households.
2. Eradicate hunger, food security, improved nutrition and sustainable agriculture.	2.1. Increase agricultural productivity and incomes for small-scale food producers through secure and equitable access to land, knowledge, financial services, markets, and opportunities for added value creation and non-agricultural employment. 2.2. Ensure sustainable food production systems and implement sustainable agricultural practices that increase productivity and production, which can help preserve ecosystems. 2.3. Investments in rural infrastructure, agricultural research and extension services, development of technologies to increase the productive potential of agriculture. 2.4. Effective functioning of food markets.	• Lack of higher education, vocational training and R&D. • No investment in R&D, innovation and new downstream technologies. • No indicators for agricultural productivity and sustainability. • High prices and low quality of food. • Low investments in rural infrastructure.	• Technological modernization of agriculture. • Introduction of concepts and technologies of carbon agriculture and forestry. • Legalization of personal subsidiary plots. • Granting the rights to use land and water resources.
3. Ensuring healthy lifestyles and promoting well-being for all.	3.1. Access to quality and affordable basic reproductive health services and medicines. 3.2. Prevention and treatment of drug and alcohol abuse. 3.3. Ensuring a safe environment, accidents and natural disasters. 3.4. Introduce health-saving technologies, finance health care, recruit, develop, train and retain health care staff.	• Limited access to quality and affordable basic reproductive health services and medicines. • No data on the harmful use of alcohol. • High crime rate. • Low financing of health care and low quality of local medicine. • Fire extinguishing is carried out by voluntary fire brigades.	• Implementation of technologies for early warning, risk reduction and management of national and global health risks. • Implementation of remote medicine technologies. • Implementation of preventive health-saving technologies.
4. Inclusive and equitable quality education and promotion of lifelong learning opportunities for all.	4.1. Access to quality early childhood development, care and pre-primary education. 4.2. Quality local primary and secondary education. 4.3. Equal access to affordable and quality technical, vocational and higher education, including university education. 4.4. Access to quality training in skills needed for local sustainable development for all ages.	• Lack of objective indicators of the quality of early childhood development, childcare, preschool, primary and secondary education. • Lack of locally accessible and high-quality technical, professional and higher education, including university education. • Lack of effective blended learning.	• Monitoring and improving the quality of local education through objective indicators: learning, practical and scientific achievements of schoolchildren, demand for and success of specialists at the local and global levels. • Availability and access to quality lifelong learning and getting skills for sustainable

	5. Safe, non-violent, inclusive and effective learning environment for all.		local development for all ages. • Development of educational expeditions, exchange programs.
6. Access to and sustainable management of water and sanitation for all	6.1. Adequate and equitable sanitary and hygienic conditions for all. 6.2. Reducing pollution, eliminating landfilling and minimizing releases of hazardous chemicals and materials. 6.3. Protection and restoration of water-related ecosystems. 6.4. Recycling and reuse technologies. 6.5. Strengthen the involvement of local communities in improving water and sanitation management.	• Lack of environmental indicators. • Lack of indicators for use and implementation of new recycling and reuse technologies. • Lack of centralized water supply, sewerage and wastewater treatment facilities.	• Implementation of recycling and reuse technologies. • Ensuring adequate and equitable sanitation and hygiene conditions for all. • Participation of local communities in in improved water and sanitation management.
7. Ensure access to affordable, reliable, sustainable and modern energy sources for all.	7.1. Access to affordable, reliable and modern energy services. 7.2. Significantly increase the share of renewable energy sources in the global energy balance. 7.3. Increase energy efficiency. 7.4. Access to clean energy research and technology. 7.5. Investments in energy infrastructure and clean energy technologies.	• Centralized power supply is available only in 8 out of 17 settlements, only 2 of them have 24-hour electricity supply. • No local strategic programs for improving energy efficiency and renewable energy sources. • Lack of investments in energy infrastructure development.	• Implementation of the latest energy efficiency and renewable clean energy technologies. • Development of R&D in the field of energy and infrastructure. • Development of alternative energy (renewable).
8. Promote inclusive and sustainable economic growth, full and productive employment and decent work for all.	8.1. Growth of domestic product per year without damage to the local ecosystem. 8.2. Increased economic productivity through diversification, technological upgrading and innovation, including by focusing on high value-added and labour-intensive industries. 8.3. Consumption and production efficiency 8.4. Full and productive employment and decent work for all. 8.5. Safe and reliable working environment. 8.6. Sustainable tourism that creates jobs and pro-	• No clear and effective development strategy that ensures long-term sustainable economic development. • High level of unemployment. • Small number of SMEs and entrepreneurs. • Lack of self-sufficient and sustainable local economy (94% of expenditures are subsidized). • No income from local services and tourism.	• Promotion of development-oriented policies that support productive activity, decent job creation, entrepreneurship, creativity and innovation. • Supporting modernization and creation of self-sufficient local business. • Eradication of poaching • Integration of elements of the post-industrial economy into indigenous habitats: eco-patrol, tourism, medicine, clean-

	motes local culture and products.		ing, reclamation, restoration, cultivation of biological resources.
9. Create sustainable infrastructure, promote inclusive and sustainable industrialization, and encourage innovation.	9.1. Quality, reliable, sustainable and resilient infrastructure, including regional and cross-border infrastructure. 9.2. Access of small-scale industries and other enterprises to value chains and markets. 9.3. Local technological and innovative development. 9.4. Access to information and communication technologies.	• Insufficiency of investments in the modernization of infrastructure and the construction of new infrastructure. • Transport accessibility of small settlements depends entirely on meteorological conditions and seasonality. • No investment in R&D and innovation.	• Providing a favorable political environment for industrial diversification and increasing the cost of commodities. • Support for the development of local technologies, research and innovation.
10. Reduce inequality.	10.1 Digital inequality. 10.2 Income differentiation.	• Lack of monitoring of income inequality indicators. • Sufficient gap between the highest and the lowest incomes.	• Access to communication and digital technologies, digital competencies. • Monitoring of income inequality indicators. • Development of policies to reduce income inequality.
11. Make settlements inclusive, safe, resilient and sustainable.	11.1. Universal access for all to adequate, safe and affordable housing and basic services. 11.2. Access to safe, affordable, accessible and sustainable transport. 11.3. Ability for collaborative, integrated and sustainable planning and management of settlements. 11.4. Protect and conserve the world's cultural and natural heritage. 11.5. Positive economic, social and environmental links between urban, suburban and rural areas.	• Number of citizens living in dilapidated housing stock is 2494 people (26.4%). • A large number of families need a land plot for individual housing construction. • No data on the practice of participatory management. • Labor migration from small settlements.	• Implementation of participatory management and budgeting practices. • Development of local tourism, including cultural, eco- and agro-tourism. • Increasing food security and self-sufficiency of the local economy. • Development of cooperation and collaborative technologies. • Improvement of housing and infrastructure.
12. Ensuring sustainable consumption and production patterns.	12.1. Recycling economy, zero waste and harm to nature. 12.2. Reduce waste generation through prevention, reduction, recycling and reuse. 12.3. Up-to-date information and awareness about sustainable development and living in har-	• No data on economics of recycling and waste reduction.	• Encouragement of local companies to implement sustainable models. • Changes in regulatory requirements for waste disposal in small towns.

	mony with nature.		

The proposed methodology revealed a generally low level of compliance of the current state and current trends in the development of the Shuryshkarskiy district with the sustainable development goals. Existing municipal development programs, although they have a positive effect on the sustainability of the local economy and the viability of local communities, are still insufficiently focused on the SDGs and do not use a wide range of available resources and reserves for the sustainable development of the region (see Table 6). The testing of the methodology on the example of the Shuryshkarskiy district has also revealed the problems of lack of data, inconsistency of the current system of management accounting, control and monitoring with the objectives of sustainable development of the territory.

In their strategies, all Arctic states adhere to the principles of sustainable growth and development of the Arctic territories [15, Fow S.J.]. In order to make the principles really "work", they have to be embedded in the core of the territorial management system: analysis, planning, monitoring and control of management decisions and development programs. There are many interests colliding in the management of the Arctic development, often in different directions at the operative level, but common at the strategic level: global (vulnerable ecology of the Arctic and its great impact on the overall ecological balance in the world, preservation of the culture of indigenous peoples, etc.), national (national security and resource provision), regional and municipal (quality of life of various groups: shift workers, indigenous peoples, local residents, shareholders of large oil and gas companies, etc.). The sustainable development of the Arctic territories can be achieved by integrating the goals of various actors at the strategic level, systemic planning and implementation of programs for the sustainable development of territories through participatory management. This approach maintains a balance of interests both within the Arctic community (development of a local market economy, traditional occupations, innovations, modernization of the national economy and preservation of the culture of indigenous peoples), and between Western concepts of environmental protection, sustainable development, and the goals of the national Arctic development strategy, including the intensive economic development of regional natural resources and the goals of improving the quality of life of various actors in the Arctic local economies.

Conclusion

Many researchers note the inability of global initiatives in the field of sustainable development to impose strict obligations on countries, which has led to global environmental degradation [16, Barnhizer D.]. The ongoing decline of ecosystems makes it difficult to find the most effective sustainable development policies [17, Benson M.H., Kundis R.C.]. The most pessimistic view is that achieving sustainability is impossible because it requires people to be what they are not. They point to a significant gap between the high goals of sustainable development and the real possibilities and desires of people [16, Barnhizer D.].

For many territories, economic growth is the most significant indicator of sustainable development. However, some countries and local communities use alternative measures (such as child mortality rates, educational level or incarceration rates). Governments at the national, regional and local levels are developing a variety of sustainability targets and indicators, expanding the scope for quantitative and qualitative analysis of decision-making processes and monitoring their consequences. The development of the management system entails new accounting and control systems, development programs and legal regulations that remove obstacles to sustainability in a way that contributes to the achievement of goals [18, Perkins N.D.]. The proposed methodology is also based on a broad view of sustainability, which involves the application of benchmarks that take into account the impact of the ongoing socio-economic policy on the economy, ecosystems and institutions in both the short and long term [19, Dernbach J.C.].

Arctic territories are particularly susceptible to the complex negative consequences of technical and economic growth in the context of globalization, which entails resource wealth on the one hand, but also a high degree of vulnerability of northern nature and traditional occupations of local northern communities on the other. The high level of socio-economic, technological risks and life safety determines the specificity of the "Arctic" mentality, in particular the prevalence of practices based on cooperation, mutual assistance and respect for nature, as well as food security practices at the level of local economies. From our point of view, sustainable development of the Arctic is impossible without sustainable local economy that functions on the basis of the systematic use of cooperation tools and depends on the climatic, socio-economic features of the Arctic territories and the cultural and economic traditions of the indigenous peoples inhabiting them. In order to effectively implement the sustainable development policy of the territory, stakeholders can create special agencies and public organizations (at the regional or local level) to take into account the specific interests of indigenous peoples, local enterprises and industries [36].

The proposed methodology, which is an adapted system of goals and indicators of sustainable development, analyzed in two dimensions (problems and prospects), helps to improve the consistency and scientific validity of management decisions on the sustainable development of territories, and is also a convenient tool for participatory management. Approbation of the methodology on the example of the Shuryshkarskiy district made it possible to identify serious problems in the development of the Arctic local economy: low quality of life, lack of independence, subsidiarity, insufficient orientation of strategic plans for the development of the territory towards SDGs. The systems of local goals and indicators of sustainable development, municipal databases and municipal management processes need to be further developed in the context of their integration and compliance with the goals of sustainable development.

The results of the study showed that the proposed approach to the analysis of the Arctic local economies has great potential for the development of local management systems that ensure the real

[36] Office of Research and Development National Risk Management. Research Lab., Sustainable Tech. Div., EOPA/600/R/12/687, A Framework for Sustainability Indicators 2. 2012.

sustainable development of territories, increase their prospective viability and quality of life of diverse local communities.

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Evolution of Russian State Policy for Development of the NSR (2018–2022): Influence of Geopolitical and Geoeconomic Factors

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Abstract. Russia published a series of documents from 2018 to 2022 indicating its desire to transform the Northern Sea Route (NSR) into a globally competitive international shipping route due to its awareness of the importance of the NSR for the socio-economic development of the Arctic zone of the Russian Federation. This article examines the evolution of Russian policy through a regulatory analysis combined with an empirical analysis of shipping along the NSR over the period 2018–2022, as well as the impact of Western sanctions. The aim of the article is to examine the viability of Russia's new infrastructure plan for the NSR, published in August 2022. The analysis of Russia's policy towards the NSR suggests that Russia needs to review its policy in relation to the imposed Western sanctions. This would entail a new focus on revitalising the shipbuilding industry. The targets set earlier, and then in 2022, for shipping cargo on the NSR should be redefined taking into account current realities. The practical significance of the article is in its use by policymakers engaged in the development of the NSR and researchers of Arctic shipping.
Keywords: *transport policy, Northern Sea Route, Russia, Arctic shipping, infrastructure, sanction*

Introduction

The NSR is becoming increasingly significant due to global warming and the changes in ice conditions. According to various estimates, by 2045, navigation in the Arctic zone will be possible without icebreaking support [1]. Therefore, states and companies pay greater attention towards NSR as a possible alternative for southern shipping routes, such as the Suez Canal.

However, the conditions in which vessels can operate during navigation via NSR are harsh and rough. Icebreaking support is needed, and emergency stations and teams must be established. Navigation via the NSR will appeal to international shipping companies only after that. Since the NSR is a Russian national route, it is the Russian responsibility and in its interest to develop the necessary infrastructure so that NSR could become a competitor for popular southern routes. Hence, the article aims to assess the evolution of Russian state policy for the NSR and assess the influence of geopolitical and geo-economic factors. Therefore, the following objectives were established:

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- to analyze Russia's normative documents related to the development of the NSR;
- to characterize the evolution of Russian state policy to the development of the NSR;
- to determine the influence of geopolitical and geo-economic factors on Russian policy towards the NSR.

Literature review

Few Russian and foreign researchers are engaged in the study of changes in the Russian state policy on the development of NSR. A. Moe has written several articles related to Russian policies with respect to the NSR [1, Moe A., pp. 209–227; 2, Moe A., pp. 199–208]. B. Gunnarsson devoted two of his works to the study of international shipping on the NSR and changes in state policy to improve Arctic shipping [3, Gunnarsson B., Moe A., pp. 4–30, 4; Gunnarsson B., pp. 1–8]. Russian authors have extensively analyzed the NSR [5, Fedorov V.P., pp. 1–7]. Some collective works by Russian authors have contributed to the discourse [6, Sevastyanov S., Kravchuk A., pp. 228–250; 7, Travkina E.V., pp. 1–6].

N.I. Didenko and V.I. Cherenkov devoted their research to assessing economic and geopolitical factors [8, Didenko N.I., Cherenkov V.I., pp. 1–10]. E.G. Katysheva, in her work, assessed the role of gas in the evolution of the NSR [9, Katysheva E.G., pp. 1–6]. The international dimension of the NSR was analyzed by N.S. Lipunov [10, Lipunov N.S., pp. 78–83].

Arctic marine logistics and the challenges of the NSR have also been analyzed [11, Ilin I., pp. 1–309]. The Russian perspective is reflected in the research of V. Erokhin, A.A. Sergunin and V.N. Konyshev [12, Erokhin V., Sergunin A.A., Konyshev V.N., pp. 283–303]. However, none of the articles have analyzed the new infrastructure plan (2022), changes in the organisation of Rosatom and the effect of sanctions on the development of the NSR post the special military operation in Ukraine.

Methodology and materials

The research mainly covers the period from 2018 until 2022. The work is based on the system, structural-functional and institutional approaches which assist in analysing government policy and institutions. The IR theory of neorealism is also used as it is in Russia's national interest to develop NSR as a national route with international opportunities. The geo-economics approach is relevant as the Russian authorities project the NSR as a possible international shipping route. Russian documents, namely policies and laws, formed a majority of the sources. In addition, the speeches of the Russian officials are included to analyse their opinions and to determine the way ahead for the development of the NSR. The empirical analysis was used in respect of permissions

granted by the Northern Sea Route Administration (NSRA). These statistics assisted in the analysis of the effect of Russian state policy for the NSR [1].

Russian state policy for the NSR (2018–2022)

The Northern Sea Route as an important Russian strategic driver

The Northern Sea Route (NSR) is the Russian Arctic's main sea line of communication [2]. Throughout the NSR, there are ports such as Sabetta, Igarka, Dudinka, Dickson, Tiksi and Pevek, which are essential for Russia's economic development, because they contribute to the export of hydrocarbons and other mineral resources [13, Vylegzhanin A., p. 286]. Fig. 1 presents a map of the NSR and adjacent territories.

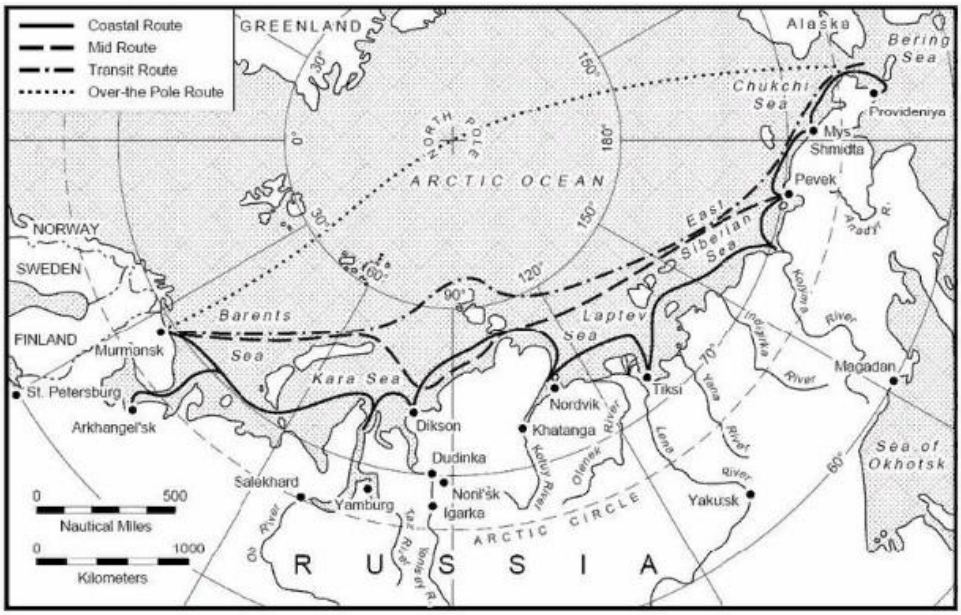

Fig. 1. Map of the Northern Sea Route and adjacent territories [3].

It has been reiterated since the Soviet era by many politicians and scientists that the Northern Sea Route (hereinafter referred to as the NSR) has a strategic character for Russia. During the 1990s, the Russian leadership practically stopped paying attention to Arctic policy, and only since the 2000s, the NSR has become a central theme in Russian politics, considered as a key element in Russia's attempt to restore its erstwhile great power status [1, Moe A., p. 209]. This

[1] Spisok razresheniy na plavanie sudov v akvatorii sevmorputi [List of permits for sailing vessels in the waters of the Northern Sea Route], December 05, 2022. URL: https://nsr.rosatom.ru/rassmotrenie-zayavleniy/razresheniya/ (accessed 1 December 2022); Severnyy Morskoy Put'. Itogi 2020 goda [The Northern Sea Route. Results of 2020], January 19, 2021. URL: https://arctic.gov.ru/wp-content/uploads/2021/02/2020.pdf (accessed 1 December 2022).

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[3] Russia's Shallow Arctic Seas and Straits. Map of the Northern Sea Route, October 23, 2008. URL: https://benmuse.typepad.com/arctic_economics/2008/10/russias-shallow-arctic-seas-and-straits.html (accessed 1 December 2022).
Severnyy Morskoy Put'. Itogi 2020 goda [The Northern Sea Route. Results of 2020]. January 19, 2021. URL: https://arctic.gov.ru/wp-content/uploads/2021/02/2020.pdf (accessed 1 December 2022).

was mainly due to resource exploitation and partly due to global warming when the ice situation began to change [1, Moe A., p. 211], and the prospects for using the NSR were manifested.

According to researchers, the NSR is opening up for traffic faster than earlier models expected (see Fig. 2). This applies to both vessels for open water (OW) navigation and polar class vessels (PC4 and PC6). This could lead to 33–60% more goods being transported along Arctic routes [15, Cao et al., 4–8]. On the other hand, some other researchers state that this may also lead to shipping companies using a Transpolar route (see Fig. 3), obviating the use of the NSR in the future [16, Lynch A.H., Norchib Ch.H., Li X., pp. 2–3]. This may also call into question the requirement of massive spending on infrastructure along the NSR unless it is purely for the development of the AZRF and the export of natural resources. However, this research may not be accurate in the short term, as, for instance, in 2022, the shipping season (generally from mid-June — mid-December) closed ten days earlier than expected due to ice formation in the East Siberian Sea [4]. It may be noted that when Novatek attempted to extend the shipping season in 2020–2021, one of its ships "Nikolai Yevgenov" damaged one of its three azipods (propulsion system) in January 2021 [5]. Similarly, in November–December 2021, a number of vessels were stuck in ice in the Eastern part of the NSR [6].

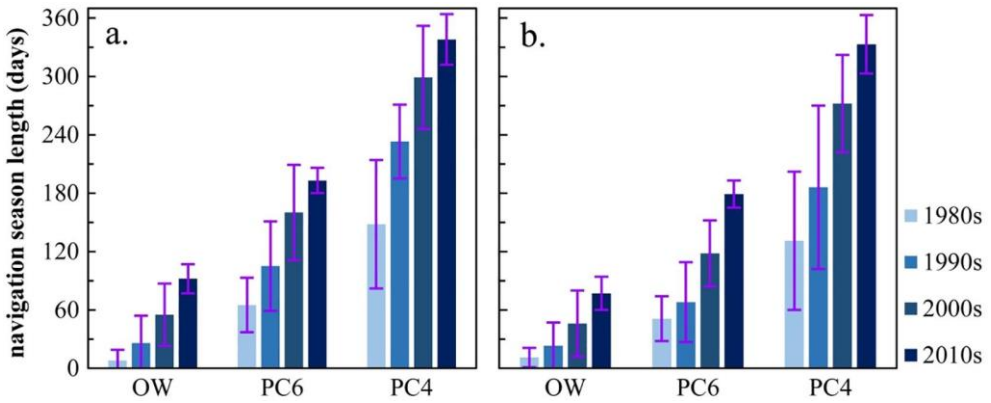

Fig. 2. Trans-Arctic shipping routes expanding faster than the model projections [15, Cao et al., 4].

[4] Ditel T. Sevmorput' privel na Zapad [NSR led to the West]. November 29, 2022. URL: https://www.kommersant.ru/doc/5693647 (accessed 1 December 2022).
[5] Ibid.
[6] Voytenko M. LNG tanker damaged while transiting the NSR. January 19, 2021. URL: https://www.fleetmon.com/maritime-news/2021/32337/lng-tanker-damaged-while-transiting-northern-sea-r/ (accessed 1 December 2022).

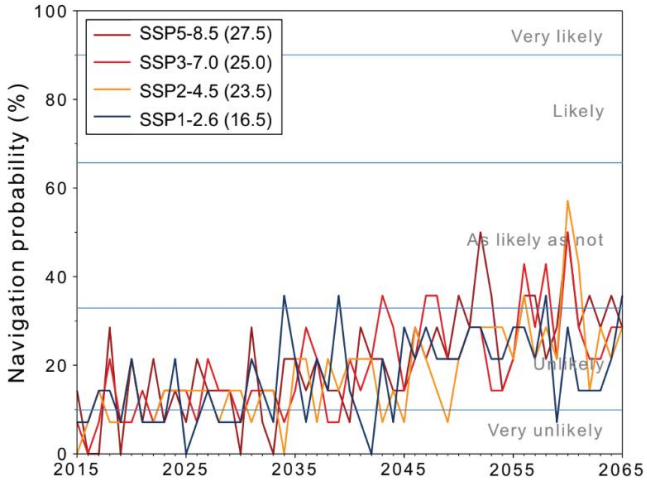

Fig. 3. Projections from 14 Coupled Model Intercomparison Project (CMIP) models of climate change highlighting four scenarios of the probability of Arctic navigability [16, Lynch A.H., Norchib Ch.H., Li X., p. 2].

Some Russian politicians and researchers began to make statements that the NSR could become an alternative to southern routes, the main one — the Suez Canal. Thus, among the advantages of the NSR over the Suez Canal, one can distinguish several factors.

- The most crucial advantage of the NSR is the smaller distance between the ports of Asian countries and ports in Europe and Russia. Table 1 presents comparative data on the distance between key ports and a comparison route map. Therefore, on average, 25 days and 625 tons of fuel oil are required for the transition from Europe to China by the Northern Sea Route, and 35 days and 875 tons of fuel oil— via the Suez Canal [5, Fedorov V.P., p. 4].

Table 1

Comparative table of distances between key seaports (in nautical miles)
[8, Didenko N.I., Cherenkov V.I., p. 2]

	From Hamburg to:			
Shipping routes via:	Vancouver	Yokohama	Hong Kong	Singapore
Northern Sea Route (NSR)	6.635	6.920	8.370	9.730
North West Passage	n/d	11.507	n/d	n/d
North West Passage / NSR	n/d	1.00	n/d	n/d
Suez Canal	15.377	11.073	9.360	8.377
Suez Canal / NSR	2.32	1.60	1.12	0.86
Cape of Good Hope	18.846	14.542	13.109	11.846
Cape of Good Hope / NSR	2.84	2.10	1.57	1.22
Panama Canal	8.741	12.420	12.920	15.208
Panama Canal / NSR	1.32	1.80	1.55	1.56

- The price of transportation by sea transport routes directly depends on the cost of fuel. Thus, with increased fuel prices, transportation costs will increase, to the advantage of the NSR, where less fuel is consumed. Moreover, less fuel consumption will have a positive effect on the environment.

- The fee for passage through the Suez Canal is increasing. From January 2023, the fee for the transit of ships increased by 15%, and for bulk carriers and cruise liners — by 10%. An increase in prices could also be observed in 2022, when the daily charter rate for tankers increased by an average of 88% compared to 2021. For gas carriers, it increased by an average of 11% [7].
- The route is relatively free of shipping compared to the Suez Canal, and hence there is no time penalty [8]. The accident with the container ship "Evergreen" in the Suez Canal in 2021 [9] showed how vulnerable the world's logistics chains are and how high the need for alternative routes is.

The NSR undoubtedly has several advantages over the Suez Canal. However, other factors such as political uncertainty, weather, reliability, search and rescue and availability of a standby port also play a crucial role in a decision by shipping companies to choose a particular route.

In addition, the importance of the NSR is also noted by Russian leaders. V. Ruksha of Rosatom declared that the NSR could take away up to 15% of cargo traffic from the Suez Canal. This will be advantageous for Asian countries — Japan, South Korea and China, mainly the northern provinces [10].

Moreover, Russian Deputy Prime Minister Alexander Novak stated that the NSR is a global transport corridor providing transit between Europe and Asia [11]. A. Novak also highlighted several advantages for the Russian economy from the development of the NSR. In particular, the overall effect of GDP growth from implementing projects may amount to about 30 trillion roubles by 2030, and the increase in tax revenues is slated to be more than 10 trillion rubles [12].

President Vladimir Putin stated in 2019 that it is an imperative to make the NSR safe for navigation and commercially viable [13], and he reiterated this in 2022 [14]. According to Presidential

[7] Prokhod po Suetskomu kanalu snova vyrastet v tsene [Passage through the Suez Canal will rise in price again]. September 20, 2022. URL: https://logirus.ru/news/transport/prokhod_po_suetskomu_kanalu_snova_vyrastet_v_tsene.html (accessed 1 December 2022).

[8] Vinogradov I. Konteynerovoz Ever Given zastryal nadolgo [Container ship Ever Given stuck for a long time]. March 26, 2021. URL: https://www.vedomosti.ru/opinion/articles/2021/03/25/863243-konteinerovoz-given (accessed 1 December 2022).

[9] Ibid.

[10] Sevmorput' mozhet "ottyanut" do 15% gruzopotoka iz Suetskogo kanala — Rosatom [The Northern Sea Route can "take away" up to 15% of cargo traffic from the Suez Canal — Rosatom]. October 13, 2022. URL: https://fomag.ru/news-streem/sevmorput-mozhet-ottyanut-do-15-gruzopotoka-iz-suetskogo-kanala-rosatom/ (accessed 1 December 2022).

[11] Murmanskiy port — arkticheskie vorota Soyuznogo gosudarstva Rossii i Belorussii [Murmansk Port is the Arctic gateway of the Union State of Russia and Belarus]. September 23, 2022. URL: http://vch.ru/event/view.html?alias=murmanskii_port__arkticheskie_vorota_soyuznogo_gosudarstva_rossii_i_belorussii (accessed 1 December 2022).

[12] Ignatieva A. Pravitel'stvo rasporyadilos' sozdat' glavnoe upravlenie Severnogo morskogo puti [The Government has ordered the creation of the main Directorate of the Northern Sea Route]. August 2, 2022. URL: https://neftegaz.ru/news/transport-and-storage/745709-pravitelstvo-rasporyadilos-sozdat-glavnoe-upravlenie-severnogo-morskogo-puti-/ (accessed 1 December 2022).

[13] Rossiya stroit plavuchie atomnye reaktory dlya osvoeniya mestorozhdeniy Severa [Russia is building floating nuclear reactors to develop the fields of the North]. October 12, 2022. URL: https://www.epochtimes.com.ua/ru/poslednie-

Envoy Yu. Trutnev, the NSR could become the second global transport corridor, taking part of the cargo from the Suez Canal, because it is relatively shorter [15].

Moreover, Russian officials note that under the conditions of Western sanctions post the special military operation in Ukraine, most of the Russian cargo flow has turned to the East. Thus the importance of the NSR for the Russian economy has increased significantly. Therefore, the NSR can become the second global transport corridor after the Suez Canal [16]. Consequently, Russian authorities continue to invest significant resources in developing the NSR.

However, examining the changes in Russia's state policy regarding the development of the NSR, it can be stated that the Russian leadership has constantly modified its policies on the importance of the NSR for the country. So, in the initial period, the Russian leadership considered the NSR as a promising substitute for the southern routes, especially the Suez Canal.

Liberalisation and market-oriented approach seemed to be favoured in the initial period by the state for increasing transportation along the NSR. Thus, one of the declared objectives of the NSR policy was to ensure equal access for interested shipping companies, including foreign ones.

Vital decisions for the evolution of the NSR were made in 2018–2019. The most important one was undoubtedly a decree [17], in which Russian President Vladimir Putin set the task to achieve 80 million tons of cargo turnover on the NSR. In December 2018, specific measures were initiated in accordance with the tasks set out in the decree [18].

The Federal Law of December 2018 introduced a change in the management of the NSR. The management of the NSR is based on the principle of "2 keys" — the Ministry of Transport is responsible for regulation, and Rosatom is responsible for commercial and economic functions. Thus, the principle of separate control of the NSR was introduced between the Ministry of Transport of Russia and the state company "Rosatom" [17, Sergunin A.A., p. 82]. Rosatom was further tasked with being the sole operator of the Northern Sea Route and the provider of infrastruc-

novosti-mira/rossiya-stroit-plavuchie-atomnye-reaktory-dlya-osvoeniya-mestorozhdeniy-severa-146783 (accessed 1 December 2022).

[14] Putin ne uvidel nereshaemyh problem po Sevmorputi [Putin did not see unsolvable problems along the Northern Sea Route]. June 16, 2022. URL: https://www.interfax.ru/russia/772494 (accessed 1 December 2022).

[15] Orbital'nuyu sputnikovuyu gruppirovku sozdayut dlya razvitiya Severnogo morskogo puti [An orbital satellite grouping is being created for the development of the Northern Sea Route]. October 21, 2022. URL: https://primamedia.ru/news/1381827/?from=37 (accessed 1 December 2022).

[16] V pravitel'stve rasskazali o planakh razvitiya Sevmorputi [The government told about the plans for the development of the Northern Sea Route]. October 28, 2022. URL: https://rossaprimavera.ru/news/14e2cf9c (accessed 1 December 2022).

[17] Ukaz Prezidenta Rossiyskoy Federatsii ot 07.05.2018 № 204 "O natsional'nykh tselyakh i strategicheskikh zadachakh razvitiya Rossiyskoy Federatsii na period do 2024 goda" [Decree of the President of the Russian Federation as of 07.05.2018 № 204 "On National goals and strategic objectives of the development of the Russian Federation for the period up to 2024"]. May, 2018. URL: https://mvd.consultant.ru/documents/1056500?items=1&page=1 (accessed 1 December 2022).

[18] Federal'nyy zakon Rossiyskoy Federatsii ot 27.12.2018 № 525-FZ "O vnesenii izmeneniy v otdel'nye zakonodatel'nye akty Rossiyskoy Federatsii" [Federal Law of the Russian Federation as of 27.12.2018 № 525-FZ "On amending certain legislative acts of the Russian Federation"]. December, 2018. URL: http://extwprlegs1.fao.org/docs/pdf/rus183299.pdf (accessed 1 December 2022).

ture and seaports. It is relevant to mention that “Rosatom” has the world’s largest icebreaking fleet [5, Fedorov V.P., p. 2].

The Ministry of Transport retained the authority to issue shipping regulations (including safety and environmental standards) and to develop international cooperation, including the execution of the Polar Code. Further, the Ministry is responsible for controlling and supervising transportation on the NSR. It was assumed that this reform would help the NSR to fulfil the presidential task of increasing the annual cargo volume.

To achieve the task of increased cargo turnover, it is crucial to focus on the AZRF since promising deposits of hydrocarbons and other mineral resources are located there. Moreover, the Arctic territories of Russia also depend on the NSR. The Ministry of the Far East was given the authority in 2019 to develop and implement state policy and legal regulation in the field of development of the Arctic because of the commonality of problems of remote regions. This organisation was rechristened as the Ministry of Development of the Far East and the Arctic of the Russian Federation [19].

This State Commission for the Development of the Arctic, which exclusively deals with the development of the AZRF, acts in concert with this Ministry. Reference zones for development of the AZRF were introduced [20]. This is an essential mechanism since the prospects of the NSR are related mainly to the coastal infrastructure — ports, sea terminals, dredging, roads and railways. Economically promising deposits in the coastal and offshore territories of the Arctic can become drivers for these projects [5, Fedorov V.P., p. 4]. Therefore, it is unsurprising that plans for infrastructure development of the NSR include the development of shore infrastructure.

Fundamentals of the state policy of the Russian Federation for the Arctic (period up to 2035)

The document of state policy concerning the Arctic approved by the President in March 2020, hereinafter referred to as the Arctic Policy, outlines the vision for developing the NSR [21]. This document highlights Russia’s main interests and priorities in the Arctic. The threats are related to potential or existing problems in Russia, while the challenges are related to external international factors. Moreover, the main tasks for the Arctic, including developing the NSR as a globally-competitive transport route, are highlighted.

[19] Ukaz Prezidenta Rossiyskoy Federatsii ot 26.02.2019 № 78 "O sovershenstvovanii gosudarstvennogo upravleniya v sfere razvitiya Arkticheskoy zony Rossiyskoy Federatsii" [Decree of the President of the Russian Federation as of 26.02.2019 № 78 "On Improving public Administration in the development of the Arctic Zone of the Russian Federation"]. February, 2019. URL: http://publication.pravo.gov.ru/Document/View/0001201902260038 (accessed 1 December 2022).

[20] Opornye zony razvitiya sostavyat osnovu gosprogrammy po Arktike [Supporting development zones will form the basis of the state program on the Arctic]. September 7, 2017. URL: https://tass.ru/ekonomika/4543491 (accessed 1 December 2022).

[21] Ukaz Prezidenta RF ot 5 marta 2020 g. № 164 "Ob Osnovakh gosudarstvennoy politiki Rossiyskoy Federatsii v Arktike na period do 2035 goda" [Decree of the President of the Russian Federation as of 05.03.2020 № 164 "On the fundamentals of the State Policy of the Russian Federation in the Arctic for the period up to 2035"]. March, 2020. URL: https://base.garant.ru/73706526/ (accessed 1 December 2022).

In particular, in addition to the need to form a fleet capable of solving various tasks, emphasis is also placed on the importance of ensuring safe navigation, creating port and communication infrastructure, and developing cooperation. The importance of the environmental aspect is emphasised. The document noted the increasing pressure of the international community on Russia using the pretext of environmental degradation caused by industrial activities. The Norilsk Nickel leak incident [22] became a precedent for putting more pressure on Russia.

Thus, it can be concluded that the 2020 document continues the established vector of development, while highlighting threats reflected in modern geopolitical realities. However, comparing the documents of 2008 and 2020, there are no significant innovations [23]. Thus, it is noted that, in general, Russia continues its policy of developing regional leadership in the Arctic while trying to create interaction with other actors.

Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2035

The Strategy 2020 [24], hereinafter referred to as the Arctic Strategy, mentions the requirement of cargo turnover on the NSR by 2024, specifies the types and number of transport and icebreaking fleets, the need to create port and related infrastructure, and also highlights measures aimed at navigation safety on the NSR. The Strategy underlines the AZRF's development and emphasizes the NSR in a similar manner to the earlier document. It also highlighted the necessity of the development of infrastructure of the NSR, including an agency for maritime operations, a digital platform for this purpose, conducting geological exploration and dredging, deploying a space system, and developing communication technologies to improve navigation on the NSR.

From the point of view of the development of the NSR, both the Arctic Policy and the Arctic Strategy enunciated similar goals (infrastructure development, navigation safety, and development of modern technologies to facilitate navigation on the NSR). That is, the Russian leadership formed a vision for the future of the NSR, and these goals were linked in all the regulatory documents of this period.

[22] Zlobin A. U «dochki» «Nornikelya» na Taymyre proizoshla novaya utechka topliva [The "daughter" of Norilsk Nickel on Taimyr had a new fuel leak]. May 17, 2021. URL: https://www.forbes.ru/newsroom/milliardery/429519-u-dochki-nornikelya-na-taymyre-proizoshla-novaya-utechka-topliva (accessed 1 December 2022).

[23] Klimenko E. Russia's new Arctic policy document signals continuity rather than change. April 6, 2020. URL: https://www.sipri.org/commentary/essay/2020/russias-new-arctic-policy-document-signals-continuity-rather-change (accessed 1 December 2022).

[24] Ukaz Prezidenta Rossiyskoy Federatsii ot 26.10.2020 g. № 645 [Decree of the President of the Russian Federation as of 26.10.2020 № 645 "On the Strategy for the development of the Arctic Zone of the Russian Federation and ensuring national security for the period up to 2035"]. October, 2020. URL: http://www.kremlin.ru/acts/bank/45972 (accessed 1 December 2022).

Impact of State transport policy

The NSRA began issuing increasing approvals for sailing post-2012 when the Russian government started formalising rules to encourage shipping along the NSR [25]. Furthermore, the above-mentioned policy changes had a positive impact on international shipping owing to the effect of geo-economics even though they were mostly directed internally. The NSRA had issued more than 1200 permits for passage along the NSR by 2021, i.e. the number of permits given almost doubled between 2013 and 2021. Despite the fact that most of the permits were for Russian vessels, we note the growing interest from other countries, including the Asian region. However, the majority of the traffic was to and from Western Europe to facilitate the LNG projects [4, Gunnarsson B., pp. 1–8, 14, Gavrilov V., p. 2]. Fig. 4 shows the statistics of international traffic on the NSR for the period 2013–2022.

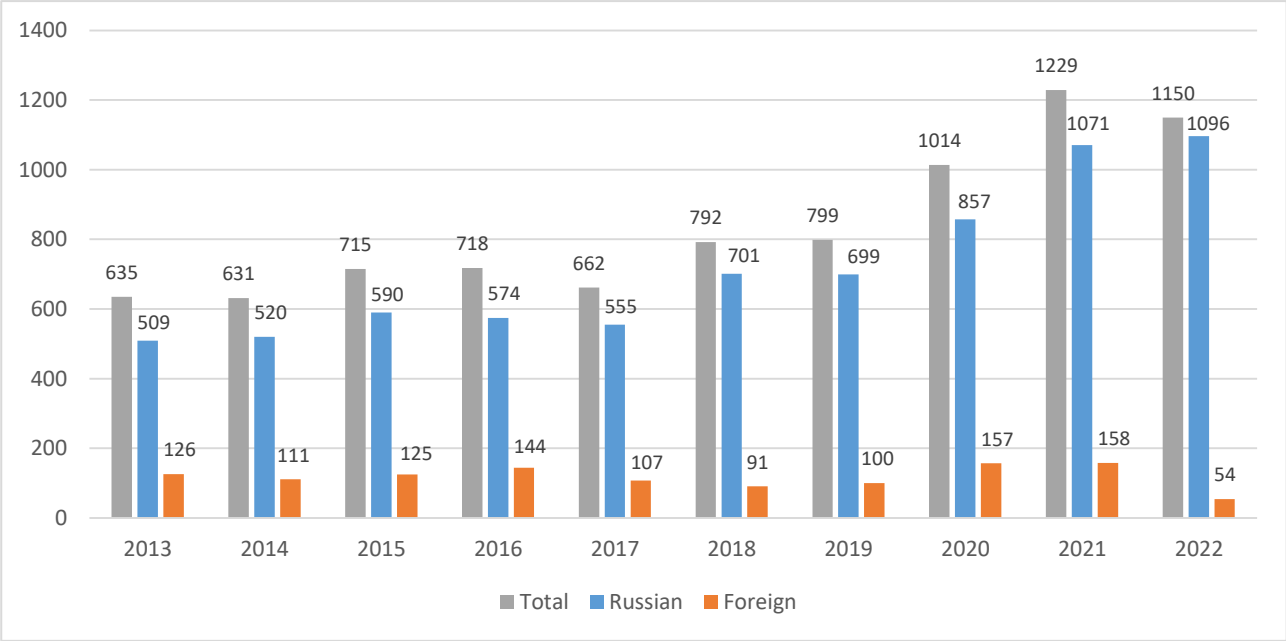

Fig. 4. Russian and foreign vessels on the NSR 2013–2022: number of permits [26].

Changes in State transport policy — 2022

In 2022, further changes to the regulations of 2018 were made. Glavsevmorput was disbanded in 1964 and was re-established under “Rosatom”. Therefore, it is now possible to restrict the vessel’s movements if the forecast of the ice situation differs from what is permissible for the

[25] Federal'nyy zakon ot 28.07.2012 g. N 132-FZ "O vnesenii izmeneniy v otdel'nye zakonodatel'nye akty Rossiyskoy Federatsii v chasti gosudarstvennogo regulirovaniya torgovogo moreplavaniya v akvatorii Severnogo morskogo puti" [Federal Law of the Russian Federation as of 28.07.2012 No. 132 "On Amendments to Some Legislative acts of the Russian Federation regarding the State Regulation of Merchant Shipping along the routes in the waters of the Northern Sea Route"]. July, 2012. URL: https://base.garant.ru/70207760/#:~:text=Северного%20морского%20пути%22-,Федеральный%20закон%20от%2028%20июля%202012%20г.,в%20акватории%20Северного%20морского%20пути%22 (accessed 1 December 2022).

[26] Spisok razresheniy na plavanie sudov v akvatorii sevmorputi [List of permits for sailing vessels in the waters of the Northern Sea Route]. 2022. URL: https://nsr.rosatom.ru/rassmotrenie-zayavleniy/razresheniya/ (accessed 5 December 2022). Note: Data for 2022 and previous years cannot be accessed on this website now.

ice class of the vessel. Before that, the decision to continue the way along the route was the responsibility of the owner and captain of the vessel [27]. Thus, it is expected that this will improve the safety of navigation along the NSR and avoid emergencies as it was at the end of 2021.

The reason for these changes was the events of November-December 2021, when 24 vessels were trapped in ice in the eastern part of the NSR. During this period, there was unusually high traffic as well as difficult ice conditions. At that time, only the icebreaker "Vaigach" was available for escort, which means that some vessels were stuck in the ice for several weeks before they received icebreaking support [28].

The Main Directorate of the Northern Sea Route, or Glavsevmorput, was established in June 2022. This organisation commenced work on August 1, 2022, as part of Rosatom [29]. Its responsibilities include ensuring the organisation of icebreaking support and escort of vessels along the routes of navigation on the NSR, the development of routes of navigation of vessels and the implementation of the placement of icebreaking fleet vessels in the water area, taking into account the hydro-meteorological, ice and navigation conditions in the water area, as well as the issuance, suspension, renewal and termination of permits for shipping on the NSR. This also includes amendments to existing permits.

Consequently, the mechanism for issuing permits for the NSR has changed. Now, in addition to issuing permits, it is assumed that they can be suspended, renewed, amended and revoked. These innovations have been introduced in order to improve safety on the route in light of the experience gained [30].

Fig. 5 demonstrates a comparative table of the distribution of responsibilities in the field of management of the NSR.

[27] GlavSevmorput' budet upravlyat' sudokhodstvom na etom napravlenii [Glavsevmorput will manage shipping in this direction], July 22, 2022. URL: https://www.kamgov.ru/news/glavsevmorput-budet-upravlat-sudohodstvom-na-etom-napravlenii-53500 (accessed 1 December 2022).

[28] Sanctions have no impact on Rosatom's plans for Northern Sea Route — head. June 18, 2022. URL: https://tass.com/russia/1468017 (accessed 1 December 2022).

[29] Putin podpisal zakon o peredache "Rosatomu" polnomochiy po organizatsii sudokhodstva na SMP [Putin signed a law on the transfer of Rosatom's authority to organize shipping on the NSR]. June 28, 2022. URL: https://www.interfax.ru/russia/849200 (accessed 1 December 2022).

[30] V Rosatome sozdano Glavnoe upravlenie Severnogo morskogo puti [The Main Directorate of the Northern Sea Route has been created in Rosatom]. August, 2022. URL: https://rusatom-energy.ru/media/rosatom-news/v-rosatome-sozdano-glavnoe-upravlenie-severnogo-morskogo-puti/ (accessed 1 December 2022).

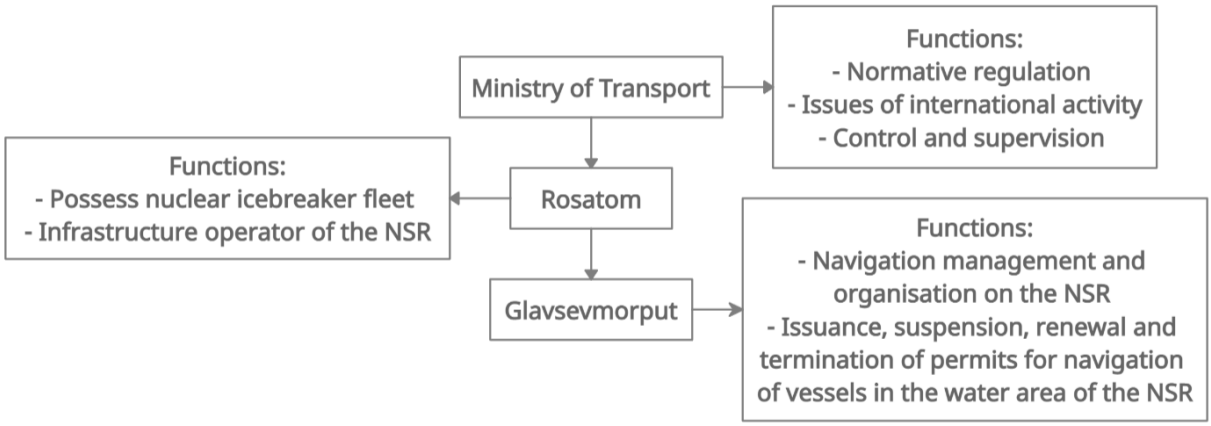

Fig. 5. Delineation of responsibilities in the field of management of the NSR [31].

Comparative analysis of the NSR Infrastructure Development Plans of 2019 and 2022

The first NSR Infrastructure Development Plan, hereinafter referred to as the Plan, developed by Rosatom, was promulgated by the Russian government in December 2019 [32], and an updated version of the Plan was published on August 1, 2022 [33]. It is, therefore, necessary to conduct a comparative analysis of these two plans.

The updated version contains 152 different activities compared to 84 activities in the previous Plan. The planned amount of funding is 1.8 trillion roubles. The government and Rosatom expect that by 2035, private investors will invest about 15.6 trillion roubles in the implementation of investment projects forming the cargo base of the NSR, which will provide an increase in the gross product by 28.5 trillion roubles and tax revenues at all levels of the budget system of the Russian Federation of 16.3 trillion roubles [34]. Though the government has further expanded sops to domestic investors [35], it seems unrealistic to expect this kind of skewed ratio (1:11) of investment between the state and private companies in a period of economic downturn and political

[31] V Rosatome sozdano Glavnoe upravlenie Severnogo morskogo puti [The Main Directorate of the Northern Sea Route has been created in Rosatom]. August, 2022. URL: https://rusatom-energy.ru/media/rosatom-news/v-rosatome-sozdano-glavnoe-upravlenie-severnogo-morskogo-puti/ (accessed 1 December 2022).

[32] Rasporyazhenie Pravitel'stva RF ot 21.12.2019 g. № 3120-r "Ob utverzhdenii prilagaemogo plana razvitiya infrastruktury Severnogo morskogo puti na period do 2035 g" [Order of the Government of the Russian Federation as of 21.12.2019 № 3120-r "On approval of the Northern Sea Route infrastructure development plan for the period up to 2035"]. December 30, 2019. URL: http://government.ru/docs/38714/ (accessed 1 December 2022).

[33] Rasporyazhenie Pravitel'stva Rossiyskoy Federatsii ot 01.08.2022 № 2115-r "Ob utverzhdenii prilagaemogo Plana razvitiya infrastruktury Severnogo morskogo puti na period do 2035 goda" [Decree of the Government of the Russian Federation as of 01.08.2022 № 2115-r "On approval of the attached Plan for the development of the infrastructure of the Northern Sea Route for the period up to 2035"]. August, 2022. URL: http://static.government.ru/media/files/StA6ySKbBceANLRA6V2sF6wbOKSyxNzw.pdf (accessed 1 December 2022).

[34] Ignatieva A. Pravitel'stvo rasporyadilos' sozdat' glavnoe upravlenie Severnogo morskogo puti [The Government has ordered the creation of the main Directorate of the Northern Sea Route]. August 2, 2022. URL: https://neftegaz.ru/news/transport-and-storage/745709-pravitelstvo-rasporyadilos-sozdat-glavnoe-upravlenie-severnogo-mors kogo-puti-/ (accessed 1 December 2022).

[35] Kabmin rasshiril dostup k l'gotnym kreditam dlya investorov na Dal'nem Vostoke i v Arktike [The Cabinet of Ministers has expanded access to preferential loans for investors in the Far East and the Arctic]. July 7, 2022. URL: https://minvr.gov.ru/press-center/news/kabmin_rasshiril_dostup_k_lgotnym_kreditam_dlya_investorov_na_dalnem_vostoke_i_v_arktike/ (accessed: 01.03.2023).

uncertainty. J.M. Keynes enunciated in his article, written in 1932 during the time of the Great Depression, that the state has to be the prime initiator of recovery [36].

At the Eastern Economic Forum in September 2022, it was decided to create a Council of Participants in Shipping on the NSR. This body will be responsible for monitoring the implementation of the 2022 Plan. One of the key tasks of the Council is for the NSR to achieve year-round operation [37].

The 2022 version continues the directions of development set by the previous Plan: cargo base, transport infrastructure, shipbuilding, the safety of navigation and control, and the development of navigation. However, unlike the previous Plan, the document has an additional emphasis on creating a joint digital information base for the NSR, which, as expected, will also contribute to the expansion of international cooperation. Table 2 highlights the key features of the two Plans.

Table 2

Comparison between Infrastructure Plans for the development of the NSR (2019–2022)

Section	2022	Section	2019
1	Cargo base	---	---
2	Transport infrastructure	1	Development of the infrastructure of seaports and terminals
		6	Development of aviation and railway infrastructure to ensure cargo transportation along the NSR
3	Cargo and icebreaking fleet	4	Development of the icebreaking fleet
		10	Development of domestic shipbuilding for the purposes of Arctic shipping
4	Safety of navigation on the NSR	2	Development of the rescue and auxiliary fleet
		3	Development of navigation and hydrographic support of navigation along the NSR
		7	Ensuring the safety of navigation and communication along the NSR
5	Navigation management and development of navigation on the NSR	5	Stimulating the development of cargo traffic and international transit shipping in the waters of the NSR, including the construction of marine logistics hubs
		8	Development of energy capacities that ensure the functioning of the infrastructure of the Northern Sea Route and coastal territories
		11	Ensuring environmental safety along the NSR

In general, they demonstrate that according to the tasks reflected in the Plan, the development of the NSR corresponds to the principles of modernisation, introduction of new (including those provided by Roscosmos) technologies for interaction with mining and interested companies,

[36] Keynes J.M. The World's Economic Outlook. 2022. URL: https://www.theatlantic.com/magazine/archive/1932/05/the-worlds-economic-outlook/307879/ (accessed 1 December 2022).

[37] Zubov M. Severnyy morskoy put' poluchit 80 novykh ledokolov do 2035 goda [The Northern Sea Route will receive 80 new icebreakers by 2035]. September 7, 2022. URL: https://www.rzd-partner.ru/wate-transport/news/severnyy-morskoy-put-poluchit-80-novykh-ledokolov-do-2035-goda/ (accessed 1 December 2022).

Russian and foreign participants in the transport market. It is intended for the NSR to act as the engine for the socio-economic growth of the AZRF and Russia.

The main goal for both Plans is to increase cargo turnover along the NSR, to ensure year-round navigation, to develop coastal and port infrastructure, and to develop several key ports (Sabetta, Tiksi, Dixon, etc.). Nevertheless, the 2022 Plan is a necessary update since several projects have progressed or completed viability studies envisaged in the 2019 Plan. The Plan includes some new goals and reformulated objectives (see Table 2). Moreover, it includes preparing a list of critical equipment for import substitution and placing orders for such products.

The federal and regional authorities have been tasked to improve navigation and hydrographic support and safety of navigation on the NSR. This includes developing and implementing meteorological, hydrographic and ice-forecast services. This can be achieved by progress in radio communications and the use of unmanned aerial vehicles for rescue, monitoring and ice reconnaissance. Work is underway to create a unified communication system to notify and prevent emergencies in the waters of the NSR. Marine rescue centres continue to be formed in key ports. Similarly, groups under the Ministry of Emergency Situations are being expanded with the purpose of carrying out rescue measures in case of emergencies [5, Fedorov V.P., pp. 2–3].

However, there are several shortcomings in the plan, which can be explained by current geopolitical realities and the difficulty of allocating funding at the moment. The head of the north-western branch of the International Academy of Transport Y. Chizhkov noted that the 2022 Plan is not really a plan, because it lacks adequate funding, which is envisaged to be provided from extra-budgetary sources. According to Professor A. Pilyasov of the Moscow State University, while the Plan indicates the governments focus, the shortcomings include a continued focus on the European market, lobbyism (some projects have more priority than others regarding state budgetary support) and distinctively inadequate funding for dredging and the river fleet, and lack of detailed plans for either import substitution plan or supporting of small and medium enterprises (SMEs) [38]. The authors agree with the analysis of these experts but note that delineating priorities to the Plan are inevitable in view of budgetary constraints. Furthermore, the Plan does not seem to have undergone revision in terms of a serious cost-benefit analysis post-implementation of more serious Western sanctions, including price caps on oil and gas, and the mining industry, which will be discussed in detail later.

It is possible that the financing issues may be adjusted during the Plan's execution. For example, at the end of September 2022, an explanatory note to the draft law on the federal budget of Russia for 2023 and the planning period 2024–2025 was announced [39]. According to this law, in 2023, Russia plans to increase subsidies to Russian shipbuilders by 7.46 billion roubles under the

[38] SMP: More Planov [NSR: Sea of Plans]. Sovezdye Review #40, a periodical for oil and gas suppliers. 2022. URL: http://www.sozvezdye.org/sozvezdyereview/digital/7/index.html#p=24 (accessed 27 January 2023).
[39] Zakonoproekt № 201614-8 "O federal'nom byudzhete na 2023 god i na planovyy period 2024 i 2025 godov" [Draft Law № 201614-8 "On the Federal Budget for 2023 and for the Planning period of 2024 and 2025"]. September, 2022. URL: https://sozd.duma.gov.ru/bill/201614-8 (accessed 1 December 2022).

program “Development of shipbuilding and equipment for the development of offshore fields”. Thus, the amount of financing may grow from 17.343 billion roubles to 24.804 billion roubles [40].

The change in the financing parameters compared to the planned indicators is due to an increase in budget allocations for the development and production of ship equipment in 2023 by 15 billion roubles and by 1 billion roubles in 2024. In addition, in 2025, it is planned to increase budget allocations by 5 billion roubles as a contribution to the authorized capital of the State Transport Leasing Company for leasing and financing the construction of 10 vessels [41].

It is also planned to increase the funding for the NSR project. Thus, it is planned to increase funding by 11.482 billion roubles and by 21.992 billion roubles in 2024–2025 [42]. The increase in spending is due to the construction of the nuclear icebreaker “Leader”, the multifunctional vessel for nuclear technological maintenance and the sixth and seventh atomic icebreakers (Russian terminology refers to it as the fifth and sixth of the series since they do not take into account the lead vessel) of the 22220 project [43]. Thus, within the framework of the NSR project, the government has allocated 24.798 million roubles (2023–2029) for the construction of the main multifunctional nuclear-technological service vessel [44], as well as 56.612 million roubles (2023–2028) and 61.344 million roubles (2023–2030) for the construction of the 5th and 6th atomic icebreakers respectively of the series project 22220 (total amount is 117.956 million roubles (2023–2030). However, it should be noted that in both projects, only 50% of funds are going to be allocated from the federal budget, and it is presumed that 50% will be provided by Rosatom since nothing else has been specified in the order [45].

Thus, it can be inferred that the NSR Infrastructure Development Plan of 2022 caters to some extent for various changes and developments related to financing and difficulties due to the sanctions imposed on Russia. It also demonstrates certain flexibility in the approach of the Russian authorities to the development of the NSR, taking into account current geo-economic realities. For example, the Russian government announced that it would stop the project of the Northern lati-

[40] Programmu razvitiya sudostroeniya v 2023 g. planiruetsya uvelichit' na 7,5 mlrd rub. [The shipbuilding development program in 2023 is planned to be increased by 7.5 billion rubles]. September 23, 2022. URL: http://www.morvesti.ru/news/1679/98232/ (accessed 1 December 2022).
[41] Programmu razvitiya sudostroeniya v 2023 g. planiruetsya uvelichit' na 7,5 mlrd rub. [The shipbuilding development program in 2023 is planned to be increased by 7.5 billion rubles]. September 23, 2022. URL: http://www.morvesti.ru/news/1679/98232/ (accessed 1 December 2022).
[42] Ibid.
[43] Pravitel'stvo odobrilo byudzhetnye investicii v stroitel'stvo dvuh atomnyh ledokolov i sudna tekhnicheskogo obsluzhivaniya [The government approved budget investments in the construction of two nuclear icebreakers and a maintenance vessel]. January 3, 2023. URL: http://government.ru/news/47487/ (accessed 3 January 2023).
[44] Rasporyazhenie Pravitel'stva RF ot 29 dekabrya 2022 g. № 4321-r [Decree of the Government of the Russian Federation No. 4322-r as of December 29, 2022]. December, 2022. URL: http://static.government.ru/media/files/aSVDOmz5AHMLzApsGy7guP1RyPEX89gS.pdf (accessed 2 January 2023).
[45] Rasporyazhenie Pravitel'stva RF ot 29 dekabrya 2022 g. № 4321-r [Decree of the Government of the Russian Federation No. 4322-r as of December 29, 2022]. December, 2022. URL: http://static.government.ru/media/files/aSVDOmz5AHMLzApsGy7guP1RyPEX89gS.pdf (accessed 2 January 2023).

tudinal railway [46], though the decision to commence the project was taken only in April 2022. However, this project is listed in the NSR Infrastructure Development Plan of 2022. Therefore, it can be stated that the NSR Infrastructure Development Plan of 2022 is a guideline for the development of the NSR. However, due to the current geopolitical and economic situation, changes and progress in the implementation of some projects are possible.

The Plan briefly mentions international cooperation (articles 5.3.1 and 5.3.2). This includes focus areas for cooperation with international countries and businesses towards improving cargo turnover and realisation of measures for improving the image of the NSR as an economically competitive and environmentally sustainable transport route. If we compare it to the 2019 Plan, where it was part of the task of increasing cargo turnover, it now appears as a separate task. However, taking into account the requirements of international shipping and making it an internationally competitive transport corridor present in the 2019 Plan do not figure in the new Plan, thus taking into account the current situation.

Russia's Strategy articulated the need to create a system of state support for the remote regions of the AZRF [47]. The "northern delivery" instrument articulated in the Plan is to be carried out by domestic shipping on the NSR. The government expects that the "northern delivery" will be able to become another driver for the NSR's growth. In particular, a draft federal law on northern import is being formulated, which is slated to be considered by the Russian parliament in early 2023 [48].

Therefore, it can be unequivocally stated that the NSR Infrastructure Development Plan of 2022 is a logical continuation of the Plan of 2019. New tasks have been added to the updated version, and a way has been outlined for the development of existing projects; new priorities have been introduced, taking into account the current geopolitical situation. This responsibility is reinforced by concrete steps to develop transport and rescue infrastructure and hydrographic and navigation support.

The influence of geopolitical and geo-economics factors on the Russian state policy towards the NSR

Some countries, the United States being the main one, do not share Russia's opinion that the NSR is historically a Russian national transport route, for the use of which it is necessary to obtain permission and obey the rules of Russian legislation, which are quite similar to Canadian legis-

[46] Ostanovka proekta Severnogo shirotnogo khoda udarit po ural'skoy promyshlennosti [Stopping the Northern Latitudinal Passage project will hit the Ural industry]. November 22, 2022. URL: https://www.nakanune.ru/articles/119887/ (accessed 1 December 2022).

[47] Ukaz Prezidenta Rossiyskoy Federatsii ot 26.10.2020 g. № 645 [Decree of the President of the Russian Federation as of 26.10.2020 № 645 "On the Strategy for the development of the Arctic Zone of the Russian Federation and ensuring national security for the period up to 2035"]. October, 2020. URL: http://www.kremlin.ru/acts/bank/45972 (accessed 1 December 2022).

[48] V Yakutii obsudili puti sovershenstvovaniya dostavki gruzov [Ways to improve cargo delivery were discussed in Yakutia]. September 23, 2022. URL: https://www.korabel.ru/news/comments/v_yakutii_obsudili_puti_sovershenstvovaniya_dostavki_gruzov.html (accessed 1 December 2022).

lation on the North-West Passage. Thus, the Russian leadership has sought to maintain a balancing act between the goal to promote the NSR as an international shipping route with the involvement of a wider number of participants to develop cargo turnover and maintain sovereignty over the NSR.

Until recently, Russia tried to attract international participants to the NSR, though it can be argued that it was not as active as China's One Belt–One Road Initiative. However, due to the geopolitical changes that followed after February 2022, the situation has changed, and Russia seems constrained to implement more protectionist measures in consonance with domestic political opinion to maintain tight control over the NSR.

This trend manifested itself after the Crimean crisis of 2014 when the Russian leadership began to introduce a number of measures aimed at limiting the use of foreign tonnage on the NSR. For example, on February 1, 2018, a law came into force that introduced some restrictions for foreign vessels when using the NSR, including cabotage and transportation of oil and gas [49]. However, it may be noted that these are similar to American regulations on the subject [50], a fact not mentioned by foreign researchers. Despite the introduction of restrictions, this law allowed exceptions for some companies with pre-existing obligations. Also, the law facilitated the procedure of re-registration under the Russian flag.

Further changes followed at the beginning of 2018. The modifications stated that the transportation of hydrocarbons through the NSR should be carried out by vessels made in Russia [1, Moe A., p. 213]. Other categories of vessels must also be made in Russia. The reform was designed to strengthen and improve the positions of Russian shipbuilders. The changes came into force on January 1, 2019.

In August 2019, it was clarified that the need to use Russian vessels does not apply to those ships that were used before the law came into force. However, this restriction has remained for all vessels that will navigate along the NSR after the law's entry into force. This change was partly introduced because there could be problems with Russian companies' fulfilment of obligations in international agreements [1, Moe A., pp. 216–217].

Nevertheless, the introduction of these protectionist measures had several negative consequences. For instance, the introduction of this law has sharply highlighted the problem with Russia's icebreaking fleet. One of the largest Russian companies, Novatek, indicated that in the next few years, to continue the successful transportation of natural gas from the Yamal-LNG project, it will need a new series of LNG tankers Arc-7 class (capable of sailing through the ice of thickness 1.5 metres at a speed of 8–10 knots) for its next project, Arctic LNG-2. At the same time,

[49] Federal'nyy zakon Rossiyskoy Federatsii ot 27.12.2018 № 525-FZ "O vnesenii izmeneniy v otdel'nye zakonodatel'nye akty Rossiyskoy Federatsii" [Federal Law of the Russian Federation as of 27.12.2018 № 525-FZ "On amending certain legislative acts of the Russian Federation"]. December, 2018. URL: http://extwprlegs1.fao.org/docs/pdf/rus183299.pdf (accessed 1 December 2022).

[50] Cargo Preference FAQs. 2020. October 7, 2022. URL: https://www.maritime.dot.gov/ports/cargo-preference/frequently-asked-questions-faqs-cargo-preference (accessed 1 December 2022).

LNG tankers have never been built in Russia [2, Moe A., p. 216]. Thus, Russia faced the question of creating an icebreaking and cargo fleet at the expense of its own national capacities.

Most orders for new ships were placed on the Zvezda shipyard at Bolshoi Kamen in the Far East. However, private companies, such as Novatek, stipulated that the cost of icebreakers should be equal to the cost of the same icebreakers produced at Korean shipyards — about $315 million per icebreaker. The Zvezda shipyard predicted that the costs would be several times higher (about twice as high — almost $700 million). Therefore, Novatek expected subsidies to cover the difference in costs [51].

In this regard, the Russian leadership has introduced state support measures aimed at stimulating its own ship production for the renewal and development of its own national Arctic fleet. However, geopolitical changes and sanctions imposed on Russia may hinder plans to build icebreakers. For example, during the construction of one of the icebreakers of Project 22220, namely Yakutia, there were problems with the supply of steam turbine units. Unfortunately, Russian manufacturers could not supply the necessary parts. Therefore, it is likely that the deadline for the icebreaker will be shifted [52], notwithstanding statements made by Rosatom [53].

The Decree of the Government of the Russian Federation “On approval of the rules of navigation in the waters of the Northern Sea Route” was promulgated on September 18, 2020. This introduced a restrictive regime for vessels entering the waters of the NSR (i.e., vessels need to obtain permission to use the NSR in advance), similar to Canada. Of course, this caused an adverse reaction from several countries, primarily the United States, since there are divergent views on this aspect. Several countries in the world, including China and India, follow a legal regime where it is mandatory for warships and government vessels to seek permission for passage through territorial waters, notwithstanding the provision of Article 236 of UNCLOS. Nevertheless, this Resolution can also be considered a continuation of the Russian policy to ensure its national security. Thus, the Russian leadership introduces protectionist measures to a certain extent to protect the NSR as a national route and to develop its own shipbuilding facilities.

The latest Maritime Doctrine of the Russian Federation (2022) emphasises the Arctic and the NSR as vital sea areas linked with the security of the Russian Federation [54]. Despite all the above-mentioned legislative measures, there was an unresolved issue about the right of passage

[51] Vedeneeva A., Barsukov Yu., Dyatel T. Rossiyskiy gazovoz nagruzili tsenoy [Russian gas carrier loaded with price]. February 12, 2019. URL: https://www.kommersant.ru/doc/3881485 (accessed 1 December 2022).
[52] Sevmorput' mozhet "ottyanut" do 15% gruzopotoka iz Suetskogo kanala — Rosatom [The Northern Sea Route can "take away" up to 15% of cargo traffic from the Suez Canal — Rosatom]. October 13, 2022. URL: https://fomag.ru/news-streem/sevmorput-mozhet-ottyanut-do-15-gruzopotoka-iz-suetskogo-kanala-rosatom/ (accessed 1 December 2022).
[53] Sanctions have no impact on Rosatom’s plans for Northern Sea Route — head. June 18, 2022. URL: https://tass.com/russia/1468017 (accessed 1 December 2022).
[54] Ukaz Prezidenta RF ot 31.07.2022 g. № 512 «Ob utverzhdenii Morskoy doktriny Rossiyskoy Federatsii» [Decree of the President of the Russian Federation as of 31.07.2022 No. 512 "On the approval of the Maritime Doctrine of the Russian Federation"]. July, 2022. URL: http://static.kremlin.ru/media/events/files/ru/xBBH7DL0RicfdtdWPol32UekiLMTAycW.pdf (accessed: 01.03.2023).

through the internal waters of the NSR for foreign warships and state-owned vessels [55]. Therefore, in December 2022, the President signed the law restricting the passage of foreign vessels along the Northern Sea Route. According to this law, foreign warships and other government vessels may only enter the internal sea waters in the waters of the NSR without the purpose of entering a port or a naval base by permission requested through diplomatic channels no later than 90 days before the intended call [56]. The bill includes a provision that allows the immediate suspension of the passage of foreign ships and other state vessels by transmitting navigation warnings.

Summarising, geopolitical changes are constraining Russia to resort to more protectionist measures against the NSR to maintain total sovereignty over it. The Western sanctions imposed on Russia will lead to a forced restructuring of shipyards to meet the deficiencies in vessels contracted with foreign shipyards.

Due to these factors, Russia is experiencing difficulties in expanding its icebreaking fleet, and attracting foreign investors and shipping companies to the NSR is also becoming more complicated. However, state support measures are designed to smooth out these problems. Thus, it can be expected that in the medium-long term, these shortcomings will be surmounted subject to the availability of funding, and only then will Russia achieve the planned indicators for the state of the icebreaker fleet and cargo turnover on the NSR.

Influence of sanctions on the NSR and related projects

President Vladimir Putin remarked that, despite attempts of external pressure, the total cargo turnover of Russian seaports practically remained the same over the seven months of this year, remaining at the same level as a year earlier. Thus, according to the President, “the total cargo turnover of Russian seaports for seven months of this year has practically not decreased, remained at the same level as a year earlier — it is about 482 million tons of cargo. Last year there were 483 million — almost the same” [57].

Rosatom Director General A. Likhachev also noted this trend. However, according to him, Western sanctions against Russia did not affect the state company’s plans to develop the NSR [58]. Nevertheless, it should be noted that several infrastructure projects of the NSR, especially in the field of resource extraction and fleet construction, were carried out jointly with foreign compa-

[55] Federal'nyy zakon ot 05.12.2022 g. № 510-FZ "O vnesenii izmeneniy v Federal'nyy zakon «O vnutrennikh morskikh vodakh, territorial'nom more i prilezhashchey zone Rossiyskoy Federatsii" [Federal Law No. 510-FZ as of 05.12.2022 "On Amendments to the Federal Law "On Internal Sea Waters, Territorial Sea and Adjacent Zone of the Russian Federation"]. November, 2022. URL: http://www.kremlin.ru/acts/bank/48595 (accessed 1 December 2022).
[56] Ibid.
[57] Vneshnee davlenie ne povliyalo na obshchiy gruzooborot rossiyskikh portov [External pressure did not affect the overall cargo turnover of Russian ports. Russian]. September 7, 2022. URL: https://seanews.ru/2022/09/07/vneshnee-davlenie-ne-povlijalo-na-obshhij-gruzooborot-rossijskih-portov/ (accessed 1 December 2022).
[58] Zadera S. Glava Minvostokrazvitiya Chekunkov: Vse kompanii podtverdili obyem gruzopotokov po Sevmorputi do 2035 goda [Minvostokrazvitiya Chekunkov: All companies have confirmed the volume of cargo flows along the Northern Sea Route until 2035]. September 29, 2022. URL: https://rg.ru/2022/09/29/reg-dfo/glava-minvostoka-vse-kompanii-podtverdili-obem-gruzopotokov-po-sevmorputi-do-2035-goda.html (accessed 1 December 2022).

nies. Therefore, the exit of one of the investors or technology partners may seriously impact the project implementation process.

Thus, Novatek announced the delay of its Arctic LNG-2 project to produce liquefied natural gas (LNG) in the Arctic until at least the end of 2023. The company was supposed to finish the first stage (6.6 million tons of LNG) in the summer of 2022 and start producing LNG in early 2023 [59]. After the sanctions were imposed, most foreign companies left the project: France's Total, Germany's Linde and Siemens, and Japan's Mitsui. This situation is also likely to affect stages 2 and 3 of the project, which has a projected capacity of 19.8 million tons.

As a way out of this situation, Novatek is trying to find a replacement for these investors among Russian companies. So, the French company Technip was replaced by the Russian Nipigaz. To offset the loss of investors, a consortium of Russian banks will provide additional financing and guarantees for loans for almost 10 billion Euros. In addition, the Arctic LNG 2 project received additional financing from Asian investors: Chinese banks provided 2.5 billion Euros, and a Japanese bank pledged 2.5 billion Euros [60].

In addition, the South Korean company Daewoo Shipbuilding and Marine Engineering cancelled the order for the construction of LNG tankers of ice class for the transportation of LNG. Before the sanctions were imposed, the South Korean company had to build 35 LNG vessels for Russian companies and partners of Arctic LNG projects [61]. These are reflected in Table 3. The exact status of the balance orders has not been publicly confirmed by DSME.

Table 3

South Korean shipyards, building 35 LNG vessels for Russian customers [62]

South Korean shipyard	Russian customer	Vessels being built
Hyundai Sambo Heavy Industries	Sovcomflot (Total Energies charterer)	3
Daewoo Shipbuilding & Marine Engineering	Sovcomflot (Novatek charterer)	3
Daewoo Shipbuilding & Marine Engineering	Mitsui OSK Lines (Novatek charterer)	4
Daewoo Shipbuilding & Marine Engineering	Mitsui OSK Lines/COSCO (Novatek charterer)	3
Samsung Heavy Industries	Sovcomflot	3
Samsung Heavy Industries	Sovcomflot/Nippon Yusen	4
Samsung Heavy Industries/Zvezda	Sovcomflot	5
Samsung Heavy Industries/Zvezda	Smart LNG [Sovcomflot/Novatek JV]	10

[59] Humpert M. Western Sanctions Delay Opening of Arctic LNG 2 Project by One Year. September 9, 2022. URL: https://www.highnorthnews.com/en/western-sanctions-delay-opening-arctic-lng-2-project-one-year (accessed 1 December 2022).

[60] Arctic LNG 2 secures project financing lifeline. November 30, 2022. URL: https://www.upstreamonline.com/lng/arctic-lng-2-secures-project-financing-lifeline/2-1-1109454 (accessed 1 December 2022).

[61] Russia's Arctic gas ambitions at risk as sanctions imperil LNG icebreakers. 2022. URL: https://www.ft.com/content/2164d1e3-ee68-43ab-8c3d-61bd6ccde239 (accessed 1 December 2022).

[62] Ibid.

In this regard, the Russian shipyard Zvezda is now affected by great expectations. However, it should be kept in mind that the shipyard already has many orders, and it needs to be observed whether Zvezda will be able to handle the increasing volumes of orders and provide icebreakers in the required time. It is also relevant to mention that Novatek received an exemption from the Russian Government to order parts of ice-class LNG tankers from a foreign company to speed up the process of putting the project into operation. At the same time, Zvezda can produce only five vessels per year, which may not be enough to satisfy the requests of all customers [63]. The Head of Marine Operations Headquarters at Glavsevmorput V. Arutyunyan also declared that there was a shortage of icebreakers for the NSR [64].

Chinese shipbuilders might be interested in taking their place and getting contracts. They may be able to take over the production of about eight tankers per year. At the same time, Chinese firms are clearly apprehensive of secondary sanctions from the West already applied in the case of chips [65]. Therefore it may not be appropriate to have great expectations for Chinese partnership. In this respect, Russia will also need to overcome its inherent apprehensions of dependency on China, which have been most often articulated by academics, and in rare cases — by officials [66].

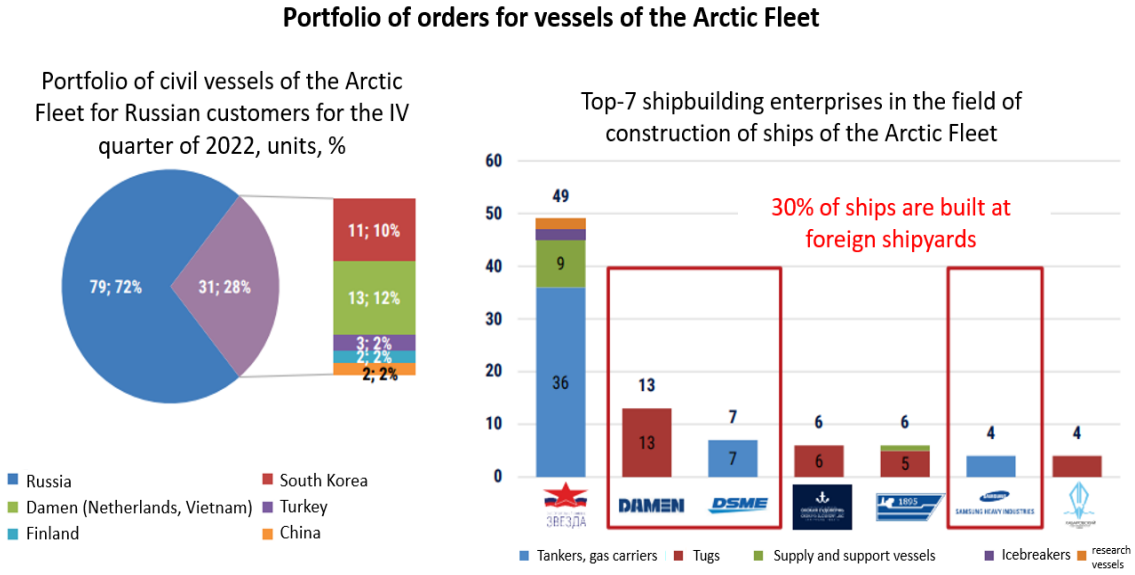

Fig. 6. Shipbuilding orders of the Russian Arctic fleet — dependency upon foreign shipyards [67].

[63] Humpert M. Western Sanctions Delay Opening of Arctic LNG 2 Project by One Year. September 9, 2022. URL: https://www.highnorthnews.com/en/western-sanctions-delay-opening-arctic-lng-2-project-one-year (accessed 1 December 2022).

[64] Main Directorate of NSR warns about lack of icebreakers. October 24, 2022. URL: https://en.portnews.ru/news/337461/ (accessed 1 December 2022).

[65] Chinese processors slow down chips to dodge US sanctions. November 8, 2022. URL: https://www.ft.com/content/7df13a5e-84e8-44af-b0d3-3e3efa6a8671 (accessed 1 December 2022).

[66] Yun S. The Northern Sea Route: The Myth of Sino-Russian Cooperation, 2017. URL: https://www.stimson.org/wp-content/files/file-attachments/Stimson%20-%20The%20Northern%20Sea%20Route%20-%20The%20Myth%20of%20Sino-Russian%20Cooperation.pdf (accessed 1 December 2022).

[67] INFOLine-Analitika na osnove bazy dannykh «Sudostroitel'nyye zakazy na verfyakh Rossii» [INFOLine-Analitika based upon the database “shipbuilding orders on Russian shipyards”] Bumistrov M.B. Razvitiye Arkticheskogo flota Rossii v

Iran and Turkey could be ready to cooperate with Russia in shipbuilding [68]. At the same time, Iran, which has been under sanctions for many years, will not be so concerned about secondary sanctions from the West compared to Turkey. This means that cooperation between these two countries is possible in the future. Moreover, it should be kept in mind that after the introduction of Western sanctions, the Russian financial system was cut off from the SWIFT system. However, the question remains of how Russian companies will be able to pay for fulfilling orders with foreign shipyards unless that particular country accepts trading in national currencies. The dependence on foreign shipyards is approximately 30% and can only be overcome by concerted state support because in the present geopolitical scenario Russia is unlikely to seek foreign partnerships than in sourcing components (see Fig. 6).

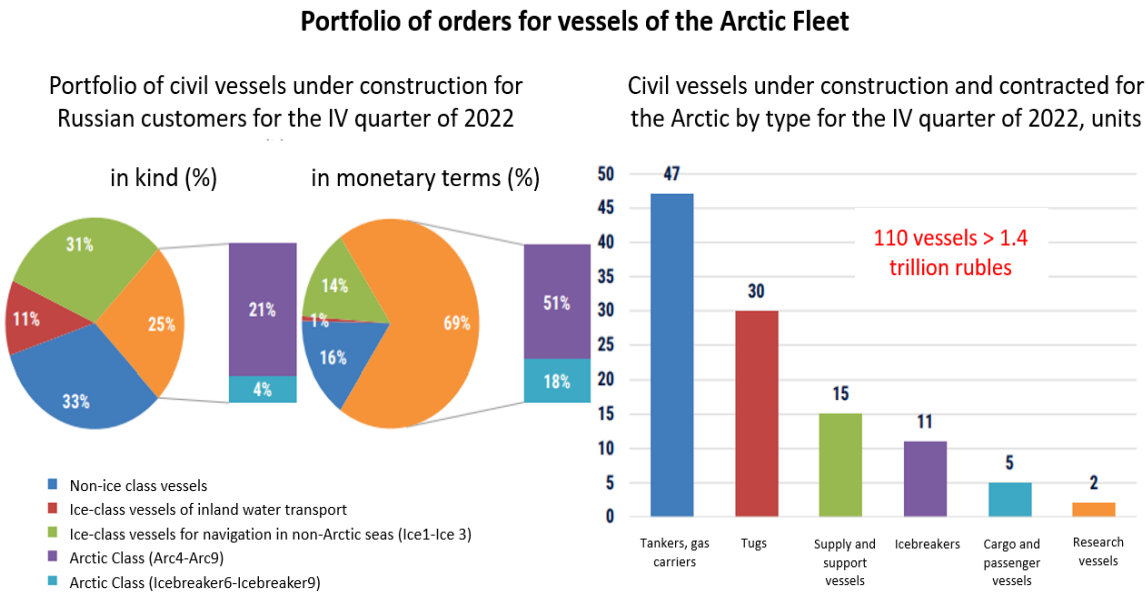

Fig. 7. Shipbuilding orders of the Russian Arctic fleet [69].

Thus, the lack of vessels of the appropriate ice classes is likely to affect the implementation of cargo transportation plans for the NSR (see Fig. 7 and Table 4) because of dependency and lack of indigenous capacity or technology. The Accounts Chamber of the Russian Federation had already cautioned, "The analysis has shown that the indicators of the functioning of infrastructure facilities in terms of increasing cargo traffic along the Northern Sea Route to 80 million tons may not be met in time" [70].

novoy real'nosti [Development of the Russian Arctic fleet under new reality]. Lecture at the International Forum "Arctic: Today and Future in Saint Petersburg. 09 December 2022 (in Russian).

[68] Rossiya i Iran gotovy sovmestno stroit' krupnotonnazhnyy flot na iranskikh verfyakh [Russia and Iran are ready to jointly build a large-tonnage fleet at Iranian shipyards]. November 1, 2022. URL: https://portnews.ru/news/337937/ (accessed 1 December 2022).

[69] INFOLine-Analitika na osnove bazy dannykh «Sudostroitel'nyye zakazy na verfyakh Rossii» [INFOLine-Analitika based upon the database "shipbuilding orders of Russian shipyards"] Bumistrov M.B. Razvitiye Arkticheskogo flota Rossii v novoy real'nosti [Development of the Russian Arctic fleet under new reality]. Lecture at the International Forum "Arctic: Today and Future in Saint Petersburg. 09 December 2022 (in Russian).

[70] Schetnaya palata: rost gruzopotoka po smp do 80 mln tonn mozhet ne byt' dostignut k 2024 godu [Accounts Chamber: growth of cargo traffic along the SSR up to 80 million tons may not be achieved by 2024]. January 14, 2020. URL:

Table 4

Status of Arctic transport fleet shipbuilding [71]

Company	Project	Type of vessel	Amount	DWT, thousand tons	Ice class	Shipyard	Year	Status
Novatek	Yamal LNG	Gas carrier	15	96.7	Arc7	DSME (South Korea)	2017-2019	Completed
	Arctic LNG 2	Gas carrier	(15+6)/8	98.5	Arc7/Arc4	LLC "SSK Zvezda" (15 units)	2023-2025	*Construction status not available. Likely to be delayed.*
						DSME (6 units), 3 units — cancelled	2023	
						DSME (4 units), Samsung HI (4 units)	2023-2024	
	Ob LNG	Gas carrier	5	98.5	Arc7	LLC "SSK Zvezda"	-	Under discussion
	Arctic LNG 1	Gas carrier	15	98.5	Arc7	-	-	Under discussion
	Arctic transshipment	Tugboat	10	0.1	Arc4	Damen	2023	Construction
Gazprom	Novoportovskoe field	Tanker	7	41.5	Arc7	Samsung Hi, South Korea	2016-2019	Completed
Rosneft’	Vostok Oil	Tanker	10	120	Arc7	LLC "SSK Zvezda" (10 tankers)	2024-2027	A contract has been signed
		Tankers, tugs	40	-	-	-	-	-
Severya Zvevda	Syrasaydayskoe field	Bulk carrier	40	110-120	Arc5	-	2027-2030	Under discussion
		LNG icebreaker	2	-	-			
Nornikel	MMC Norilsk Nickel	Container ship	5	18.1	Arc7	1 unit — Aker Yards (Finland); 4 units — Wadan Shipyards MTW (Germany)	2006-2009	Completed
		Tanker	1	18.9	Arc7	Nordic Yards Wismar (Germany)	2011	Completed
		Icebreaker	1+1	-	-	1 unit — Helsinki Shipyard Oy (Finland)	2024? 2027-2030	*Finnish shipyard has declined to undertake the work*
KAZ Minerals	GDK Baimskaya	Bulk carrier	3	40	Arc6/Arc7	-	2027-2028	Under discussion
		Icebreaker	1	-	-	-	2027-2028	

https://nao24.ru/natsproekt/19040-schetnaya-palata-rost-gruzopotoka-po-smp-do-80-mln-tonn-mozhet-ne-byt-dostignut-k-2024-godu.html (accessed 1 December 2022).

[71] Green – built and under construction in Russia. Red – were built or are planned to be built at foreign shipyards. Modified by the authors based upon Western sources mentioned in Table 5 and INFOLine-Analitika based upon the database “shipbuilding orders on Russian shipyards”. Bumistrov M.B. Razvitiye Arkticheskogo flota Rossii v novoy real'nosti [Development of the Russian Arctic fleet under new reality]. Lecture at the International Forum “Arctic: Today and Future in Saint Petersburg. 09 December 2022 (in Russian).

		Floating power unit	2+2	9.6	-	Wison (Nantong) Heavy Industry (2 units)	2025-2026	A contract has been signed
DP World	Transit	Container ship	9	6000 TEU	Arc7	-	4 units - ???	Under discussion since 2021. *Unlikely to materialise in the present scenario.*

The need for dredging is included in the Plan for the development of the NSR. However, contractors from four big European dredging companies (Van Oord, Boskalis, Jan de Nul, DEME), which provided more than 98% of dredging in Russian ports, have refused to participate in Russian Arctic infrastructure projects since February 2022. The capacities of the domestic dredging fleet for the implementation of Arctic projects are insufficient [72]. Thus, Russia will also need to create its production facilities and technologies in this vital area.

The impact of Western sanctions on important projects of the AZRF related to the transportation of cargo on the NSR is presented in Table 5.

Table 5

Influence of Western sanction on the Russian projects linked to the NSR

№	Project	Planned indicator by the year 2024 (share of target cargo to be carried on the NSR) / 2030 / 2035 or vital for year-round navigation	Sanctions	Consequences	Solution
1	Atomic Icebreakers	Vital for year-round navigation	1. Icebreakers — Project 22220 (LK-60). The commissioning of atomic icebreakers of project 22220 "Yakutia" and "Chukotka" is scheduled for 2024 and 2026. In addition, a contract with the Baltic shipyard for the construction of two more vessels of the same project for delivery in 2028 and 2030 may be signed as funds have been allocated. Presently, Arctic, Sibir and Ural are in service. The first of the class Arctic took seven years to be operationalised. There have been slippages in the project due to delay in supply of equipment including those earlier envisaged from Ukraine, and also from Finland. The next icebreaker — Yakutia — is planned to be commissioned in 2024, Chukotka — in 2026.	Dmitri Medvedev noted that the delivery of icebreakers is not as per the designated schedule due to difficulties in supply of equipment, inadequate qualified personnel and lack of funding. In addition, there is a problem with supply of critical equipment for reserve power supply and propulsion from Finnish firm, 'Wartsila'.	Focus on import substitution of all equipment.

[72] Severnyy morskoy put': chto den' gryadushchiy nam gotovit? [Northern Sea Route: what does the coming day have in store for us?]. September 19, 2022. URL: https://www.korabel.ru/news/comments/severnyy_morskoy_put_chto_den_gryaduschiy_nam_gotovit_2.html (accessed 1 December 2022).

			Their localization, according to the director of the consulting company 'Gekon' Mikhail Grigoriev, should reach 96%. The vessels are being built at the Baltic Shipyard. 2. Icebreakers — Project 10510 (LK-100YA). The first of the Leader-class icebreakers (total 3 planned) was launched in 2021 at the Zvezda shipyard, Bolshoy Kamen, Primorye territory near Vladivostok. Delivery is likely to be delayed beyond the planned 2027 due to some of the equipment being required from abroad. Earlier it had been announced that they would be ready by 2024-25.		
2	Diesel icebreakers	Critical for year-round navigation	Finnish firms have declined to participate in the project.		Focus on indigenous shipbuilding and import substitution.
3	Auxiliary ships for search and rescue and support	Critical for year-round navigation	Dutch firm Damen has revoked existing contracts. Ships ready in China are also not going to be delivered because of ongoing sanctions.		Focus on indigenous shipbuilding and import substitution.
4	Dredging	Critical for allowing passage of larger ships and to maintain existing ports			Focus on indigenous shipbuilding and import substitution.
5	Vostok Oil	30 (37.5%) / 100 (66.67%) / 100 (45.45%)	Trafigura's stake in Vostok Oil, including bank debt, was acquired by Nord Axis Limited, an independent trading company registered in Hong Kong. Vitol Group announced its intention to withdraw from the Vostok Oil project and completely stop trading in Russian oil and petroleum products by the end of 2022. In addition, the oil and gas industry has been hit by fresh EU, US and Japanese sanctions. The main oilfield service Companies" (France's Schlumberger, America's Halliburton and Baker Hughes, Switzerland's Weatherford) have exited Russia.	The loss of significant export markets and the need to find new ones. The plan of 30 million tons by 2024 seems unlikely to be achieved.	Search for new investors mainly in Asian countries. Search for new export markets.
6	Yamal LNG	19.7 (24.63%) / 19.5 (13%) / 19.5 (8.86%)	Baker Hughes recalled engineers and all shipments of equipment for joint venture projects in Russia.	Possible problems with equipment maintenance. The threat of project disruption.	The serviceability of equipment may decrease, which could lead to an increase in cost price for hydrocarbons. Russia needs to create its own capacities for the construction of large-capacity LNG plants.
7	Arctic LNG 2	12.6 (15.75%) / 21.4 (14.27%) / 21.4 (9.73%)	Exit of French Total, German Linde, Siemens and Japanese Mitsui from the project. It is reported that Chinese manufacturers have stopped	Shift of stage 1 of project implementation dates by at least 1 year. The threat of disruption or serious	Replacing the French Technip with the Russian Nipigaz. Possibility of transfer of contracts for the

			production of modules for the project. Refusal of Daewoo Heavy Industries to comply with the order for the construction of icebreakers for the transportation of LNG due to non-fulfilment of payment.	delays in the implementation of the complete project earlier scheduled to reach full capacity by 2026. In addition, lack of icebreakers for LNG transportation. Two LNG hubs at Murmansk and Kamchatka: were planned by Novatek in 2020. The current status of the order placed on South Korean DSME is not known.	construction of LNG ice class tankers to the Russian shipyard "Zvezda". Obtaining additional financing from the Russian bank Sberbank.
8	Norilsk Nickel	0.96 (1.2%) / 1.08 (0.72%) / 1.08 (0.49%)	The sanctions that the UK authorities imposed on June 29, 2022 against the largest co-owner (owns almost 36%) and the president of Norilsk Nickel, Vladimir Potanin, do not affect the company itself. In January 2023, the company reported a delay of at least two years in certain projects.		Norilsk Nickel and Rosatom have abandoned the idea of building a dual-fuel icebreaker that could run on both diesel and LNG.
9	Sakhalin 1	There is no share allocated to this project in the Plan.	ExxonMobil's exit from the project.	Investor loss and possible reduction of traffic on the NSR.	Vladimir Putin signed a decree on the creation of the Russian operator of the Sakhalin-1 project.

Compiled on the basis of:
1. Rasporyazhenie Pravitel'stva Rossiyskoy Federatsii ot 01.08.2022 № 2115-r "Ob utverzhdenii prilagaemogo Plana razvitiya infrastruktury Severnogo morskogo puti na period do 2035 goda" [Decree of the Government of the Russian Federation as of 01.08.2022 № 2115-r "On approval of the attached Plan for the development of the infrastructure of the Northern Sea Route for the period up to 2035"]. August, 2022. URL: http://static.government.ru/media/files/StA6ySKbBceANLRA6V2sF6wbOKSyxNzw.pdf (accessed 1 December 2022).
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4. Potanin rasskazal o vliyanii personal'nykh sanktsiy na «Nornikel'» [Potanin spoke about the impact of personal sanctions on Norilsk Nickel]. July 5, 2022. URL: https://www.rbc.ru/business/05/07/2022/62c32d3c9a7947181d8e9978 (accessed 1 December 2022).
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7. Godovannik L. Baltiyskiy zavod nachinaet sudit'sya s finskoy Wartsila za 5 mln evro [Baltic plant begins to sue Finnish Wartsila for 5 million euros]. November 24, 2022. URL: https://vedomosti-spb.ru/business/articles/2022/11/23/951830-baltiiskii-zavod-trebuet-wartsila (accessed 1 December 2022).
8. Kaverin D. Zampred SB Medvedev zayavil o slozhnostyakh pri stroitel'stve i sdache v ekspluatatsiyu ledokolov [Deputy Chairman of the Central Bank Medvedev said about the difficulties in the construction and commissioning of icebreakers]. November 18, 2022. URL: https://www.gazeta.ru/social/news/2022/11/18/19068289.shtml (accessed 1 December 2022).
9. Zaderzhki i uspekhi. Programma stroitel'stva ledokolov pr. 22220 / LK-60YA [Delays and successes. Icebreaker construction program 22220 ave. / LK-60YA]. November 28, 2022. URL: https://topwar.ru/205744-zaderzhki-i-uspehi-programma-stroitelstva-ledokolov-pr-22220-lk-60ja.html (accessed 1 December 2022).
10. Russia launches construction of world's most powerful nuclear icebreaker. July 6, 2021. URL: https://arctic.ru/infrastructure/20210706/996250.html (accessed 1 December 2022).
11. Russia to Build Three Nuclear-Powered Project 10510 Leader Icebreakers by 2024-2025. September 6, 2017. URL: https://navyrecognition.com/index.php/naval-news/naval-news-archive/2017/september-2017-navy-naval-forces-defense-industry-technology-maritime-security-global-news/5551-russia-to-build-three-nuclear-powered-project-10510-leader-icebreakers-by-2024-2025.html (accessed 1 December 2022).
12. Humpert M. France's Technip to Complete Exit from Arctic LNG 2 Project in First Half of 2023. October 25, 2022. URL: https://www.highnorthnews.com/en/frances-technip-complete-exit-arctic-lng-2-project-first-half-2023 (accessed 1 December 2022).
13. Humpert M. South Korean DSME Cancels Contract for Novatek Arctic LNG Carriers. May 27, 2022. URL: https://www.highnorthnews.com/en/south-korean-dsme-cancels-contract-novatek-arctic-lng-carriers (accessed 1 December 2022).

14. Humpert M. Novatek Orders World's Largest Floating LNG Storage Unit for Arctic. June 10, 2020. URL: https://www.highnorthnews.com/en/novatek-orders-worlds-largest-floating-lng-storage-unit-arctic (accessed 1 December 2022).
15. Petrova N. New sanctions against Russia: What will they change, January 27, 2023. URL: https://news.ru/economics/novye-sankcii-protiv-rossii-chto-oni-izmenyat/ (accessed 27 January 2023).
16. Expert.ru. Norilsk Nickel to postpone implementation of major projects due to problems with suppliers. January 24, 2023. URL:https://expert.ru/2023/01/24/norilskiy-nikel-otlozhit-realizatsiyu-krupnykh-proyektov-iz-za-problem-s-postavschikami/ (accessed 27 January 2023).
17. The Diplomat. Amid Ukraine war Russia's Northern Sea Route turns East. January 24, 2023. URL: https://thediplomat.com/2022/12/amid-ukraine-war-russias-northern-sea-route-turns-east/ (accessed 27 January 2023).
18. Vedomosti. Litova A. Rossiya aktivno obnovlyaet svoj flot: k 2035 godu planiruetsya postroit' bolee 1000 novyh sudov [Russia is actively updating its fleet: it is planned to build more than 1,000 new vessels by 2035]. December 15, 2022. URL: https://www.vedomosti.ru/industry/infrastructure_development/articles/2022/12/15/955368-rossiya-aktivno-obnovlyaet-flot (accessed 28 January 2023).

Considering all the above-mentioned difficulties, Russia is facing the challenging task of adapting to the new conditions since the post-2014 sanctions did not affect shipbuilding and a broad spectrum of high-technology areas as is presently the case. The main difficulties now are the issue of financing and technology [19, Bhagwat J., p. 95–96]. However, Russia has commenced efforts to neutralise Western sanctions' impact on both counts.

The government formed a list of 162 critical projects, including shipbuilding, metallurgy, machine tool and heavy engineering (linked to the NSR) that require indigenous capacity. The project will require a total of 5.2 trillion roubles (about 4% of the current Russian GDP), of which 123.6 billion roubles is needed until 2030. The budget for 2023 provides 5 billion roubles for this process[73]. It is intended to achieve this with offset contracts (including obligations of counter-investment), and increased state support for the most efficient business enterprises. However, the federal budget of Russia for 2023 assumes a deficit of 2.9 trillion roubles. At the same time, it is planned to offset this deficit from the National Welfare Fund in the next three years [74]. The deficit is due to the need to fulfil the directives of the President of the Russian Federation, among which is to ensure financing for the development of the NSR. Thus, the most vital projects for developing the NSR are expected to receive funding. However, it should be kept in mind that this fund will reach its lowest level for the last 20 years.

The strain on the exchequer of the Russian Federation will be further exacerbated by spending on defence and national security and law enforcement, where expenditure is one-third of all budgetary expenses, and this expenditure is more than that on the national economy (3.5 trillion roubles, or 12%) and national projects (2.9 trillion roubles). Furthermore, about 23% of the budget in 2023 will be related to closed or secret expenditure (most probably related to strategic aspects of national defence), which was at an average of 17% [75]. This effectively means that just

[73] Pravitel'stvo sformirovalo pul proyektov po importozameshcheniyu na 5,2 trln rubley [The government has formed a pool of import substitution projects worth 5.2 trillion rubles]. October 9, 2022. URL: https://www.vedomosti.ru/economics/articles/2022/10/10/944595-vlasti-sformirovali-pul-proektov (accessed 27 January 2022).
[74] Chto nuzhno znat' o byudzhete na 2023 god [What you need to know about the draft budget for 2023]. September 29, 2022. URL: https://tass.ru/ekonomika/15898737 (accessed 1 December 2022).
[75] V otkrytoy chasti rossiyskogo byudzheta na 2023 god ostalos' 77% raskhodov [In the open part of the Russian budget for 2023, 77% of expenditures remain]. September 29, 2022. URL: https://www.vedomosti.ru/economics/articles/2022/09/29/943018-v-otkritoi-chasti-byudzheta (accessed 27 January 2022).

over 50% of the budget is related to all aspects of national security. Therefore, this cannot be sustained for a prolonged period without consequent effects on other sectors of the economy [76] and, more importantly, the living standards of people [77]. It may be noted as per the International Monetary Fund, the Russian economy contracted by 2.2% in 2022 due to the combined effect of Western sanctions post the special military operation in Ukraine. This negative growth may reduce to 2% in 2023 [78].

Consequently, it is possible that some projects will be postponed or will not be implemented at all. It may be therefore advisable to seek other sources of funding such as the New Development Bank, BRICS and funding from citizens taking into account the experience of the Panama and Suez Canal expansion projects [20, Bhagwat J., 94–99]. This may also encourage the involvement of citizens and foster patriotism [21, Zazou Z.A., 8–21].

Regarding Russia's technological lag, which also impacts the development of NSR projects, it is necessary to note Russia's attempts to establish cooperation with non-Western countries, among which China is the most promising ally. China may cooperate with Russia to implement projects for the development of the NSR because the NSR is a way to diversify energy imports for China. However, Russia has not permitted investment in NSR infrastructure or related transport projects due to its focus on security and supporting its own industry [22, Bhagwat J., p. 85–88]. It is also inherently cautiousness of Chinese involvement as an operator, a prerequisite for any successful public-private partnership project with a foreign investor. This is supported by the analysis of the shelved Belkomur railway project [23, Moe A., 29–31].

Nevertheless, it should be remembered that China is concerned about the possibility of secondary sanctions when continuing cooperation with Russia. Therefore, it seems that Russian-Chinese cooperation will be limited. In this regard, it is necessary to build cooperation with other non-Western countries, for example, the BRICS countries, of which India is a promising partner. However, India also faces a similar problem of secondary sanctions due to its dependency on exports to the United States [79]. It is also uncertain whether the firm DP World from UAE, which earlier signed an agreement to develop container transportation along the NSR [80] is still interested.

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[76] Obyem FNB po otnosheniyu k VVP k kontsu 2024 goda dostignet minimuma za 20 let [The volume of the NWF in relation to GDP by the end of 2024 will reach a minimum in 20 years]. October 19, 2022. URL: https://www.vedomosti.ru/economics/articles/2022/10/20/946429-obem-fnb-po-otnosheniyu-k-vvp (accessed 1 December 2022).

[77] Ekonomisty TSB predupredili o neizbezhnom snizhenii urovnya zhizni iz-za neobkhodimosti importozameshcheniya [Central Bank economists warned of an inevitable decline in living standards due to the need for import substitution]. December 28, 2022. URL: https://www.kommersant.ru/doc/5748957 (accessed 1 January 2022).

[78] MVF poveril v Rossiyu [The IMF believes in Russia]. November 18, 2021. URL: https://expert.ru/2023/01/31/mvf-poveril-v-rossiyu/ (accessed 31 January 2023).

[79] India should decrease its dependence on team Biden. November 9, 2022. URL: https://www.livemint.com/news/world/india-should-decrease-its-dependence-on-team-biden-11667975552473.html (accessed 1 December 2022).

[80] Dubai and the Opening Arctic: Russia's Rosatom and UAE Logistics Company to Cooperate in the Far North. November 25, 2021. URL: https://portnews.ru/digest/print/22828/?backurl=/digest/ (accessed 1 December 2022).

Moreover, it can be assumed that the shift in the implementation of some projects will lead to the fact that the planned indicators of cargo transportation on the NSR may not be achieved. This was also stated by the head of the directorate of the NSR Rosatom V. Rukshi. According to Rukshi, the cargo flow through the NSR in 2024 may amount to only 57 million tons [81]. Later, the Minister of the Russian Federation for the Development of the Far East and the Arctic A. Chekunkov declared that all companies confirmed the volume of cargo flows along the Northern Sea Route according to its development plan until 2035 [82]. However, the President's representative Yuri Trutnev acknowledged that plans would not be met due to the prevailing situation and there would be a delay of 1–2 years even though more than 1.5 trillion roubles of public and private investment is envisaged [83]. For the first time, a representative of the government acknowledged that stated goals were not likely to fructify at the same time whilst maintaining that the delay was not critical. The formation of a new Presidential working group of the State Council on transport-logistics and socio-economic progress in the AZRF in November 2022 may be a step towards better coordination in order to reduce the delay [84]. Overall, it can be inferred that the Russian leadership and the heads of corporations associated with the NSR still cannot accurately assess the impact of the current geopolitical situation on the implementation of the planned indicators of the NSR or are inclined to continue to support earlier articulated goals to cater for domestic political compulsions.

Nevertheless, it should be noted that the cargo turnover indicators for the NSR for 2022 indicate that the geopolitical situation has already impacted the steep increase in cargo turnover indicators of the NSR observed earlier. The refusal of foreign companies and countries other than Flags of Convenience to use the NSR has led to a near stagnation of cargo turnover indicators. At the same time, it seems unlikely that Russian companies will be able to independently take over the entire cargo turnover through the NSR due to inherent limitations in terms of the capabilities of Russian companies, which were gifted away to the Baltic republics or Ukraine; and, in addition,

[81] Volobyev A. Gruzopotok na Sevmorputi mozhet ne dostignut' 80 mln t k 2024 godu [Cargo traffic on the Northern Sea Route may not reach 80 million tons by 2024]. June 20, 2022. URL: https://www.vedomosti.ru/business/articles/2022/06/19/927357-gruzopotok-sevmorputi (accessed 1 December 2022).

[82] Zadera S. Glava Minvostokrazvitiya Chekunkov: Vse kompanii podtverdili obyem gruzopotokov po Sevmorputi do 2035 goda [Minvostokrazvitiya Chekunkov: All companies have confirmed the volume of cargo flows along the Northern Sea Route until 2035]. September 29, 2022. URL: https://rg.ru/2022/09/29/reg-dfo/glava-minvostoka-vse-kompanii-podtverdili-obem-gruzopotokov-po-sevmorputi-do-2035-goda.html (accessed 1 December 2022).

[83] Yuriy Trutnev podvol itogi 2022 goda v Dal'nevostochnom Federal'nom okruge [Yuri Trutnev summed up the results of 2022 in the Far Eastern Federal District]. December 29, 2022. URL: https://www.kamgov.ru/news/urij-trutnev-podvel-itogi-2022-goda-v-dalnevostocnom-federalnom-okruge-58432 (accessed 30 December 2022).

[84] Pervoye zasedaniye rabochey gruppy Gossoveta po razvitiyu Arktiki sostoitsya v fevrale 2023 g. [The first meeting of the State Council's working group on Arctic development will be held in February 2023]. December 28, 2022. URL: https://fomag.ru/news-streem/pervoe-zasedanie-rabochey-gruppy-gossoveta-po-razvitiyu-arktiki-sostoitsya-v-fevrale-2023-g/ (accessed 1 December 2022).

disintegrated due to neo-liberal economic policies followed by the Russian Federation in the 1990s [85]. In this regard, it can be assumed that without the participation of foreign companies and countries in the NSR, the planned projects related to the NSR may not be fully implemented. Russia is also actively promoting the North–South transport corridor with other interested countries, including Iran and India. If the problems between Azerbaijan and Armenia are resolved, this could also be a cost-effective transport corridor to obviate Western sanctions [86].

Developments — 2022

As fallout of the international geopolitical situation post the special military operation in Ukraine and the series of Western sanctions, it was gradually realised that the NSR could, at least in the near and medium term, be used mainly as a route for the transportation of minerals and hydrocarbons that are actively mined in the AZRF. According to Rosatom, the cargo turnover for the NSR in 2022 was 34.035 million tons [87]. In 2021, it was 34.85 million tons [88]. Thus, even though the planned indicator for 2022 was achieved according to official sources, there was a slight decline (2.34%) in the overall figure as compared to 2021, contrary to assertions by the same source that seems to be only referring to an increase in cargo carried by Russian ships. This can be attributed to the geopolitical situation when transits of foreign ships along the NSR have practically stopped [89]. Thus, data from the official website of Glavsevmorput indicate that permits for 2022 were issued either to Russian vessels or to vessels under the jurisdiction of Russian companies, i.e. Flags of Convenience (FOCs) (see Fig. 8) [90]. These vessels mainly supplied LNG to Europe (15 million m^3) as gas prices were higher than in Asia. Thus, shipment to Asia in 2022 (2.4 million tons of LNG) was reduced compared to 2021 (3 million tons of LNG). However, it must be noted that only for the second time oil was supplied to China via the Arctic route in November 2022 [91].

[85] Morskoy flot otechestvennykh kompaniy [Marine fleet of domestic companies]. July 7, 2021. URL: http://www.morvesti.ru/analitika/1689/90465/ (accessed 1 December 2022).
[86] Vlasti obsudyat sozdanie sudokhodnoy kompanii dlya magistrali «Sever — Yug» [The authorities will discuss the creation of a shipping company for the North-South highway]. November 24, 2022. URL: https://www.rbc.ru/business/24/11/2022/637e447d9a79470ac9c4f51b (accessed 1 December 2022).
[87] NSR General Administration Rosatom. 34.034 million tons of cargo transported along the Northern Sea route in 2022. January 16, 2023. URL: https://nsr.rosatom.ru/en/company/news/?ELEMENT_ID=165497 (accessed 21 January 2023).
[88] Ignatieva A. Gruzooborot po SMP v 2021 gody dostig 34,85 mln t [Cargo turnover on the NSR in 2021 reached 34.85 million tons]. January 12, 2022. URL: https://neftegaz.ru/news/transport-and-storage/720501-gruzooborot-po-smp-v-2021-g-dostig-34-85-mln-t/ (accessed 1 December 2022).
[89] Humpert M. International Shipping on Northern Sea Route Collapses as Foreign Companies Stay Away. September 12, 2022. URL: https://www.highnorthnews.com/en/international-shipping-northern-sea-route-collapses-foreign-companies-stay-away (accessed 1 December 2022).
[90] Spisok razresheniy na plavanie sudov v akvatorii sevmorputi [List of permits for sailing vessels in the waters of the Northern Sea Route], 2022. URL: https://nsr.rosatom.ru/rassmotrenie-zayavleniy/razresheniya/ (accessed 1 December 2022). Note: Data for 2022 and previous years could not be accessed on this website in January 2023.
[91] Amid Ukraine War, Russia's Northern Sea Route Turns East. December 13, 2022. URL: https://thediplomat.com/2022/12/amid-ukraine-war-russias-northern-sea-route-turns-east/ (accessed 15 December 2022).

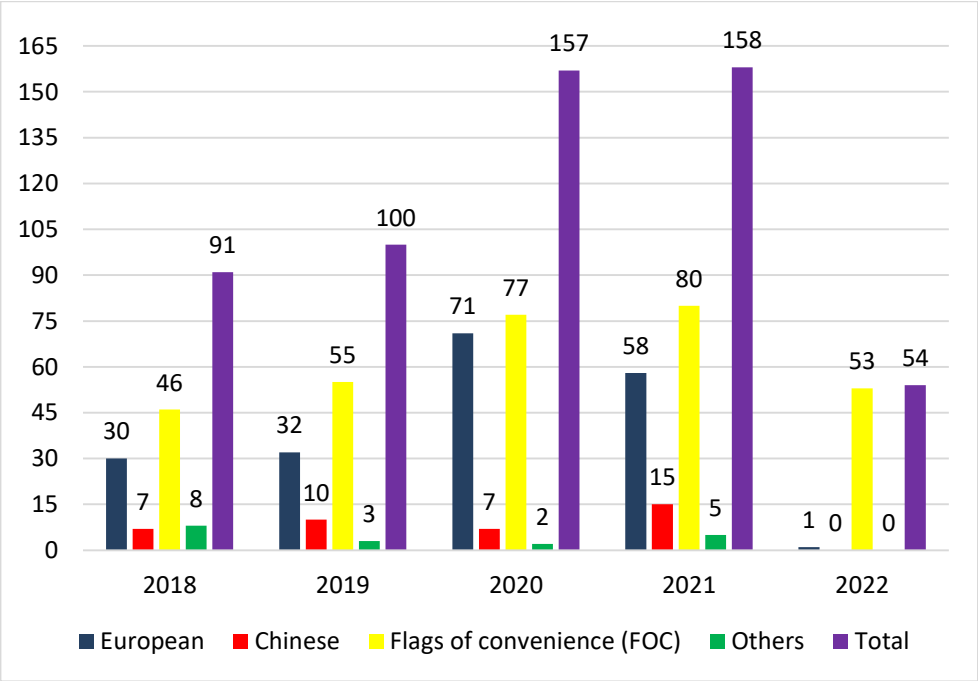

Fig. 8. Foreign vessels on the NSR: permits issued by NSRA 2018–2022 [92].

After the Eastern Economic Forum, which was held in September 2022, Russian President Vladimir Putin instructed the Government of the Russian Federation to ensure the establishment of an economically reasonable tariff, a strict schedule, and other competitive conditions for the transportation of goods along the NSR to and from the Far East to the European part of Russia. This is necessary to expand the use of the NSR and increase cargo turnover [93].

The Russian Government will need to support and expand Russian shipyards and related industries to produce the required container ships and dry and bulk cargo ice-class vessels. This is also the case with diesel ice-breakers necessary for year-round navigation where cooperation was envisaged with Finish shipbuilders. Unfortunately, these capabilities do not presently exist in Russia [94]. In addition, the President directed measures to ensure the maintenance of ships and cargo handling along the NSR [95].

The Chief of Staff of Marine Operations of the Glavsevmorput V. Arutyunyan stated that the institution plans to release a new program with automatic construction of routes along the NSR, which will update data on the weather and conditions of the NSR water area twice a day [96].

[92] Spisok razresheniy na plavanie sudov v akvatorii sevmorputi [List of permits for sailing vessels in the waters of the Northern Sea Route]. 2022. URL: https://nsr.rosatom.ru/rassmotrenie-zayavleniy/razresheniya/ (accessed 1 December 2022). Note: Data for 2022 and previous years could not be accessed on this website in January 2023.

[93] Prezident RF poruchil ustanovit' ekonomicheski obosnovannyy tarif i zhestkiy grafik perevozok po Sevmorputi [The President of the Russian Federation instructed to establish an economically reasonable tariff and a strict schedule of transportation along the Northern Sea Route]. October 20, 2022. URL: https://portnews.ru/news/337360/ (accessed 1 December 2022).

[94] V Rossii kriticheski ne khvataet flota [There is a critical shortage of fleet in Russia]. May 18, 2022. URL: http://www.morvesti.ru/analitika/1689/95648/ (accessed 1 December 2022).

[95] Ibid.

[96] V «Glavsevmorputi» predupredili o strogoy organizatsii i planirovanii sudokhodstva v akvatorii SMP s 2022 goda [Glavsevmorput warned about the strict organization and planning of navigation in the waters of the NSR from 2022]. October 20, 2022. URL: https://portnews.ru/news/337359/ (accessed 1 December 2022).

Thus, Russia is trying to create convenient and predictable conditions for carriers, which is necessary for increasing cargo turnover in the NSR.

In addition to all of the above, it should also be noted that Russia is increasing its efforts to create conditions for constant monitoring of the ice situation. At the moment, the Russian satellite Arctic-M has already been launched. Thus, Roshydromet receives operational information about the atmosphere and the underlying surface throughout the Arctic region with limited time frequency (observations are carried out for 15 minutes every 12 hours) [97].

However, to get more up-to-date information (every 15 minutes), it is planned to launch another satellite. Thus, according to the head of Roshydromet I. Shumakov, in 2023, Russia plans to launch a space satellite that will monitor the situation over the North Pole around the clock. This initiative is a part of the Arctic satellite constellation [98]. Moreover, by 2025, it is planned to install radars on four low-orbit Meteor-M satellites. It is relevant to mention that this is a critical requirement to achieve year-round navigation on the NSR. By 2026, it is planned to launch four more satellites to provide broadband access to the Internet. The head of Roscosmos, Yuri Borisov, noted that the Northern Sea Route and the Arctic zone are top priority projects. Russia plans to launch nine satellites: 4 — for broadband Internet access, 3 — for radar surveillance, and 2 — for hydrometeorology. In addition, by 2024, 68 weather buoys will be put into operation [99] on the NSR. Thus, Russia plans to create an Arctic space constellation that will ensure constant monitoring of the ice situation and weather conditions, designed to increase the safety and predictability of navigation along the NSR. However, Professor A. Pilyasov noted that these plans have not materialised for a decade due to poor funding, and no service provider has been made responsible for it[100]. There is also a need to develop indigenous technology, particularly in respect of synthetic aperture radar satellites.

The latest goal is to establish year-round navigation, including towards the East, to facilitate exports to Asian markets. A. Chekunkov, Minister for the Development of the Far East and the Arctic, claims that in 2023–2024, year-round navigation on the NSR will already be possible [101].

Results

Our research brings out several findings. Firstly, for Russia, the NSR continues to remain a crucial driver for the development of its Arctic Zone. Its role and importance as a national

[97] RF v 2023 godu nachnet kruglosutochno monitorit' Severnyy polyus [Russia in 2023 will start monitoring the North Pole around the clock]. October 21, 2022. URL: https://www.interfax.ru/russia/868927 (accessed 1 December 2022).
[98] Ibid
[99] Zubov M. Severnyy morskoy put' poluchit 80 novykh ledokolov do 2035 goda [The Northern Sea Route will receive 80 new icebreakers by 2035]. September 7, 2022. URL: https://www.rzd-partner.ru/wate-transport/news/severnyy-morskoy-put-poluchit-80-novykh-ledokolov-do-2035-goda/ (accessed 1 December 2022).
[100] SMP: More Planov [NSR: Sea of Plans]. Sovezdye Review #40, a periodical for oil and gas suppliers. 2022. URL: http://www.sozvezdye.org/sozvezdyereview/digital/7/index.html#p=24 (accessed 20 January 2023).
[101] Kruglogodichnaya navigatsiya po Sevmorputi nachnetsya v 2023-2024 godakh [Year-round navigation along the Northern Sea Route will begin in 2023-2024]. URL: https://nao24.ru/obshestvo/29939-kruglogodichnaja-navigacija-po-sevmorputi-nachnetsja-v-2023-2024-godah.html (accessed 1 December 2022).

transport route are progressively increasing. The development of the Northern Sea Route is inextricably linked with providing a reliable transport link and increased cargo traffic, improving the quality of life in the AZRF and accelerating the development of natural resources and oil, gas and mineral exports. In addition, it is a vital cog for the security of the Russian Federation, arguably more so in the current security situation.

Secondly, Russian policies towards the NSR increasingly focus only on domestic needs. The development of the NSR is primarily due to its production capacities in respect of natural resources. Currently, the NSR is part of a large project aimed at exporting resources extracted from the AZRF, which is essential under new circumstances. Legislation has been primarily aimed at promoting domestic investment in the Arctic Zone of the Russian Federation.

Thirdly, geopolitical factors and related Western sanctions have already influenced the future trajectory growth of the NSR because Russia has already lost several foreign investors and technologies necessary for the timely and successful implementation of resource and infrastructure development projects of the NSR, including transhipment hubs. The costs of all transport routes from Russia have increased because of sanctions, price ceilings on oil and gas, and the cost of insurance and other services. Therefore, the NSR is vital for Russia as an export transport route, and it is trying to offset the effects of Western sanctions through additional investment and search for new partners.

Fourthly, Russia will need to make serious investments in shipbuilding to offset the exit of international partners in crucial projects such as diesel icebreakers, LNG tankers and container/bulk cargo shipping of ice class, auxiliary vessels, search and rescue fleet, and dredgers to achieve the planned cargo turnover and its stated goal of round the clock navigation on the NSR. Foreign partners may not be interested due to the effect of secondary sanctions. This may also not be desirable from Russia's perspective, but there is a lack of domestic shipbuilding capacity. Therefore, delays are inevitable. In the short term, there is no alternative but to buy second-hand ships to meet the shortfall in the transportation of various types of cargo. However, they will not be of ice-class, and therefore, the icebreaker program will need state support.

Fifthly, the goal of year-round navigation by 2024 is still premature. The critical infrastructure, namely, the icebreaker fleet and transhipment hubs, to achieve desired trade turnover and the auxiliary fleet to carry out emergency rescue measures are still in various stages of preparedness.

Sixthly, from our analysis, the infrastructure plan is detailed, but many projects still need to be budgeted. Consequently, the goals set for cargo turnover are not likely to be achieved. Lastly, internally within Russia, the NSR may face competition for funds from the North-South transport corridor, which faces fewer climatic and infrastructure hurdles.

Conclusion

In conclusion, we assert that the Russian government has constantly promulgated and modified its policies for the NSR in response to the geopolitical and geo-economic situation since it considers the NSR crucial for the development of the AZRF and national security. The prospect of year-round navigation directly depends on Russia's efforts to develop the NSR, and this is essential to cater for the pivot to the East after the closure of the G7 and EU export markets as a consequence of a "Black Swan event" like the special military operation in Ukraine. In this regard, the Russian leadership places great emphasis on developing the icebreaking fleet and creating the necessary infrastructure. However, Western sanctions have significantly impacted projects connected both with shipbuilding and the extraction of energy resources. Thus, it is expected that in the medium and long term, Russia will need to invest significant resources to offset the effect of sanctions in critical areas, especially shipbuilding, satellite and telecommunications coverage of the Arctic, to increase the potential and capabilities of the NSR. It is uncertain how the goals set in the 2022 NSR development Plan would be achieved in the context of increased spending in all spheres of national security due to the special military operation and other measures to stimulate the economy in the context of a recession. Consequently, it may be prudent to reassess goals set earlier and focus on achievable tasks factoring in the limitations imposed by geopolitical and geo-economic factors.

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The Impact of India's International Discourse on Its Arctic Policy

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Abstract. Since the 20th century, international discourse has gradually become a hot topic in the study of political science and international relations, and its impact is especially important in new areas such as space, cyberspace and polar regions, where stable rules and governance system have not yet been developed. In this paper, the influence of international discourse is classified as verbal, structural, institutional and moral. Based on this classification, the increasing influence of India's international discourse on its Arctic policy through its verbal expression, national strength, institutional involvement, and sense of values is examined. The difficulty of developing a strategy in the Arctic is due to the fact that India is not an Arctic country, so there is a cautious attitude of the world community towards it. Northern countries believe that India can use the Arctic for additional natural resources or even political benefit. In addition, there is little coverage of Arctic policy in the Indian media and government activities. Therefore, due to the possible misunderstanding by the international community of India's involvement in the Arctic and the country's weak awareness of Arctic issues, its influence on the international Arctic discourse should be improved in several ways: government officials should participate more actively in international organizations (UN, Arctic Council); the media should fully cover the country's activities in addressing Arctic issues; academically, integration of research, creation of special educational programs should be required, etc. Last but not least, the interests of Arctic Indigenous peoples should be taken into account. The resolution of all these issues can enable India to strengthen its position in the Arctic and increase the country's potential.
Keywords: *discourse, Arctic, India, Arctic issues, Arctic policy*

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Introduction

With the release of the Arctic policy in March 2022, India has officially declared that it is an active participant in Arctic affairs. Despite being a non-Arctic country, it shows its interest in increasing the scientific, political, economic and cultural influence in this region. International discourse as an important tool for disseminating a country's foreign policy makes it possible to analyze its priority in a particular area. This influence, in turn, is reflected in future foreign policy. The theoretical basis of this study was the approach to classifying the influence of international discourse, put forward by the Chinese scientist Zhang Zhizhou, according to which the influence of international discourse can be divided into verbal, structural, institutional and moral [1, Zhang Zh., pp. 38–41]. In terms of the influence of international verbal discourse, the scientist emphasizes its expressive function and focuses on the "speech" of the country's politicians, the media, scientists

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and other representatives of the international community. It, as a "soft power", can change people's perception of the country's image through the dissemination of information. The influence of international structural discourse depends on the structural position of the country in the international community, and the change of a country's power is the main factor affecting the structural position [2, Waltz K., pp. 5–41]. As for the influence of international institutional discourse, it determines the role of the country in the functioning of international organizations, the formulation of international rules and the impact on the international order. Discussion of the influence of international institutional discourse became popular after the Second World War, when various international organizations gradually came out. Nowadays, in many cases, competition between countries is often reflected in international mechanisms, great powers are trying to protect their interests through these beneficial mechanisms they have already created, while developing countries are trying to capture interest by reforming them, so international institutional discourse plays an important role for those countries that are involved in a certain area later than other countries. The influence of international moral discourse extends to the morality and legality of the activities of subjects in international affairs. First of all, it is necessary to observe such generally recognized principles as human rights, the preservation of peace; in addition, it is essential, for example, as in the case of the Arctic, to pay attention to its natural character, population, etc. (Fig. 1).

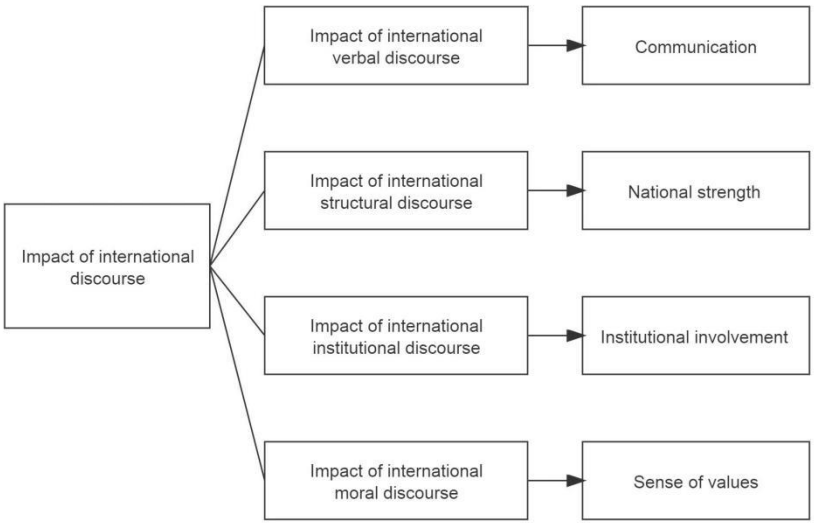

Fig. 1. Influence of international discourse [1].

Therefore, within the framework of this approach to classifying the influence of international discourse, the impact of India's international discourse on its Arctic policy is enhanced through speech expression, accumulation of power, institutional participation and its value in Arctic affairs. An analysis of it can help us to analyze the current understanding of the problem of the Arctic policy of India and possible solutions for successful development in the future.

The impact of India's international verbal discourse on its Arctic Policy

[1] The scheme was designed by the author according to the classification of Zhang Zhizhou.

In terms of the influence of international verbal discourse on Arctic policy, the Indian government has demonstrated its active involvement in Arctic affairs in recent years through a number of diplomatic statements and political documents. Arctic issues have become a topic of discussion at meetings of leaders of other countries, representatives of the Indian government often participate and speak at international Arctic conferences.

For example, Manmohan Singh, then Prime Minister of India, visited Russia in October 2013. During his visit, he expressed his readiness to strengthen cooperation with Russia in the Arctic [3, Kumari P., pp. 38–40]; in October 2014, former President of India Pranab Mukherjee visited Norway and Finland to thank both countries for their help in granting India the status of a permanent observer state in the Arctic Council [4, Filimonova N., pp. 95–105], he is also the first Indian president who visited Norway [5, Shaumyan T.L., Zhuravel V.P., pp. 175–184]. During the visit, 13 agreements were signed concerning education, defense, earth sciences and other areas [3, p. 7]. In 2015, Pranab Mukherjee also visited Sweden and Russia; Prime Minister Narendra Modi, in turn, visited Russia, the United States and Canada. For the first time in the history of Indian diplomacy, the President and the Prime Minister have made multiple visits to Arctic countries at the same time.

In recent years, India has often strengthened the influence of its international verbal discourse with the help of the Russian Federation. The Russian side invited Indian Prime Minister Narendra Modi to the Eastern Economic Forum in Vladivostok in September 2019 as a guest of honor. After negotiations, Russian President V.V. Putin said at a press conference [6, Bhagwat D., pp. 73–90]: "Indian energy concerns are invited to participate in projects such as the Far East LNG and the Arctic LNG-2" [2]; in September 2022, at the forum, Narendra Modi again expressed his desire to strengthen partnership with Russia on Arctic issues.

In addition to statements at international forums, India is increasingly incorporating Arctic issues into its policies and strategies. After India joined the Arctic Council in 2013, the Ministry of Foreign Affairs released a document titled "India and the Arctic", which demonstrated India's interests in the Arctic in four areas: scientific, environmental, commercial and strategic, although specific interests were not clearly defined. The Ministry of Earth Sciences listed the main goals of the Indian research program in the Arctic region, which are to study the relationship between the Arctic climate and the Indian monsoons [6, Bhagwat D., pp. 73–90], the influence of global warming, flora and fauna [3].

It is worth noting that the Indian Arctic Policy published this year is the first official document of the Indian government on Arctic policy, which includes six areas: science and research, climate and environmental protection, economic and human development, transport and commu-

[2] Devyatkin P. Russia and India set to deepen Trade and Investment in Arctic Energy. 05 September, 2019. URL: https://www.highnorthnews.com/en/russia-and-india-set-deepen-trade-and-investment-arctic-energy (accessed 01 December 2022).
[3] MOES, India. Scientific Endeavours in the Arctic. URL: https://moes.gov.in/programmes/polar-science-cryosphere/indian-scientific-endeavors-arctic?language_content_entity=en (accessed 03 December 2022).

nications, governance and international cooperation, national capacity building [7, Zaikov K.S., Bhagwat D., pp. 261–274]. All sections, except for scientific research, are developed in detail for the first time, the goals and ways of achieving them in the relevant areas of the Arctic are explained to a certain extent. India also expressed its position, substantiated the principles and put forward political ideas on Arctic issues in the light of the new Arctic policy.

The impact of India's international structural discourse on its Arctic Policy

The influence of India's international structural discourse on its Arctic policy is improving mainly due to the growth of national power in recent years. India's economic success in the 21st century has provided resources for organizing Arctic scientific expeditions, optimizing Arctic research equipment, and training Arctic research personnel. The influence of the international discourse of non-Arctic countries on Arctic affairs largely depends on the country's ability to acquire and transmit Arctic knowledge [8, Cheng B., p. 4]. Arctic scientific research certainly plays an important role in these matters.

Some believe that scientific research in India began when Mahendra Nath Bose collected fossil plants in the Arctic with Norwegian scientists in 1962. In fact, India officially launched scientific expeditions in the Arctic Ocean in 2007, when the Himodri Arctic Research Station was established on the Svalbard archipelago. India regularly arranges scientific expeditions (about 3–4 times a year) after that [9, Grinyaev S.N., Shevchenko A.V., Medvedev D.A., pp. 18–24], and since then the research station has already received more than 300 Indian scientists [4]. India's scientific activity is expanding rapidly thanks to the experience gained in Antarctica. As the former secretary of India H.P. Rajan said in the UN Commission on the Limits of the Continental Shelf: "India has been conducting scientific research and exploration in Antarctica for over 30 years, which has allowed India to play a unique and important role in Arctic affairs" [10, Rajan H.P., pp. 146–154]. In 2013, India decided to invest 12 million dollars in Arctic research for five years, with 3 million allocated to a scientific station [4, Filimonova N., pp. 95–115]. A year later, the IndArk multi-purpose floating observatory was created at Kungsford on Svalbard. In addition, the established National Center for Polar and Oceanic Research (NCPOR), as India's key polar science institution, has made progress in many areas. In particular, current research in the Arctic includes aerosol monitoring over the polar regions under the auspices of the Indian Polar Aerosol Network (POLAERNET), phylogenetic modeling of bacterial communities in the Kongsfjord, metagenomic assemblies of genomes (MAG) from glacial ecosystems Midtrel-Lovenbreen, research on phytoplankton dynamics and biogeochemistry of the Kongsfjord, etc. [5] It can be said that this institution has further advanced Indian scientific research in the Arctic.

[4] Middleton A. India's Arctic Policy: Strong foothold on science and business interests. HIGH NORTH NEWS, Mar 23, 2022. URL: https://www.highnorthnews.com/en/indias-arctic-policy-strong-foothold-science-and-business-interests (accessed 01 December 2022).
[5] MOES, India. Annual Report 2021-22. July 2022. URL: https://moef.gov.in/wp-content/uploads/2022/03/Annual-report-2021-22-Final.pdf (accessed 04 December 2022).

As the overall power of India grows, the Arctic countries, especially Norway and Russia, have shown increasing interest in India's participation in Arctic exploration. This is reflected primarily in the growing participation of India in international Arctic scientific work. In 2009, India and the Norwegian Institute of Polar Research signed a memorandum of understanding on joint research activities in the Arctic [6]. Joint declarations between India and Russia in subsequent years included cooperation in the Arctic. At the same time, India's interest in the development of Arctic resources is growing. Since 2014, India has placed oil and gas resources at the forefront of its cooperation with Russia, in particular, Indian companies acquired a 15% stake in the Vankorneft oil company in 2015 [7], today this share has increased to 49.9%. In addition, Indian companies acquired a 29.9% stake in Taas-Yuryakh Neftegazodobycha [8]. ONGC Videsh has acquired another 20% stake in the Sakhalin-1 project and is also the owner of Imperial Energy company. Oil India Limited acquired a 50% stake in the License 61 project [11, Bhagwat D., p. 488–506]. In addition to oil and gas resources, Indian companies are also showing great interest in other mineral resources. In 2019, Coal India Limited signed agreements with two Russian companies for the extraction of coking coal in the Far East and the Arctic [9].

The impact of India's international institutional discourse on its Arctic Policy

The influence of international institutional discourse on the country's Arctic policy depends on the contribution to the relevant international mechanisms. Arctic research is governed by general international law and specific treaties such as the UN Charter, the UN Convention on the Law of the Sea and the Svalbard Treaty. India signed the Svalbard Treaty in 1920, even before China, and this treaty grants India the right to scientific research, free navigation and a number of other rights. In addition, India has acceded not only to the UN Convention on the Law of the Sea, but also to the Vienna Convention for the Protection of the Ozone Layer, the Convention on Biological Diversity and the UN Framework Convention on Climate Change, which held the COP27 summit in Sharm El Sheikh. India is also a member of the International Arctic Science Committee (IASC), a category B member of the International Maritime Organization (IMO), a member of the Executive Council of the World Meteorological Organization (WMO), etc. All of these provide the institutional framework for India's involvement in Arctic affairs, which became available when the country was admitted as an official observer to the Arctic Council, the most important regional governance

[6] MOES, India. International collaboration convention: INDO-NORWAY. op.cit.
[7] Joint Statement between the Russian Federation and the Republic of India: Shared Trust, New Horizons, Ministry of External Affairs of India. December 24, 2015. URL: https://www.mea.gov.in/bilateral-documents.htm?dtl/26243/Joint_Statement (accessed 03 December 2022).
[8] «Rosneft'» podpisala kontrakt s Indian Oil na postavku v Indiyu do 2 mln tonn nefti, Departament informatsii i reklamy PAO «NK «Rosneft'» [Rosneft signed a contract with Indian Oil for the supply of up to 2 million tons of oil to India, Rosneft Information and Advertising Department. December 6, 2021]. URL: https://www.rosneft.ru/press/releases/item/208725/ (accessed 01 December 2022).
[9] Debjoy Sengupta. Coal India signs MoUs with Russia for coking coal, The Economic Times. September 04, 2019. URL: https://economictimes.indiatimes.com/industry/indl-goods/svs/metals-mining/coal-india-signs-mous-with-russia-for-coking-coal/printarticle/70980534.cms (accessed 01 December 2022).

mechanism for the Arctic, in May 2013. In addition to its extensive membership, India has demonstrated its responsibility and commitment as an emerging power, always ready to contribute to the development and improvement of various international mechanisms in the Arctic region, in particular, to the development of rules. As a member of the Antarctic Treaty Consultative Meeting (ATCM), India has participated in all ATCM meetings over the past three years and provided scientific and environmental information and working papers, in addition, ATCM will be hosted by India in 2023 [10]. India is also a member of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), its representatives always take into account the need to ensure the sustainable development of marine living resources and the reasonable protection of the polar environment, objectively put forward a number of reasonable proposals. This experience gained by India in Antarctica can help strengthen the influence of international institutional discourse on its Arctic policy.

The impact of India's international moral discourse on its Arctic Policy

While engaging in Arctic affairs, India always takes into account the special natural and social environment of the Arctic region and adheres to accepted moral principles. In this regard, India plays a positive role in protecting the rights of the indigenous peoples of the Arctic; it supported the adoption of the Declaration on the Rights of Indigenous Peoples at the UN session in 2007 [11]. Inside the country, Indian bishops have always called for the conscientious observance of laws to protect indigenous peoples, preserve their language, culture and traditions and prevent them from loss of identity, which is also in line with moral principles in the Arctic. In addition, in May 2013, Assistant Secretary of the Ministry of Foreign Affairs Navtej Sarna noted that India plans to "productively interact with the indigenous people of the region (Arctic) and work with them on environmental issues" [12].

Significantly, in joining the Arctic Council, the country also pledged to respect the sovereignty, sovereign rights and jurisdiction of Arctic countries in the region and to attach importance to scientific research and environmental protection in the Arctic. In this regard, India's new Arctic Policy 2022 also emphasizes the importance of environmental and climate protection and the concept of sustainable development. It is assumed that the Arctic region is similar to the Himalayan region in terms of natural environment, so India can provide various types of assistance. In general, India adheres to the principles of harmonious coexistence of people and nature in the Arctic, the balance of environmental protection with economic development, as well as fairness between the interests of present and future generations.

[10] MOES, India. International collaboration convention: Others. op.cit. URL: https://moes.gov.in/international-collaboration-convention/others (accessed 07 December 2022).
[11] General Assembly adopts Declaration on Rights of Indigenous Peoples; 'Major Step Forward' towards human rights for all, says President". UN General Assembly GA/10612. September 13, 2007.
[12] Kabir Taneja. India Arrives at the Arctic, New York Times. May 20, 2013. URL: https://www.mea.gov.in/articles-in-foreign-media.htm?dtl/21730/india+arrives+at+the+arctic (accessed 01 December 2022).

Problems in strengthening the influence of international discourses and approach to their solution

As can be seen from the above, India has formed a certain positive influence of international discourses on its Arctic policy and is playing an increasingly important role in this region. However, given the status of a non-Arctic state and a developing country, India faces a number of internal and external restrictions in this regard.

As for the difficulties in strengthening the influence of international verbal discourse on its Arctic policy, firstly, India's participation in the Arctic is interpreted differently by the international community in the context of its growing participation in the political arena and the late emergence of official Arctic policy. Fifteen years have already passed since 2007, when the first Arctic research expedition was organized. Only in March 2022, the government formulated its first Arctic policy, which lagged far behind not only the eight Arctic states, but also such non-Arctic countries as Germany, Japan, South Korea and even China. The absence of an Arctic policy to some extent determined the ambiguity of India's international involvement in the Arctic, as domestic environmental and resource issues led to many arguments in favor of the opinion of "resource capture" and "environmental destruction". Undoubtedly, the Arctic states pay special attention to the involvement of non-Arctic states in Arctic affairs, including India. In the context of today's volatile global environment, there is also the question of whether India has strategic and military intentions in the Arctic and whether it will increase influence as a result of increased cooperation and increased investment in countries such as Russia.

Secondly, the Indian media pay little attention to the Arctic and have not accumulated enough knowledge about it, resulting in a lack of Arctic consciousness in society.

India is geographically distant from the Arctic and has not been involved in Arctic affairs for long, Arctic issues have rarely been covered in the press inside the country. On the one hand, this makes it difficult for the Indian media to cover India's participation in the Arctic and constructively interpret its Arctic policy. On the other hand, it is difficult for the Indian media to respond effectively to questions from the Western media. At the same time, the lack of coverage of this topic has led to an insufficient understanding of the problems of the Arctic by the population and the difficulty of forming a broad base of discourse. In addition, India's proximity to the Indian Ocean means that people's attention tends to be focused on the Indian Ocean rather than the Arctic Ocean.

Therefore, due to the possible misunderstanding of the international community of India's participation in the Arctic and the poor awareness of Arctic issues, the influence of international speech discourse on the Arctic policy of India should be improved in three directions: political, media and academic.

Scientists Jawahar Bhagwat and A.E. Shaparov believe that India's large-scale participation in the Arctic is still in its infancy, since there is no plan that specifies the particular steps to be taken to implement the policy [12, pp. 16–22]. The new 2022 policy sets the direction for India's in-

volvement in Arctic affairs, but it is relatively general in nature, so specific research and resource development programs in the Arctic should be established in the future. At the same time, Indian officials should be more involved in various organizations such as the UN and its bodies, the Arctic Council and the Arctic Circle Forum, etc., in order to better and more accurately explain to the international community India's position on Arctic policy. In terms of media discourse, the relevant information department should play a leading role in shaping public opinion and clarifying the importance of Arctic affairs. For example, documentaries about the Arctic and books about the Arctic can be produced in the country to increase the knowledge of the general public about the region. All this should properly explain India's involvement in Arctic affairs, which will resolve the doubts of the international community and increase its confidence. The scientists not only conduct research, but are also an important component in the formation of policy and public opinion. Therefore, on the one hand, researchers should actively share their discoveries and enable the international community to hear professional opinions; on the other hand, they should invite leaders and scientists from Western countries, especially Arctic ones, and change their views on India's participation in Arctic affairs.

The influence of India's international structural discourse on its Arctic policy is also associated with a number of problems. In terms of external factors, there is a lot of competition from countries and organizations seeking to gain real influence in the Arctic. In terms of its own strength, participation in Arctic affairs for non-Arctic countries requires a higher level of state capacity, economy and science and technology, while India's investment in Arctic research is insufficient, and relevant institutions need to be improved and updated. Although India ranks third in the world GDP ranking according to the World Bank [13], it is still a developing country with limited funds for Arctic research and still does not have a polar research vessel, which has resulted in insufficient scientific research and lagging behind in research of applied technologies for the special conditions of the Arctic. All this limits its participation in Arctic affairs. Meanwhile, India's scientific strength is distributed among organizations such as NCPOR, Earth System Science Organization-National Center for Polar and Ocean Research, Geological Survey of India, CSIR-Centre for Cellular and Molecular Biology, Jawaharlal Nehru University, energy companies, etc. In many cases, they are independent of each other, which makes it difficult to integrate research achievements. By the way, India does not yet have a single university with an educational program related to the Arctic [13, Shailesh N., Suba Ch.D., pp. 901–904], and few people have heard about university cooperation programs with other Arctic countries.

It is well known that the impact of a country's international discourse often depends on the degree of activity of the state in the international community. Therefore, if India wants to strengthen its influence of international structural discourse on foreign policy, it should expand its

[13] GDP based on PPP valuation of country GDP, The World Bank. 2022. URL: https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD?most_recent_value_desc=true (accessed 01 December 2022).

participation and contribution. In the context of the Arctic, the most direct way is to increase investment in Arctic scientific research, as well as expand research areas. At the same time, India should focus on transforming and applying the results of scientific research in the Arctic in order to solve the practical problems of the Arctic. Secondly, research forces should be integrated and a platform for sharing research achievements should be established. In particular, the synergy of various organizations, such as public research institutions, universities and enterprises, should be further strengthened so that the Arctic natural, humanitarian and social sciences develop harmoniously. In addition, educational institutions should implement educational programs related to the Arctic and actively develop cooperation with universities in the Arctic countries, including joint training, exchange programs and internships.

International institutional discourse helps in securing its own interests in a legitimate form. But in fact, India's degree of participation in existing international Arctic mechanisms has been low, both in terms of breadth and depth of participation. For example, in the first case, although India has joined a number of Arctic governance mechanisms in recent years, it has not been among the first to do so. Japan, Italy, France and the Netherlands have applied for observer status in the Barents Euro-Arctic Council [14], while India has not yet paid attention to this sub-regional organization. In the second case, participation and contributions to international mechanisms were modest due to barriers such as language and knowledge of the rules. For example, India does not have a permanent representative in the IMO, while other Asian countries such as China, Japan, Korea and Singapore have representatives in every working group and committee, in addition to permanent representatives, and have expert groups involved in working studies [15]. In addition, India has not sent enough experts to the Arctic Council working groups since 2013, which has prevented it from influencing the creation of new rules. This is largely due to the minor role of the Arctic in India's foreign strategy, which is one of the reasons why the Arctic policy was not published until 2022.

Thirdly, non-Arctic states, including India, often face restrictions on their participation in this region. The Arctic states believe that the Arctic is their property and they need to consolidate their influence through various mechanisms, and one of the most important is the Arctic Council, which has adopted a "limited openness" to other states. The Nuuk Declaration clearly states that the role of observers is limited to participation in scientific research or financial support: the amount of funding should not exceed that of the Arctic states; observers do not have the right to vote on issues raised; speeches are subject to the approval of the chairman of the meeting [16]. It is clear that although non-Arctic countries, including India, have been admitted as observers to the

[14] Members of the Barents Euro-Arctic Council and the Barents Regional Council, The Barents Euro-Arctic Council. URL: https://barents-council.org/barents-euro-arctic-council/members-of-the-beac-and-the-brc (accessed 18 January 2023).
[15] Kalyanaraman M., Panda L.K. A case of a maritime presence adrift, THE HINDU. February 05, 2020. URL: https://www.thehindu.com/opinion/op-ed/a-case-of-a-maritime-presence-adrift/article30736915.ece (accessed 01 December 2022).
[16] Nuuk Declaration. The Seventh Ministerial Meeting of the Arctic Council, Nuuk, Greenland. May 12, 2011. URL: http://hdl.handle.net/11374/92 (accessed 06 August 2022).

Arctic Council, they still have little influence of international institutional discourse on Arctic issues, naturally, its influence on their policies is also small.

In response to external and internal factors, in order to increase the influence of international institutional discourse on its Arctic policy, India should more often take part in international Arctic projects. It should become more active in shaping maritime rules and international Arctic mechanisms, and reasonably express and defend its interests. India should also study the laws and policies of the Arctic countries, abide by them and protect its interests together with them. On the other hand, India should train diplomatic personnel with knowledge of laws, foreign languages and rhetoric, who can fully realize their right to vote and speak out to become a true "active" participant.

It is worth noting that Arctic research, climate and environmental issues are the most pressing issues in the region, so non-Arctic countries such as India should continue to pay attention to these issues. Following the development of the situation in the Arctic, it is necessary to lead the development of a new cooperation mechanism in time, to become a policy initiator [14, pp. 27–32]. For example, in the context of the current world order and the suspension of the Arctic Council, India may initiate the creation of a multilateral mechanism for regional cooperation of a less politically sensitive nature. Such a mechanism has become more accessible in recent years and can involve both Arctic and non-Arctic countries. An example is the trilateral dialogue on cooperation in the Far East of the Russian Federation and the Russian Arctic between Japan, India and Russia in 2021 [17]. However, taking into account a number of events in the Arctic after the SMO on February 24, 2022, at this stage, it would be more promising for India to establish an Arctic cooperation mechanism involving China, Russia, and India. Although there are still issues between India and China, including territorial disputes, and they are often seen as major strategic competitors, there is no direct conflict of interest between India and China in the Arctic region; on the contrary, they have many common interests in the field of climate change, environmental protection and resource development, so there is great potential for trilateral cooperation in the Russian Arctic. In addition, such cooperation in the Arctic can, on the one hand, reduce the long-standing mutual distrust between the two countries, and Russia can not only contribute to the cooperation itself, but also serve as a regulator in relations between the countries. On the other hand, such a trilateral mechanism could become an example of cooperation between non-Arctic and Arctic states in the Arctic, facilitate coordination between the international communities in the region, and contribute to peace, stability, and sustainable development.

In the Arctic, international institutional discourse is important because it ensures the legitimacy of the country's activities in the region, in this respect it is coercive, while in contrast, inter-

[17] Indiya i Yaponiya opredelili prioritetnye napravleniya sotrudnichestva na rossiyskom Dal'nem Vostoke, Ministerstvo RF po razvitiyu Dal'nego Vostoka i Arktiki [India and Japan have identified priority areas for cooperation in the Russian Far East, Ministry of the Russian Federation for the Development of the Far East and the Arctic]. URL: https://minvr.gov.ru/press-center/news/indiya-i-yaponiya-opredelili-prioritetnye-napravleniya-sotrudnichestva-na-rossiyskom-dalnem-vostoke-31454/ (accessed 18 January 2023).

national moral discourse is usually voluntary, but this does not mean that it is unimportant; it is the ideological basis for all of a country's international activities and is also an important part of its image. But at present, as the geo-economic and geo-security value of the Arctic is rapidly increasing, there is already a tendency for international moral discourse on Arctic policy to diminish in many countries. In addition, the Arctic is becoming more and more "militarized", the moral demands of the Arctic indigenous peoples, environmental NGOs are at risk of being ineffective, all this shows that it is necessary to pay attention to the influence of international moral discourse on Arctic politics.

For India, the issue is even more complex: it offers both an opportunity and a challenge. The international community, especially the Arctic countries, is wary of the involvement of non-Arctic states in Arctic affairs, and India needs to take international responsibility for its participation, which will help it get support from outside, otherwise the mentioned opinions about the "resource capture" and "environmental destruction" may become popular.

In the "era of development", a number of international companies have become a significant force in the economic development of the Arctic. Although India's focus so far has been on scientific research, mainly with Norway and the EU [6, Bhagwat D., pp. 73–90] [18], but the new Arctic policy notes the desire to expand its investments in the energy sector of the Arctic countries, and therefore in the future the country may face some moral problems. For example, the desire to comply with the interests of energy organizations often contradicts the interests of the fragile ecological environment of the Arctic, and the use of traditional experience will inevitably damage the Arctic ecosystem. Traditionally, environmental NGOs, such as Greenpeace, WWF, etc., play an important role in international moral discourse. However, Indian environmental NGOs face barriers: although the number of environmental NGOs in the country is significant, many of them are unable to obtain permanent funding for their work, which makes it difficult to ensure the functioning of organizations and the creation of a long-term strategy. In addition, Indian environmental NGOs usually have few links to international NGOs, the lack of such connection or cooperation limits their development; therefore, in this regard, they are less involved in Arctic affairs. In addition, India itself has environmental problems; according to the annual report of the Environmental Performance Index, India ranks last out of 180 countries in the EPI 2022 ranking with a score of 18.9, influenced by such factors as changes in water quality, air pollution, biodiversity and so on [19]. All this has led to a de facto "loss of discourse" in morality.

Improving the influence of international moral discourse cannot be done quickly; it requires long-term efforts not only from the government, but also from a number of non-state actors, even the entire nation. Energy companies, as the main force for the economic development of the Arctic, should maintain a balance in their affairs. In fact, in interviews with Arctic indigenous

[18] EU-India calls on Polar Climate and Developing the next generation of Earth system models, The European Union. December 13, 2019. URL: https://euraxess.ec.europa.eu/worldwide/india/eu-india-calls-polar-climate-anddeveloping-next-generation-earth-system-models (accessed 01 September 2022).
[19] Wolf M.J., Emerson J.W., Esty D.C., de Sherbinin A., Wendling Z.A. et al. 2022 Environmental Performance Index, CT: Yale Center for Environmental Law & Policy. URL: epi.yale.edu (accessed 18 January 2023).

peoples, participants often expressed their concerns about the Arctic energy development project. Therefore, the Indian government should encourage NGOs to join international organizations dealing with climate change, environmental protection and ensuring the life of the indigenous peoples of the Arctic. The government should continue to promote the right and equitable concept, work with countries and international organizations to strengthen its influence of international moral discourse on its Arctic policy, in order to make the Arctic a model zone for mutually beneficial cooperation and harmonious coexistence of human and nature. It is worth mentioning that India's Arctic policy is centered on the "Indian philosophy of Vasudhaiva Kutumbakam: the world is one family" [20], and what the Indian path will look like, we will find out in the future.

Conclusion

Since the 20th century, international discourse has become an important topic in the study of political science and international relations. Scientists have created different methods for classifying international discourse, the influence of international discourse, etc. In particular, according to the Chinese scientist Zhang Zhizhou, the influence of international discourse is divided into verbal, structural, institutional and moral. India, as a large emerging power and an interested party in Arctic affairs, places great emphasis on the influence of international discourse on its Arctic policy. Thanks to a series of speeches by politicians and scientists, the development of a strategy, the influence of international verbal discourse on Arctic politics is increasing, and in recent years, due to the rapid development of the economy and the rise in overall power, it has successfully developed its Arctic sector, including through the creation of research institutions and cooperation with interested countries, which makes it possible to strengthen the influence of international structural discourse on politics. India is making great efforts to strengthen its role in various international and regional organizations such as the UN Convention on the Law of the Sea and the Arctic Council. Moreover, India knows that without morality in the Arctic, which is far from its territory, it is impossible to get support from the Arctic countries and indigenous peoples; therefore, it advocates respect for the fundamental issues of the region.

However, India is a rather late participant and a non-Arctic country, which negatively affects its participation in the affairs and implementation of Arctic interests. In terms of the existing problem in the influence of international verbal discourse, such assessments as "resource capture" and "environmental destruction" are often mentioned by scientists from the Arctic countries. The media in the country do not disseminate much information about the Arctic. India needs to change the stereotypes of the perception of the international community at various events, and the country's media should show the Arctic to its people more often and more correctly. Regarding the problem in influencing international structural discourse on its policies, the integration of research achievements, lack of investment and lack of Arctic education need to be addressed. Problems related to the influence of international institutional discourse, including inactive partic-

[20] MOES, India. India's Arctic Policy. op.cit. (accessed 06 December 2022).

ipation in some regional organizations and lack of knowledge of relevant rights and laws, severely limit the strengthening of its own interests in a legitimate form. To increase the influence of international institutional discourse on Arctic policy, it is important to participate in international Arctic mechanisms in a legal and reasonable manner. At the same time, training of personnel is also important in order to use their right on a legal basis. Influencing international moral discourse on Arctic policy requires a long-term effort, environmental NGOs in this sense play a key role, the country and commercial companies are obliged to take on international social responsibility.

Overall, in today's world, India is aware that the influence of international discourse is important for its own Arctic policy, but further systematic work is needed for it to play a more positive role.

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Ecological Problems and Peculiarities of the Environmental and Economic Development of the Nenets Autonomous Okrug

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Abstract. The current stage of economic development of the Russian Arctic combines two contradicting tendencies — the intensification of economic development in line with the adopted special preferential measures and the aggravation of technical and technological contradictions under the tightening of sanctions and technological blockade, increasing wear of equipment, the loss of markets for extracted products. Under these conditions, anthropogenic and, particularly, technogenic environmental threats to nature and human habitat become the most important risk factor. The purpose of the work is to identify current ecological threats, problems and features of the environmental and economic development of the Nenets Autonomous Okrug. The study applies a comprehensive economic and sociological toolkit, including general theoretical approaches — dialectical, spatial economics and sustainable development, and private methods — statistical analysis, a number of sociological methods of collecting and processing data. The information basis of the study is the data of official authorities, statistics, the work of domestic and foreign scientists, as well as the results of a sociological survey of residents of the Nenets Autonomous Okrug (May 2022; n=539). Key features of environmental and economic processes in the region were identified. Low degree of waste processing, high risks of technogenic accidents at oil and gas production enterprises and transport infrastructure remain. The main environmental threats perceived by the population include oil and gas production facilities, household waste and illegal dumps. In a number of territories, threats from defense activities, catching and processing of fish and illegal fishing are also relevant. The population is least satisfied with the quality of water resources, the cleanness of the environment and the state of forests and parks. Based on the results obtained, recommendations aimed at optimizing the environmental component of the social well-being of the population are given. The scientific significance of the study is determined by the actualization of knowledge about environmental and economic processes in the Arctic region of the Nenets Autonomous Okrug, based on a comprehensive economic and sociological toolkit. The practical importance lies in the formation of the analytical framework for managing the environmental and economic development of the regions during the period of exacerbated contradictions in the development of the Russian Arctic.

Keywords: *environmental problem, Nenets Autonomous Okrug, industrial pollutant, environmental threat, population survey, environmental and economic development, Arctic zone*

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Introduction

The historically established extractive profile of the economies of the Arctic regions causes an increased load on the environment. The most pronounced ecological risks are in the places of localization of industrial enterprises and their production wastes, as well as in areas affected by the natural transfer of pollutants [1, Makosko A.A., Matesheva A.V., pp. 62–65; 2, Slukovskii Z.I., Guzeva A.V., Dauvalter V.A., pp. 2–5]. Certain results of the programs to reduce accumulated environmental damage in the Arctic should be noted [3, Shevchuk A.V., Shumikhin O.V., pp. 99–101], as well as the gradual modernization of treatment facilities and the overall ecologization of processes at operating enterprises [4, Skufyina T.P., Samarina V.P., Samarin A.V., pp. 55–57]. State measures to enhance the economic development of the Arctic zone of Russia (AZRF) [1], increase in the number of investment projects and opening of new industries [5, Volkov A.D., Tishkov S.V., Nikitina A.S., pp. 190–193] form the prerequisites for increasing anthropogenic load on the natural ecosystems of the Arctic macro-region. More pronounced prerequisites are caused by the risks of technogenic accidents, inevitable under the depleting nature of equipment operation under the conditions of sharply tightened sanctions and technological dependence. This determines the relevance of a comprehensive study of existing ecological problems and the dynamics of environmental and economic processes in the Russian Arctic for the timely accounting and prevention of long-term environmental consequences of economic activity. The most complete overview in this sphere can be obtained on the basis of synthesis of ecological-economic and sociological research methods within the approach, already tested on the materials of other Arctic regions [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P., pp. 102–108].

The object of consideration in this paper is the Nenets Autonomous Okrug (Nenets AO), where environmental risks are quite strong [7, Vasiltsov V.S., Yashalova N.N., Novikov A.V., p. 344], and scientific data on ecological and economic processes require updating. The purpose of the study is to identify key ecological problems and features of the environmental and economic development of the Nenets Autonomous Okrug. In order to achieve the goal, a complex economic

[1] Federal'nyy zakon ot 13.07.2020 № 193-FZ «O gosudarstvennoy podderzhke predprinimatel'skoy deyatel'nosti v Arkticheskoy zone Rossiyskoy Federatsii» [Federal Law No. 193-FZ dated July 13, 2020 "On state support for entrepreneurial activities in the Arctic Zone of the Russian Federation"]. URL: http://publication.pravo.gov.ru/Document/View/0001202007130047 (accessed 15 November 2022).

and sociological methodology was applied, which included a specialized survey of the population and comparison of its results with official statistics.

The study aims to update the scientific basis for managing the development of the Arctic macro-region in the current economic, environmental and geopolitical conditions.

The consequences of the impact of economic activity on the Arctic ecosystems are multi-faceted. In addition to direct pollution of the atmosphere, soils and waters of the Arctic as a result of mining and transportation, noted in numerous works of Russian [8, Sedova N.B., Kochemasova E.Iu., pp. 817–818; 9, Karnaeva A., Kulikova O., Mazlova E., Buryak A., pp. 2–5] and foreign researchers [10, Walker T.R., Crittenden P.D., Dauvalter V.A. et al., pp. 769–773; 11, Tolvanen A., Eilu P., Juutinen A. et al., pp. 835–836 and references in this paper], the natural transfer of pollutants and the systemic impact of increased CO2 emissions on biological processes and circulation of substances in Arctic ecosystems are of paramount importance [12, Stern G.A., Macdonald R.W., Outridge P.M. et al., pp. 24–28; 13, Rani A., Gupta K., Saini K.C. et al., pp. 225–231]. Changes in concentrations of pollutants are noted as both in the main components of the Arctic natural environment [14, Schartup A.T., Soerensen A.L., Angot H., pp. 4–7; 15, Ershova A., Makeeva I., Malgina E. et al., pp. 3–5; 16, Ji X., Abakumov E., Polyako V. et al., pp. 4–8] and directly in living organisms [17, Sobolev N., Aksenov A., Sorokina T. et al., pp. 971–972], including in the organisms of people living in the macro-region [18, Varakina Y., Aksenov A., Lakhmanov D. et al., pp. 8–9]. General multidirectional dynamics of the current environmental pollution by certain substances [19, Evans L.K., Nishioka J., pp. 53–56; 20, Zhang W., Paatero J., Leppänen A.P. et al., pp. 4-7], differentiated also in the spatial section [21, Makosko A.A., Matesheva A.V., pp. 41; 22, Zaikov K.S., Sobolev N.A., pp. 247–250], should be noted. With regard to the AZRF and the regions of the North, researchers note a strong correlation between the types of environmental pollution and the spatial specifics of operating enterprises [23, Glazyrina I.P., Zabelina I.A., pp. 1052–1056; 24, Druzhinin P.V., Shkiperova G.T., Potasheva O.V., Zimin D.A., pp. 136–138; 25, Zabelina I.A., Delyuga A.V., Zabelina N.I., pp. 138–141].

In addition to direct physiological effects on human health [26, Plusquellec P., Muckle G., Dewailly E. et al., pp. 21–24; 27, Lamoureux-Tremblay V., Muckle G., Maheu F. et al., p. 7], socio-psychological consequences of environmental pollution are dangerous and closely related [28, Saraeva N.M., Galiakberova I.L., Sukhanov A.A.; 29, Saraeva N.M., Sukhanov A.A., pp. 86–88]. The level of susceptibility of the population to environmental threats, in particular, the subjective feeling of insecurity, is one of the key parameters of the social well-being of the residents of the Arctic regions [30, Romashkina G.F., Vylegzhanina A.O., pp. 126–127]. This study points out the discrepancy between the threats perceived by the population and the objective growth of environmental hazards on the example of the Yamalo-Nenets Autonomous Okrug. In earlier studies, we noted similar phenomena, but only for a number of environmental components, and first of all for pollutions, which due to their nature practically exclude identification with the help of the senses — “with the naked eye” [6, Volkov A.D., Tishkov S.V., Karginova -Gubinova V.V., Shcherbak A.P.]. At

the same time, for some types of pollution, the respondents' assessment allows to qualitatively supplement the available official, statistical and scientific data not only on environmental problems in the Arctic regions, but also on the sources of their occurrence [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P.].

Despite the fact that a number of studies note the relative ecological well-being of the territories of the Nenets Autonomous Okrug [31, Rozhnov V.V., Lavrinenko I.A., Razzhivin V.Yu. et al.; 32, Yakovlev E., Puchkov A., Malkov A., Bedrina D., p. 8], a number of local problems affect the health of the local population and the content of pollutants in human organisms [18, Varakina Y., Aksenov A., Lakhmanov D. et al., pp. 8–9]. The consequences of accidents at the largest enterprises in the region and transport infrastructure, due to their geographical location, are dangerous both for the territories of the Nenets Autonomous Okrug and for the neighboring Arctic territories of the Komi Republic. Examples are the emergencies of October 2020 (oil spill at the Kharyaginskoe field oil pipeline) and of May 2021 (oil spill at the Oshskoe field infrastructure), resulted in significant environmental damage in the mentioned territories.

Within the framework of this work, the existing studies of the environmental and economic problems of the Arctic territories will be supplemented by a comprehensive analysis of the current situation in the Nenets Autonomous Okrug.

Materials and methods

The object of the study is the Nenets Autonomous Okrug included in the AZRF in accordance with the provisions of the Decree of the President of Russia "On land territories of the Arctic zone of the Russian Federation" [2]. The main objectives of the study are:

1. Summarize and update data on environmental and economic processes and development problems of the Nenets Autonomous Okrug. The information basis for solving this task was the data of official authorities and departments, statistical information, as well as the data received in response to official requests to these structures.

2. Supplement the information obtained at the first stage with the results of a specialized sociological study on the territory of the Nenets Autonomous Okrug. A mass questionnaire survey of the population was conducted from May to June 2022.

3. Based on the results of a comprehensive economic and sociological study, draw conclusions about the dynamics of environmental and economic processes and urgent ecological problems in the development of the Nenets Autonomous Okrug.

In connection with the previously noted extreme differentiation of the spatial development of the region and the uneven location of the population, the sociological part of the study was conducted in a number of settlements, including remote ones (Fig. 1). A combined survey method

[2] Ukaz Prezidenta Rossiyskoy Federatsii ot 02.05.2014 g. № 296 «O sukhoputnykh territoriyakh Arkticheskoy zony Rossiyskoy Federatsii» [Decree of the President of the Russian Federation of 02.05.2014 No. 296 "On land territories of the Arctic zone of the Russian Federation"]. URL: http://www.kremlin.ru/acts/bank/38377 (accessed 15 November 2022).

was used: the main part of the sample, formed in the most populated and transport accessible towns and villages (Naryan-Mar, Iskateley village, Krasnoe village and Telviska village), was covered by direct personal formalized interviewing; remote and sparsely populated areas (Nes, Nelmin-Nos, Karatayka and Ust-Kara villages) were surveyed using an Internet questionnaire. The total sample size was 539 people [3]. All respondents were informed about the purpose of the study and expressed their willingness to cooperate.

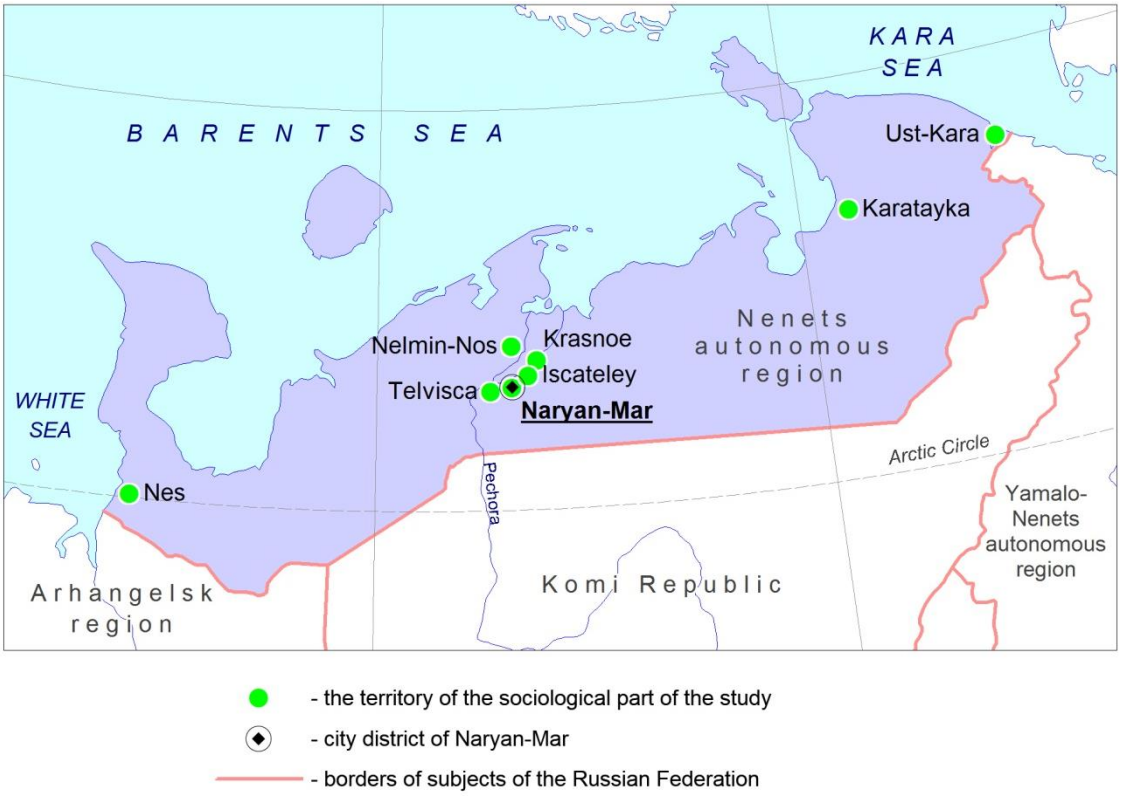

Fig. 1. Territories of the study — Nenets Autonomous Okrug.

The technical processing of the obtained data was carried out in the SPSS system. Data analysis was conducted using the methods of spatial economics, ecological economics, statistical analysis, sociological analysis and dialectical approach.

Results and discussion

Ecological situation in the Nenets Autonomous Okrug in official data

In 2021, the total volume of emissions of pollutants into the atmosphere in the Nenets Autonomous Okrug amounted to 56.1 thousand tons [4], the dynamics of emissions for 2018–2021 presented in table 1.

[3] The sample is distributed as follows: Naryan-Mar – 291 people, Iskateley – 98 people, Krasnoe – 56 people, Telviska – 37 people, Nes – 20 people, Nelmin-Nos – 15 people, Ust-Kara – 15 people, Karatayka – 7 people.
[4] Calculated by the authors based on Rosprirodnadzor data.

Table 1

Air pollutant emissions within the boundaries of the Nenets Autonomous Okrug, tons [5, 6].

Territory	2018	2019	2020	2021	including in 2021 without cleaning
Total volume: Nenets Autonomous Okrug	73 140	66 883	59 366	56 083	56 077
Including: Naryan-Mar urban district	515	739	1 237	1 282	1 282
Zapolyarnyy municipal district	72 625	66 144	58 129	54 802	54 795
Per square kilometer: Nenets Autonomous Okrug	0.41	0.38	0.34	0.32	0.32
Including: Naryan-Mar urban district	11.41	16.39	27.41	28.40	28.40
Zapolyarnyy municipal district	0.41	0.37	0.33	0.31	0.31
For reference: Russian Federation	1.00	1.01	0.99	1.00	0.91

For 2018–2020, all air emissions were not cleaned.

The main cause of air pollution in the Okrug is the activities of oil and gas extraction companies, as well as fuel combustion in the heat and power supply and vehicle traffic [7] (in 2021, about 26% of pollutant emissions were associated with fuel combustion [8]). It should be noted that all large and hazardous enterprises, in particular, oil and gas producers, are located several hundred kilometers away from settlements [9], and the level of pollutant emissions per square kilometer in 2021 in the Nenets Autonomous Okrug (0.3 tons) was more than three times lower than the same indicator for the Russian Federation as a whole (1.0 tons) [10]. Taking it into account, it is impossible to speak about the general high risk of air pollution in the Okrug, these risks are rather of a local nature.

The volume of wastewater discharge is presented in Table 2. It should be noted that in recent years this indicator has decreased by almost a third (due to the reduction in discharges of

[5] Data on facilities with emissions of more than 10 tons of air pollutants per year (and 5–10 tons for substances of I–II hazard classes).
[6] Calculated by the authors based on data from Rosprirodnadzor and FSSS.
[7] Doklad «O sostoyanii i ob okhrane okruzhayushchey sredy Nenetskogo avtonomnogo okruga v 2021 godu» [Report "On the state and protection of the environment of the Nenets Autonomous Okrug in 2021"]. Department of Natural Resources, Ecology and Agro-Industrial Complex of the Nenets Autonomous Okrug. Naryan-Mar, 2022, 141 p.
[8] Calculated by the authors based on Rosprirodnadzor data.
[9] Doklad «O sostoyanii i ob okhrane okruzhayushchey sredy Nenetskogo avtonomnogo okruga v 2021 godu» [Report "On the state and protection of the environment of the Nenets Autonomous Okrug in 2021"]. Department of Natural Resources, Ecology and Agro-Industrial Complex of the Nenets Autonomous Okrug. Naryan-Mar, 2022, 141 p.
[10] Calculated by the authors based on data from Rosprirodnadzor and FSSS.

Naryan-Mar enterprises). However, almost the entire volume of wastewater is treated to standard values, while this rate across Russia is much lower.

Table 2

Wastewater discharge within the boundaries of the Nenets Autonomous Okrug, mln m³ [11]

Area	2018	2019	2020	2021
Wastewater discharge volume, million m³: Nenets Autonomous Okrug	3.00	2.40	2.50	2.00
Including: Naryan-Mar urban district	2.03	1.40	1.20	1.04
Zapolyarny municipal district	0.97	1.00	1.30	0.96
Share of wastewater treated to standard values in the total volume of wastewater discharged through treatment facilities, %: Nenets Autonomous Okrug	100.0	100.0	99.98	n/d
For reference: Russian Federation	46.50	45.73	44.33	n/d

It should be noted that the quality of water from the distribution network has remained at approximately the same, but rather low, level in recent years. In 2021, 14.0% of water samples did not comply with established standards. In general, a significant problem for the Okrug is the increased iron content in the used waters. This problem is especially relevant for the village of Iskateley, where four out of five water samples had an increased content of it. In Naryan-Mar, water supply problems are exacerbated by the high degree of deterioration of the water supply network. In the villages of Karatayka, Nelmin-Nos and Ust-Kara, water supply is arranged from block-modular water treatment plants, there are no distribution networks, and no sanitary protection zone has been created. There is a decentralized water supply (wells and boreholes) in the villages of Krasnoe, Nes and Telviska. The share of non-centralized water supply sources that do not meet sanitary requirements in the Okrug as a whole in 2021 was 24.3%, which is slightly higher than the average for the Nenets Autonomous Okrug.

The provision of quality water is complicated by the natural and climatic features of the territory, in particular, its high swampiness and the presence of permafrost. The importance of water resources in the life of the local population and, in particular, the prevalence of fisheries is noteworthy; commercial fishing is carried out. At the same time, since the 1990s, there has been a fifty-fold decrease in the volume of catch in different areas of the NAO. On the one hand, it was caused by the pollution of water bodies by enterprises producing electricity, extracting and processing oil, gas, and coal. On the other hand, unauthorized fishing and irrational use of water bodies have also played an important role.

The level of solid municipal waste generation for 2021 per inhabitant of the Nenets Autonomous Okrug (according to the average annual population) amounted to 0.3 tons, which is 1.2 times less than the Russian average [12]. In Naryan-Mar, there was 0.4 tons of waste per person, which is higher than the average for the Okrug and for Russia as a whole. However, from 2017 to

[11] Calculated by the authors based on FSSS data.
[12] Calculated by the authors based on the FSSS and UISIS data.

2021, there has been a 2.1 times reduction in solid municipal waste formation by weight in the Okrug, while the volume has increased by 1.1 times [13].

The share of production and consumption waste per unit of produced gross regional domestic product in the Nenets Autonomous Okrug is also lower than in the Russian Federation as a whole, but this is primarily due to the economic specialization of the territory [14].

The share of utilized production and consumption waste in Nenets Autonomous Okrug as a whole was 87.7% in 2021, which is 1.9 times higher than the national average, however, the share of recycled waste in the Okrug is lower (30.0% compared with 40.7% in the Russian Federation as a whole). The low share of solid municipal waste sent for recycling (sorting) in their total mass is also noteworthy: in 2021, this indicator for the Nenets Autonomous Okrug was 14.4%, for Russia as a whole — 46.5% [15]. Thus, we can conclude that the re-use (efficient use) of waste is not developed in the region.

The number of unauthorized dumps in the Nenets Autonomous Okrug as of October 2022 is 58, the number of waste disposal sites is 18, including 17 temporary ones, for up to 11 months (see Table 3). Formation of unauthorized dumps and difficulties with their liquidation are primarily associated with the underdevelopment of the transport infrastructure (lack of year-round roads) in the territories of rural settlements.

Table 3

Number of authorized and unauthorized waste disposal sites [16]

Area	Number of authorized MSW disposal sites		Number of unauthorized MSW disposal sites	Population density, people per square kilometer
	active	planned in 2022–2023		
Nenets Autonomous Okrug	18	20	58	0.25
Including: Naryan-Mar urban district	1	n/d	22	571.60
Zapolyarnyy municipal district	17	20	36	0.11
Including: Karskiy village council (Ust-Kara)	0 (0)	1 (1)	1 (1)	586.96[17]
Kaninskiy village council (Nes)	1 (1)	2 (0)	3 (1)	131.16
Malozemelskiy village council (Nelmin Nos)	1 (1)	0 (0)	1 (1)	786.81

[13] Calculated by the author according to the FSSS data.
[14] Calculated by the authors based on UISIS and Rosprirodnadzor data.
[15] Calculated by the authors based on Rosprirodnadzor data.
[16] Pis'mo v administratsiyu munitsipal'nogo obrazovaniya «Gorodskoy okrug «Gorod Nar'yan-Mar» ot 18 oktyabrya 2022 g. № 6204/01-26. Istochnik: Ofitsial'nyy zapros KarNTs RAN; Pis'mo v administratsiyu munitsipal'nogo rayona «Zapolyarnyy rayon» Nenetskogo avtonomnogo okruga» ot 3 noyabrya 2022 g. № 01-30-2743/22-0-1. Istochnik: Ofitsial'nyy zapros KarNTs RAN [Letter No. 6204/01-26 dated October 18, 2022 to the administration of the municipal formation "City District" City of Naryan-Mar. Source: Official request of KarRC RAS; Letter to the administration of the municipal district "Zapolyarnyy district" of the Nenets Autonomous Okrug dated November 3, 2022 No. 01-30-2743 / 22-0-1. Source: Official request of KarRC RAS].
FSSS data.
[17] The high values of population density indicators in the village councils of the Nenets Autonomous Okrug are primarily due to their small administrative boundaries.

Yusharskiy village council (Karatayka)	1 (0)	1 (1)	2 (1)	105.20
Telvisochniy village council (Telviska)	2 (1)	1 (0)	1 (0)	222.61
Primorsko-Kuiskiy village council (Krasnoe)	0 (0)	3 (1)	3 (3)	377.41
Work settlement Iskateley	0	0	1	824.19
Others	12	12	24	0.03

Noise pollution is associated with industrial and economic activities. The transport sector also makes a significant contribution. It should be noted that one of the most environmentally friendly types of transport — railway (taking into account its electrification) — is absent in the Okrug. However, unlike some other northern territories, water transport is developed, which has a relatively low negative impact on the environment, especially in the field of passenger and household transportation (but a number of works note the need for further research on the impact of maritime transport on the ecology of the Arctic [33, Svavarsson J., Guls H.D., Sham R.C., Leung K.M.Y., Halldórsson H.P., p. 6]). At the same time, non-ecological types of transport are also developing: road and air. Taking into account economic specialization, pipelines are functioning. In general, we can talk about a rather low transport development of the territory.

Summing up, we can conclude that the relatively favorable values of some environmental indicators, in particular, the level of emissions of pollutants into the atmosphere, the volume of waste generation (but not disposal), the noise level are associated with underdevelopment, low population density and relatively low anthropogenic load. At the same time, the same circumstances are an obstacle in providing the population with quality water and organizing waste recycling. The region's leading industry — oil and gas — has the greatest negative impact on the quality of the environment. Geological exploration and field development disturb the land; associated gas flaring generates significant emissions of pollutants into the atmosphere, etc.

State and dynamics of the ecological situation in the Nenets Autonomous Okrug in the assessments of the residents. Environmental well-being

Satisfaction of the population with the state of the environment was studied in the context of both individual objects of assessment of various scales (from the place of residence to the world), and by various components of the environment. The results of answers to the question "How satisfied are you with the state of the environment?" were also differentiated by the territory of residence (Fig. 2) [18].

[18] A 5-point scale was used (from 1 — "absolutely not satisfied" to 5 — "completely satisfied").

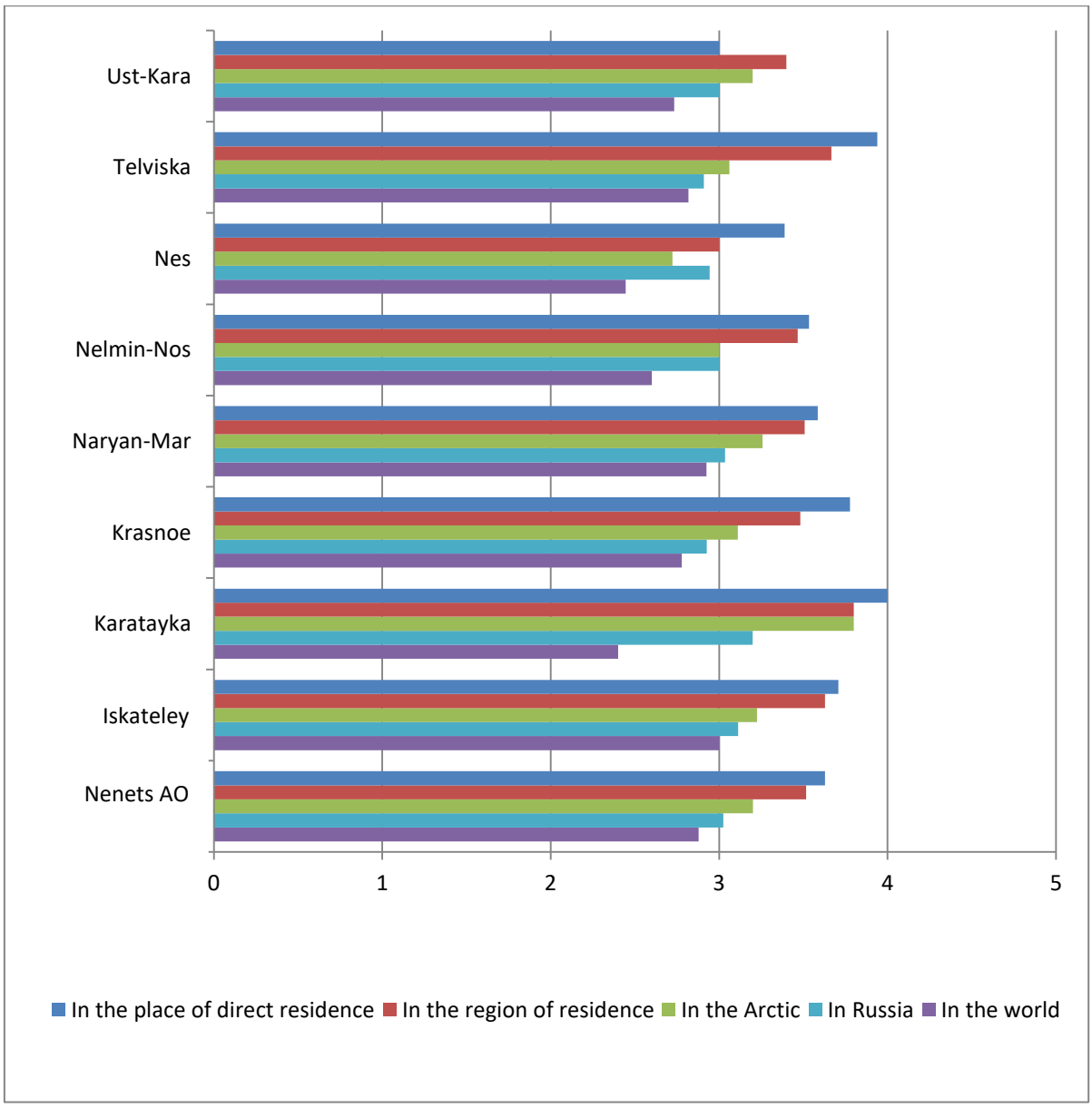

Fig. 2. Assessment by the residents of the Nenets Autonomous Okrug of satisfaction with the state of the environment, % of the number of respondents.

Consideration of the ratios of assessments of the environmental situation by settlements reveals a tendency of more critical perception of the state of the environment in objects of assessment on a larger scale. Obviously, this is due to the generally negative information agenda in the media coverage of the problems of ecological well-being at the national and global levels.

The dynamics of the state of the environment over the past 10 years was assessed by respondents on the scale of their place of residence, region of residence, the Arctic, Russia and the world (in particular, in Fig. 3, 4).

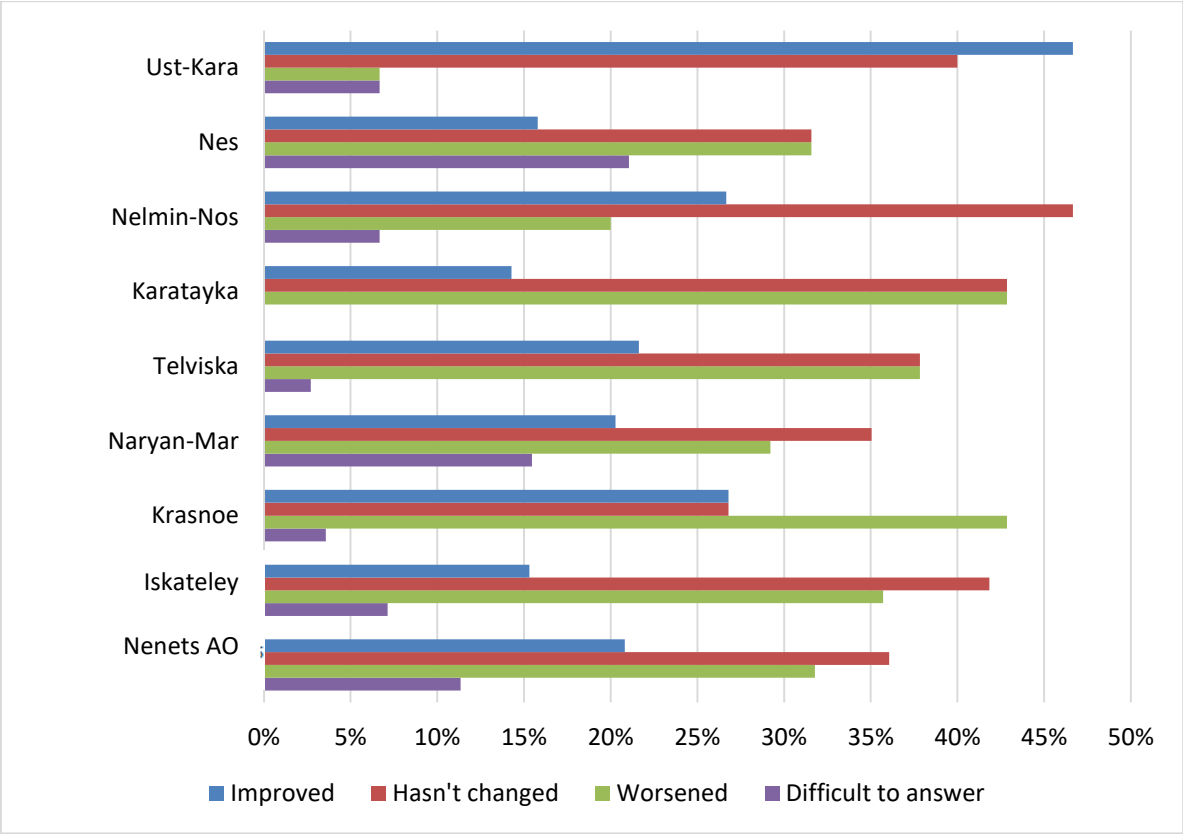

Fig. 3. Assessment by residents of the Nenets Autonomous Okrug of changes in the state of the environment over the past 10 years in the place of their residence, % of the number of respondents.

It should be noted that respondents are most critical of changes that have taken place on the scale of Russia and the world, most positive — on the scale of the place and the region of residence. Moreover, the share of negative assessments grew in direct proportion to the increase in the scale of the object of assessment. Besides, as the transition to objects of greater spatial coverage, an increasing proportion of respondents found it difficult to answer the question (Fig. 3, 4). In general, the noted features are consistent with the data obtained in other regions of the Russian Arctic [6, Volkov A.D., Tishkov S.V., Karginova-Gubinova V.V., Shcherbak A.P.].

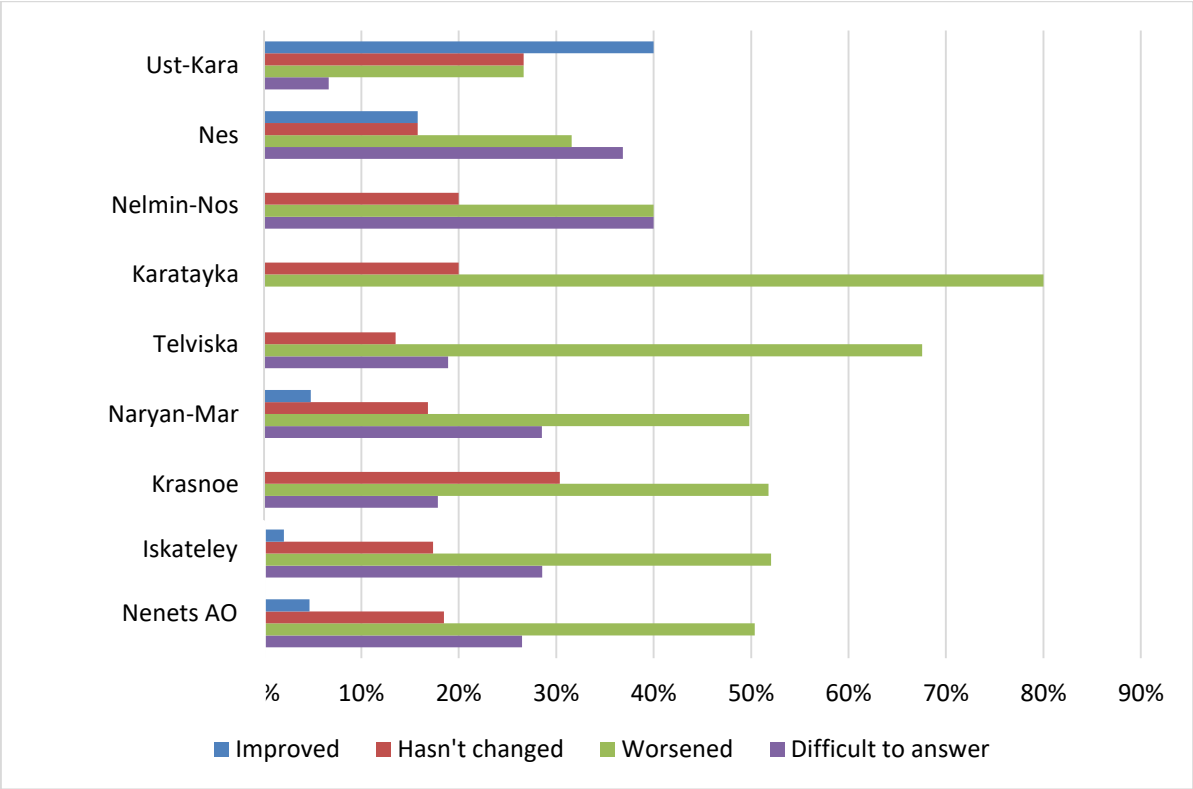

Fig. 4. Assessment by residents of the Nenets Autonomous Okrug of the dynamics of the state of the environment over the past 10 years across Russia, % of the number of respondents.

At the local level, in most settlements, with the exception of Ust-Kara and Krasnoe, the predominant assessment of the dynamics of the situation is “has not changed”, combined with an approximately equal proportion of respondents in Telviska, Karatayka and Nes who noted the deterioration of the situation.

Satisfaction of the population with the state of the environment in the place of residence differs significantly in its main components. The residents of the Nenets Autonomous Okrug are most satisfied with air quality and noise level (Fig. 5), which can be explained by the remoteness of the main enterprises from the settlement centers, as well as the overall small population of the region. The population is the least satisfied with water quality — 46% of respondents expressed a negative assessment (“completely unsatisfied” and “not satisfied”). The state of forests and parks, as well as the cleanliness of the environment, are also assessed quite critically — 37% and 33% of negative assessments, respectively (Fig. 5).

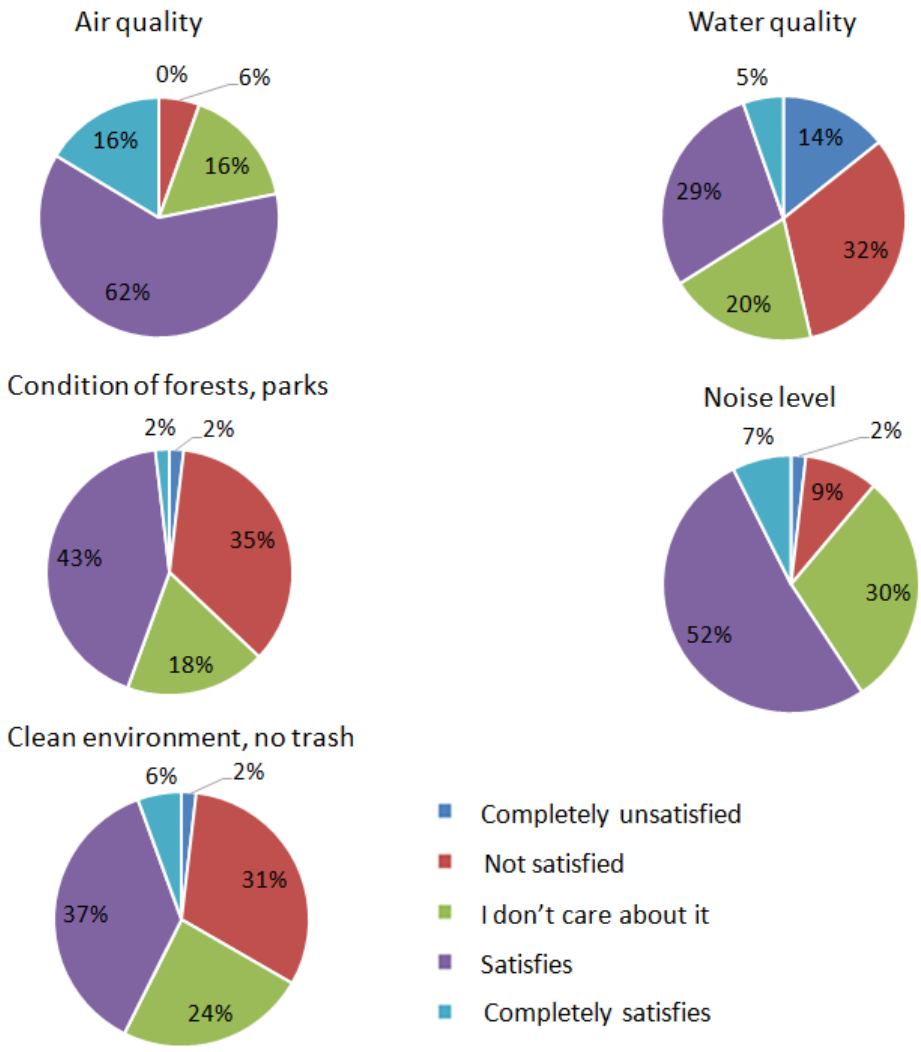

Fig. 5. Satisfaction of the population of the Nenets Autonomous Okrug with the main components of the natural environment, % of the number of respondents.

The population's perception of sources of pollution and threats to the environment [19] in the place of residence reflects the spatial distribution and nature of the main production and infrastructure facilities in the region. Thus, the most critically perceived source of environmental threats in Nenets AO is the activity of oil and gas enterprises (harmful emissions into the atmosphere, oil spills): 49% of respondents noted it as a moderate threat (answer options "weakly threatens" or "threatens"), 35.5% — as a pronounced threat (answer options "strongly threatening" or "very threatening"). The second and third most significant threats were illegal dumps of the population and household waste and illegal dumps of enterprises — 24.5% and 15% of respondents noted them as highly threatening or very highly threatening. Transportation and related issues (air pollution, oil spills, etc.) were perceived by the population as relatively significant but moderately threatening. It was noted as weakly threatening or threatening by 60.1% of respondents, and as strong or very strong threat — by 9.3%.

[19] The question "How do you assess the threat to the environment in the place of your direct residence from the listed objects?". Response on a 5-digit scale "not threatening – slightly threatening – ... – very threatening".

In terms of perceived threats, the spatial context of the respondents' place of residence was much more pronounced than in other survey questions. For example, in the village of Nes near Arkhangelsk Oblast, military activities (residues of incomplete fuel combustion, radioactive contamination, etc.) were mentioned by 65% and 25% of respondents as moderate or pronounced threats, respectively. Estimates of the following locality-specific threats were also considerably higher than the average (Table 4):

Table 4

Local features of perceived threats to the environment [20]

Settlement	Source of threat to the environment
Krasnoe village	1. Activities of oil and gas enterprises
Nes village	1. Unauthorized fishing, logging by entrepreneurs 2. Military activities (residues of incomplete fuel combustion, radioactive contamination, etc.)
Nelmin Nos village	1. Unauthorized fishing, logging by entrepreneurs 2. Illegal dumps of the population, household waste 3. Transport and related issues (air pollution, oil spills, etc.)
Naryan-Mar	1. Illegal dumps of the population, household waste
Ust-Kara village	1. Fish farming, trout farming

Another important aspect of social well-being is the perceived ability of citizens to influence the environmental sustainability of the place of residence within the framework of existing social institutions. This aspect has been developed quite fully in modern theories of economic and pro-environmental behavior of individuals [34, Stern P.C.; 35, Zhang J., Gong X., Zhu Zh., Zhang Zh.]. In terms of the previously identified importance of the problem of household waste in the study areas as a sphere that depends to some extent on the behavioral attitudes of people, it is interesting to consider the answers of the respondents to the question "Does the existing legislation help citizens to take care of nature, the state of the environment and the living environment?" (Fig. 6).

[20] Compiled by the authors based on the research materials.

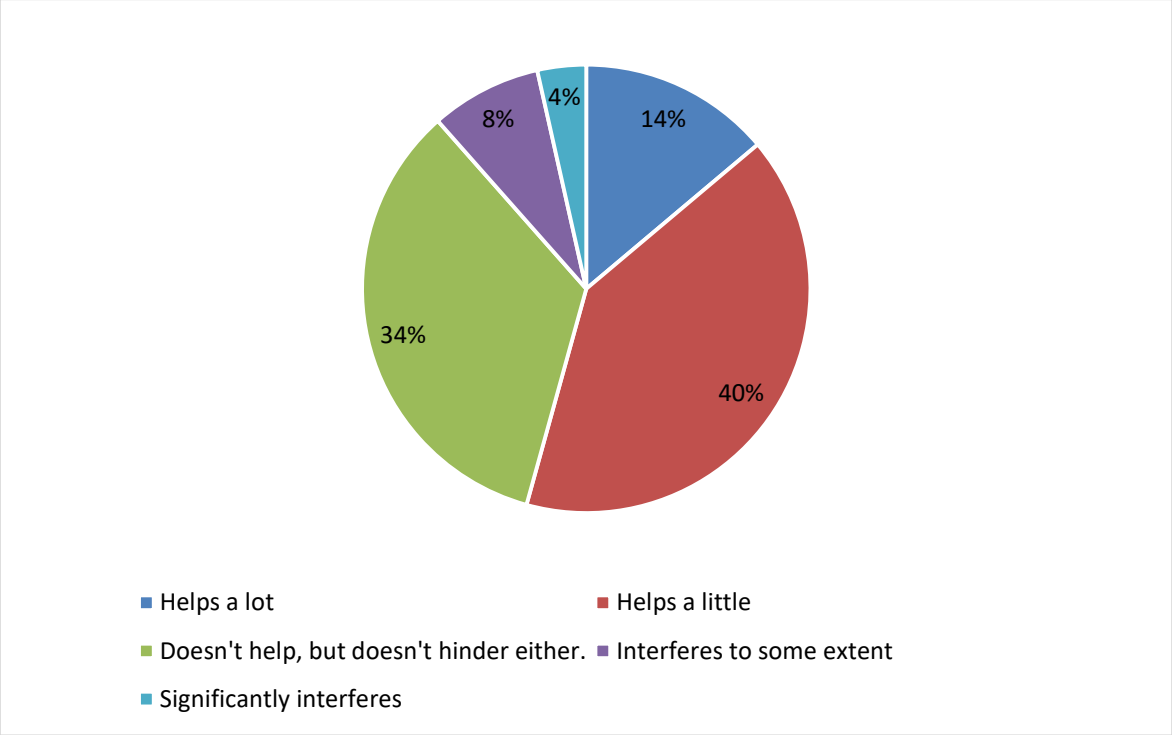

Fig. 6. Distribution of answers to the question “Does the existing legislation help citizens to take care of nature, the state of the environment and the living environment?”.

Although a relatively small proportion of respondents noted the negative impact of legislation on environmental activity, the assessments of respondents who stated that the legislation “does not help, but does not hinder either” in caring for the living environment and the state of ecology (34%) are much more indicative. Thus, according to 46% of respondents, in this area, public institutions do not fulfill their direct function of ensuring effective interaction between actors in the field of environmental well-being.

Summing up the consideration of the results of the sociological part of the study, it should be noted that most of the respondents positively assess the state of the natural environment in the place of their residence. However, as the scale of the object of assessment increases (the region of residence, the Arctic, Russia and the world), we see a decrease in respondents’ satisfaction, which is obviously associated with the negative information background in the media and social networks on these issues. The assessment of the dynamics of the state of the natural environment over the past 10 years has the same feature — while the majority of respondents tend to characterize the dynamics as neutral when considering the place of residence, they are rather negative when assessing large objects.

The population is most critical about the quality of the water resources, as well as the condition of forests and parks and the cleanliness of the environment. At the same time, when assessing local sources of threats to the state of the natural environment, the spatial specificity of populated areas is most clearly seen: for the central regions, the threat from oil and gas enterprises is the most pronounced, in remote villages, engaged mainly in fishing, unauthorized fishing is important, and some respondents noted local collective farms as an independent threat.

Conclusion

Generalization of statistical data, data from official sources and results of the sociological survey of the population of the Nenets Autonomous Okrug allows us to conclude that the ecological sustainability of the region is conditioned by a complex of general and particular factors of anthropogenic influence. The common threats for the majority of territories are:

- impact of extractive industries on the state of the environment both in the place of their localization and in the surrounding territories, determined by the natural transfer of pollutants;
- pollution of territories with household waste. This problem is reflected both in the data on the number of landfills and waste disposal sites, and in the respondents' assessments. The most important cause of the problem is the extremely small number of authorized places for permanent disposal of waste, the low degree of recycling and the underdevelopment of transport infrastructure. The low population density in most areas makes environmentally efficient waste management economically unfeasible and extremely costly;
- transport and related issues.

Among private or local threats to the ecological well-being of the territories, unauthorized fishing (mainly for fishing settlements) and the side effects of defense activities (for the northwestern territories) should be noted first of all. As an independent threat, a number of respondents indicated the activities of local fishing collective farms, polluting the coastal areas with the by-products of primary fish processing.

The assessment of threats correlates with the satisfaction of the population with the main components of the environment: the quality of water resources, the state of forests and parks, and littering of territories are perceived most critically. The reason for adjusting state regulation measures in the field of environmental sustainability of the territories of the Nenets Autonomous Okrug is the relatively low assessment of the effectiveness of existing legislation in the field of environmental protection.

The priority measure to optimize the environmental component of social well-being is the formation of economic incentives for sorting and increasing the degree of processing of household and industrial wastes. For fishing collective farms, the processing of biological waste is relevant in accordance with the technologies developed by scientists from the Karelian Research Center of the Russian Academy of Sciences and the KSC of the Russian Academy of Sciences, as well as practices used in trout breeding enterprises of the Republic of Karelia. In the context of sanctions pressure and technological blockade, the problem of maintenance of oil and gas pipelines and production facilities, and minimization of environmental risks due to equipment depreciation remains the most acute.

A more detailed study of the relationship between the social well-being of the population of the Arctic territories, perceived environmental threats and institutional mechanisms in the environmental and economic sphere should be noted as a promising area of research.

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The Choice of Tourist Destinations by Residents of the Arctic Zone of the Russian Federation: General Trends and Specifics (2004–2021)

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Abstract. Taking into account the importance of maintaining and restoring physical and emotional strength, the need to reproduce human capital in harsh natural and climatic conditions of life, the problem of organizing tourism and recreation for the population of the the Arctic zone of the Russian Federation is an important area of scientific research. Despite the growing interest in the Arctic, the issues of choosing tourist destinations by residents of the Arctic regions and their change under the influence of modern challenges remain outside the scope of scientific research. This paper seeks to answer these important questions from the perspective of recreation in the Arctic. The aim of the study is to identify the general trends and specifics of the organized outbound tourism development in the Arctic zone of the Russian Federation under the influence of the modern challenges for the period 2004–2021 on the basis of the official statistical data. The model site of the study is nine Arctic Russian regions, fully and partially belonging to the Arctic zone of the Russian Federation. The study allowed assessing the dynamics, general trends and specifics of the development of outbound tourist flow of residents of the Arctic subjects in comparison with the average Russian indicators in the context of domestic and international tourism. It reveals changes in the volume of organized tourist flow, as well as its redistribution between tourist destinations under the influence of the challenges of our time.

Keywords: *Arctic zone of the Russian Federation, Arctic region, choice of tourist destinations, outbound organized flow, local population, tourist flow, modern challenge*

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Introduction

The importance of maintaining and restoring physical and emotional strength, reproduction of human capital in severity of natural and climatic characteristics of life activity actualizes the problem of organizing tourism and recreation for the local population of the Arctic regions of the Russian Federation. What tourist destinations do residents of the Arctic zone of Russia choose? How have the preferences of the local population in the field of organized tourism changed under the influence of the challenges of our time? Are there any differences in the choice of tourist destinations in comparison with the average resident of the Russian Federation? This article is devoted to the search for answers to these questions, the purpose of which is to identify the general

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patterns and specifics of the development of organized outbound tourism in the Arctic zone of the Russian Federation under the influence of the challenges of our time based on official statistical data for the period 2004–2021.

Theoretical aspects of the problem

In the works devoted to the study of the Russian Arctic, attention is focused on the special economic and harsh climatic characteristics of the territory, including both uncomfortable natural conditions of work and residence, and unfavorable environmental situation, which together have a negative impact on the lifestyle and quality of life of the population [1, Moroshkina M.V., Potasheva O.V.]. In addition, the problem of youth outflow from the Arctic regions of the Russian Federation under the influence of both objective and subjective factors intensifies the need to preserve and reproduce human capital [2, Simakova A.V.]. According to the study of Sorokina N.S. (Plekhanov Russian University of Economics, Russian Foreign Trade Academy of the Ministry of economic development of the Russian Federation), "despite the positive dynamics of economic development, the coastal regions of the Arctic have not yet been able to provide a decent standard of living of the population and stimulate the development of social infrastructure at the level of the regions of the central part of the Russian Federation" [3].

In this regard, the issue of tourism and recreation opportunities for residents of the Arctic regions seems to be one of the most significant areas of scientific research. In addition to the above conditions and demands, the need and importance of the development of the Arctic zone of the Russian Federation is growing. Thus, a team of scientists from the Institute of Market Problems of the Russian Academy of Sciences offers three most promising concepts for developing the potential of the Russian Arctic, which can be the basis for the dynamically sustainable and environmentally safe development of the region, one of which is the transport and tourism concept [4, Tsvetkov V.A., Dudin M.N., Yurieva A.A.].

It should be noted that the corpus of works on assessing the potential, analyzing the possibilities and limitations of the development of the tourist and recreational sphere of activity in the Arctic, on the development of Arctic tourism is constantly expanding. Thus, the application of a balanced author's approach to assessing the tourist potential of the regions of the Arctic zone of the Russian Federation allowed a team of scientists from the Northern (Arctic) Federal University named after M.V. Lomonosov to identify the main problems and determine the directions for increasing the tourism potential of the Arctic territories [5, Myakshin V.N., Shaparov A.E., Tikhanova D.V.]. In the works of researchers of the Karelian Research Center of the RAS, it is emphasized that "when planning the development of tourism in the northern and Arctic regions of the European North, it is necessary to take into account the greatest vulnerability of their natural ecosystems" [6, Moroshkina M.V., Vasilyeva A.V., Kondratyeva S.V.]. Meanwhile, Sevastyanov D.V. (Saint Petersburg State University) emphasizes that "most of the tourist attractions in the Arctic are difficult to access" due to their location "mainly in specially protected natural areas", therefore "the

accessibility of tourism facilities will increase with the strengthening and development of transport communications and ports on the Northern Sea Route, as well as the formation of the infrastructure of settlements, seaports and airports in the Arctic regions of the Russian Federation" [7, Sevastyanov D.V.].

Summarizing the available theoretical and practical developments on the issue under study, one should state a sufficient share of works that reveal the potential and opportunities for the development of the tourism business, the strategic directions of its development, the assessment of various factors that have both a stimulating and a deterrent effect on the functioning of the tourist and recreational spheres of activity [8, Lukin Yu.F.; 9, Sevastyanov D.V.; 10, Bayaskalova T.A., Kuklina M.V., Bogdanov V.N.; 11, Timoshenko D.S.; 12, Timoshenko D.S.]. Works that reveal the problems of the development of cruise tourism deserve special attention [13, Kunnikov A.V.; 14, Zhilenko V.Yu.], which, according to Rosstat, is "the most popular type of tourism in the Arctic" [15, Menshikova T.N.]. Based on the assessment of economic, socio-economic and infrastructural factors, researchers have identified general trends in the development of tourism and recreation in the regions of the Arctic zone of the Russian Federation [16, Moroshkina M.V., Kondratyeva S.V.], which made it possible to conclude that, on the one hand, residents of the Arctic regions "are characterized by high opportunities in organizing tourist trips and spending leisure time, which is determined by financial indicators, the duration of vacations", on the other hand, "extremely low average indexes of priority spending on recreation [...] on the territory of permanent residence".

A significant share of works is devoted to the dynamics and structure of tourist flows in the regions of the Arctic zone of the Russian Federation. However, most of the studies reveal the problems of inbound tourism in the regional context [17, Tereshchenko E.Yu.; 18, Kolesnikov R.A., Loktev R.I.; 19, Sevastyanov D.V.], the analysis of mutual tourist flows can be separated from the works devoted to the study of Russian regions as a whole [20, Moroshkina M.V., Kondratieva S.V.; 21, Kondratieva S.V.]. Although numerous works of researchers are devoted to the study of outbound tourism of Russians [22, Leonidova E.G.; 23, Rubtsova N.V., Solodukhin K.S.; 24, Akhremchik D.V.], the analysis of the outbound tourist flow of the Arctic regions is fragmentary and isolated.

The works revealing the problem of the impact of modern challenges on the development of tourism and recreation in the focus of opportunities for the population of the Arctic regions of the Russian Federation are significant [25, Konyshev E.V., Lutoshkina A.K.]. Based on the analysis of the impact of the COVID-19 pandemic, which brought serious changes in the geography of tourist flows and consumer behavior, Konyshev E.V. and Lutoshkin A.K. predict two scenarios for the development of tourism in the Russian Arctic in the short and long term. Thus, "the first scenario is possible with the complete removal of restrictions on international tourist trips, which will lead to a decrease in interest in recreation in the Arctic regions of Russia and a return to pre-pandemic indicators", the second one, "while maintaining restrictions on international travel [...] will con-

tribute to further growth of interest in nature-oriented types of tourism and travel", becoming a catalyst for the development of tourism infrastructure [25, Konyshev E.V., Lutoshkina A.K.].

Thus, the main focus of researchers' attention is directed to the development of the tourist and recreational activities in the regions of the Arctic zone of the Russian Federation (AZRF); the possibilities of spending leisure time and recreation of the local population in places of permanent residence are less often considered. These scientific areas are significant and relevant from the socio-economic, biomedical, geopolitical and other positions. At the same time, taking into account the severity of the natural and climatic conditions of life (for example, a collective work on the health safety of tourists [26, Chistova V.V., Logunova E.V., Pashinskaya K.O., Ryzhikova E.M. , Romanova E.D., Vasiliev A.G., Udalov A.N.]) and the need to restore human capital, it is interesting to study the choice of tourist destinations by the inhabitants of the Arctic regions, taking into account their high economic opportunities for organizing tourism. The concept of a tourist destination is understood as "a managed tourist system with a tourist resource potential that is competitive and steadily attracts tourist flows" [27, Gorbunov A.P., Kolyadin A.P., Burnyasheva L.A.].

Currently available developments are characterized by significant spatial, temporal and content gaps that do not allow forming ideas about the development, scale, general trends and specifics of outbound organized tourism for residents of the Arctic zone of the Russian Federation. The present study is aimed at filling in the existing scientific gap.

Research methodology

The aim of the work is to identify the general patterns and specifics of the development of organized outbound tourism in the Arctic zone of the Russian Federation under the influence of the challenges of modernity for the period 2004–2021 on the basis of official statistics. The article proposes a comprehensive approach to the study of outbound organized tourism of the population of the Arctic zone of the Russian Federation, based on an extensive statistical database of quantitative and qualitative indicators for the study period in the focus of international and domestic tourist flows in the regional context.

The model platform for the study is nine Russian Arctic regions, four of which are completely (Murmansk Oblast, Nenets, Yamalo-Nenets and Chukotka Autonomous okrugs) and five — partially (Republics of Karelia and Sakha and Komi republic, Arkhangelsk Oblast without counting NAO, Krasnoyarsk Krai) belong to the Arctic zone of the Russian Federation.

The work is based on official statistical data available in the context of the studied nine Arctic regions of the Russian Federation. The study analyzed a vast array of quantitative and qualitative indicators of the development of outbound organized tourism in the AZRF regions in the context of tours abroad and in Russia. The study made it possible to assess the dynamics, general trends and specifics of the development of the outbound organized tourist flow of the local population of the studied subjects in comparison with the average Russian indicators and in the regional context in the focus of domestic and international tourism.

The paper considers only the organized outbound tourist flow, which is understood as the number of Russian citizens sent by Russian companies on tours abroad or within Russia. Independent (unorganized) tourism is not considered in this work.

To achieve this goal, the following indicators were analyzed in the work:

- structure of organized outbound tourism for the period 2004–2021, %
- dynamics of organized outbound international tourism for the period 2004–2021, people;
- structure of organized outbound international tourism for the period 2004–2021, %;
- dynamics of organized domestic tourism for the period 2004–2021, people;
- structure of organized domestic tourism for the period 2004–2021, %;
- intensity of outbound international tourism in 2019 and 2021, people/1 thousand people;
- intensity of domestic tourism in 2019 and 2021, people/1 thousand people.

The selected indicators are analyzed for Russia as a whole, cumulatively for the regions of the Arctic zone of the Russian Federation, as well as in the context of the nine Arctic subjects under study.

The calculation of the index of the intensity of outbound organized tourism allows us to compile the objective mobility of the population of the studied subjects of the Russian Federation. The tourist preferences of the local population formed in the pre-pandemic period are reflected in the indicators for 2019, the calculation of data for 2021 demonstrates the overcoming of modern challenges in the focus of the tourist interests of residents of the Arctic regions. The calculation of the intensity of tourist flows is based on the volume of outbound organized tourism to the population of the Arctic regions of the Russian Federation in the context of international and domestic tourism (persons/1 thousand people).

The geography of tourist preferences of residents of the Arctic zone of the Russian Federation in 2019 and 2021 is considered in the country context. However, statistical data do not allow us to analyze the directions of domestic tourism; this study will consider the Russian destination as a whole.

The analysis is based on public data of state statistics. The time period of the study is limited by the representation of statistical data in open access. The median indicators are calculated.

Research results

The analysis of the structure of organized outbound tourist flow of the AZRF population in the period 2004–2021 reveals the prevalence of international tourism over domestic (Fig. 1). The growth in preference for foreign destinations, which has been outlined since 2004, reached its maximum by 2013, when only a fifth of the residents of the studied regions chose organized tourist trips around Russia. The period of restrictions of the COVID-19 pandemic and the launch of a program to subsidize domestic tourist trips (tourist cashback) had a dramatic impact on the choice

of holiday destinations by the local population. These trends are typical for the Russian Federation as a whole.

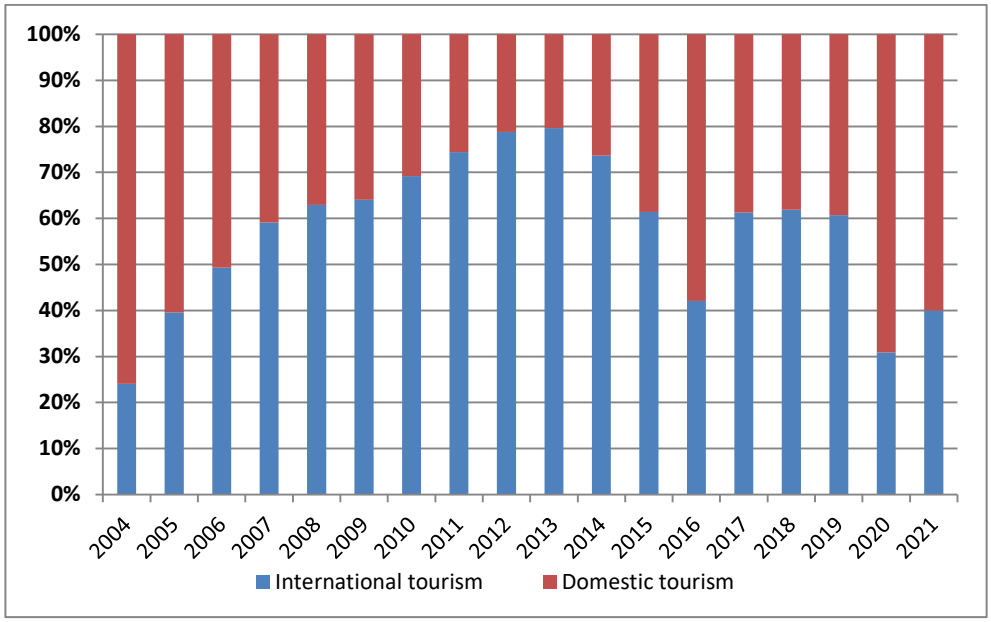

Fig. 1. Dynamics of the formation of outbound organized tourism in the regions of the Arctic zone of the Russian Federation for the period 2004–2021, % [1].

Organized tourist flow abroad

The dynamics of the organized tourist flow abroad in total for the studied Arctic regions for the period 2004–2021 is subject to the general patterns of development of outbound tourism and correlates with the dynamics of the tourist flow in the whole of the Russian Federation (Fig. 2). Separately, we can single out the period of 2012–2014, when there is a maximum increase in outbound organized tourist flow abroad (more than 300 thousand people per year) and, accordingly, the share of the Arctic regions (4.7%) in the general tourist flow of the Russian Federation. On average, the share of the Arctic regions in the formation of outbound organized tourist flow of Russians abroad is 3.1% for the study period (median). The collapse of outbound organized tourism in 2020 is both a global and an all-Russian trend due to the COVID-19 pandemic. The gradual lifting of restrictions materializes in the growth of quantitative indicators of international tourism.

[1] Source: compiled by the author based on state statistics.

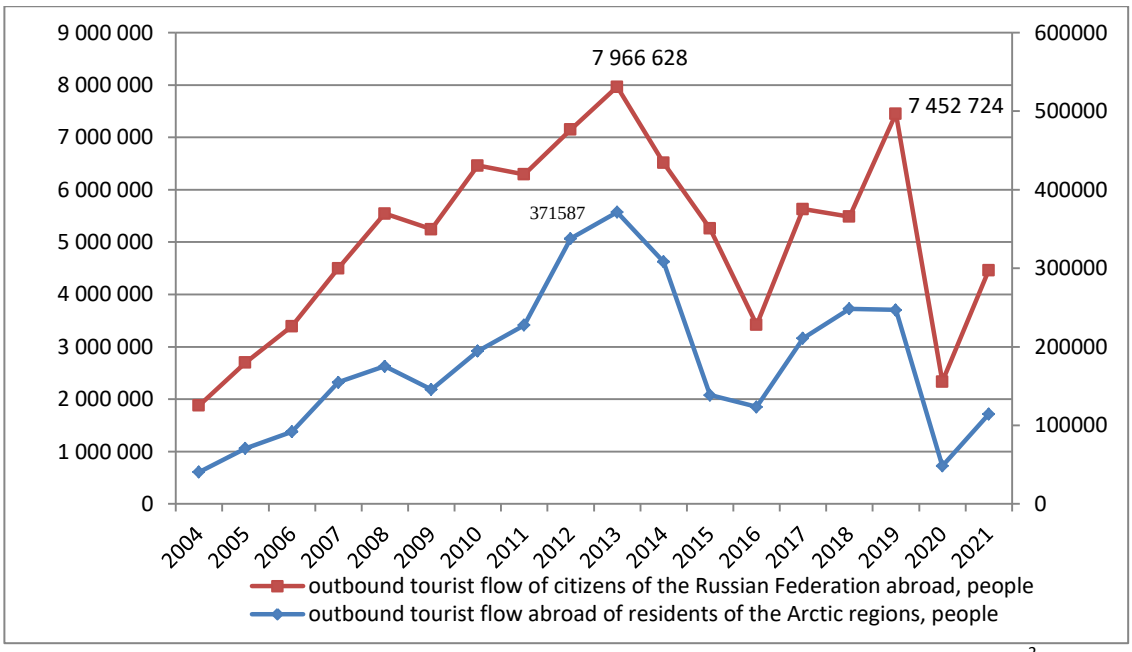

Fig. 2. Dynamics of organized international tourism for the period 2004–2021, people [2]

In the regional context, the formation of outbound organized tourism of the Arctic zone of the Russian Federation abroad for the study period of 2004–2021 is mainly due to the tourist flow of residents of the Krasnoyarsk Krai and the Arkhangelsk Oblast (Fig. 3). The share of tourists in the Chukotka Autonomous Okrug tends to zero (the maximum figure in 2013 was 0.06%).

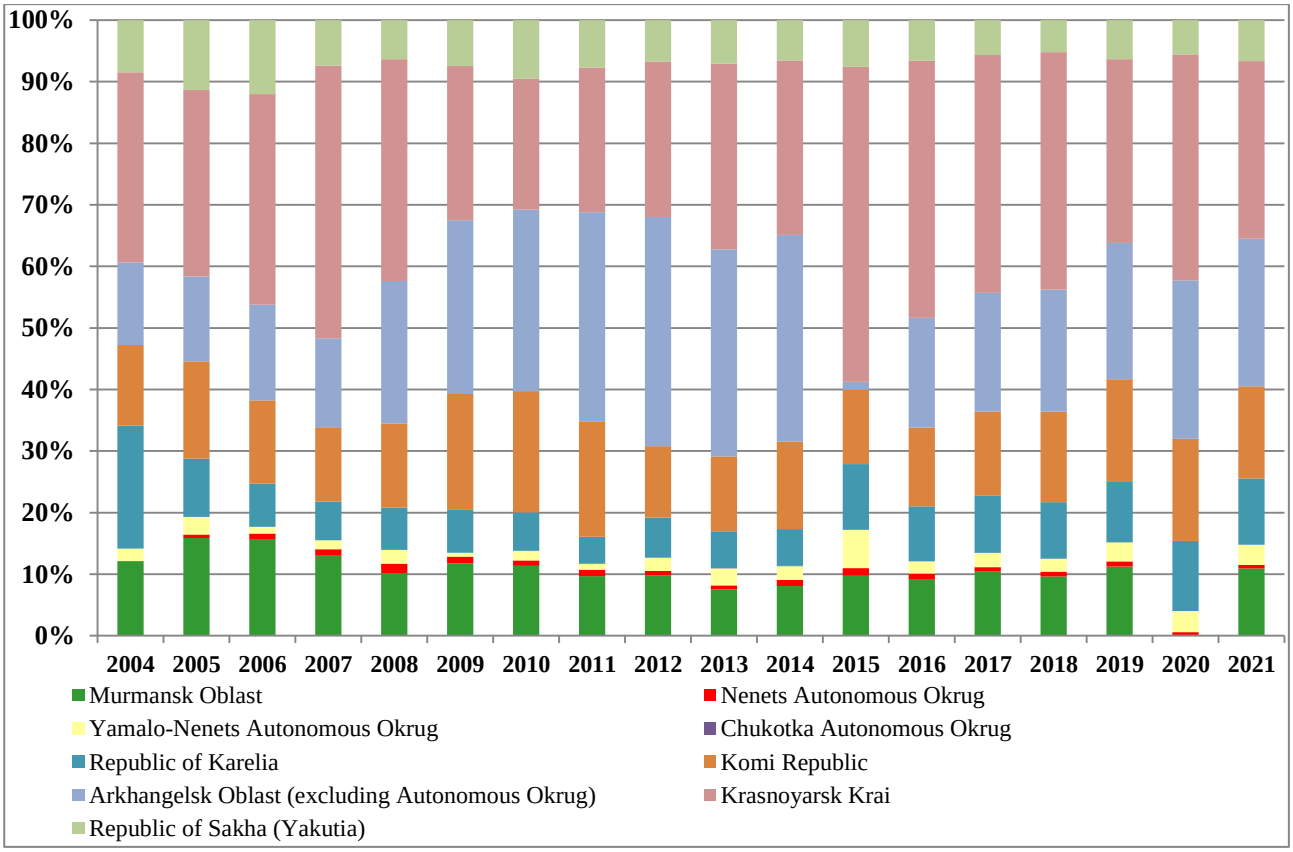

Fig. 3. Formation of outbound organized tourist flow in the regional context for the period 2004–2021, % [3].

[2] Source: compiled by the author based on state statistics.
[3] Source: compiled by the author based on state statistics.

Organized outbound tourist flow in the Russian Federation

There are some differences in the dynamics of domestic tourism development in comparison with international tourism (Fig. 4):

- Firstly, since 2009 there has been a steady growth trend in the internal tourist flow, which is typical for the Russian Federation as a whole, and for the regions of the Arctic zone of the Russian Federation (with slight fluctuations in the indicator in some years);
- Secondly, the indicators of domestic tourism both for the Russian Federation as a whole and for the Arctic regions in 2021 reached their maximum, exceeding the values of the pre-pandemic 2019 (+37.1% and +7.5%, respectively).

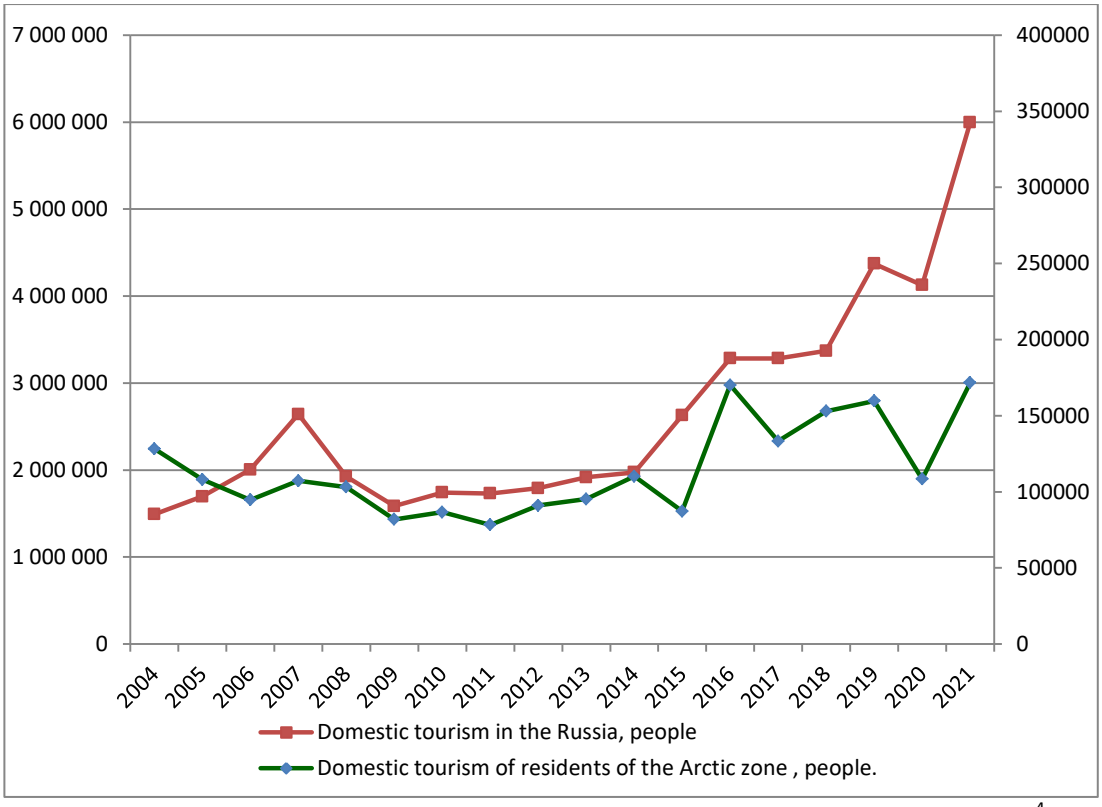

Fig. 4. Dynamics of organized domestic tourism for the period 2004–2021, people [4]

At the same time, while there is practically no sharp collapse in the value of organized domestic tourism in 2020 compared to the indicators of 2019 for the Russian Federation as a whole (-5.6%), there is a significant decline in the index for the Arctic regions — 32.1%. The average share of the studied regions in the Russian Federation is higher than in outbound international tourism (4.9%).

The main supplier of domestic tourists among the Arctic regions is the Republic of Karelia, which forms an average of 41.8% of outbound organized tourist flow in Russia (Fig. 5).

[4] Source: compiled by the author based on state statistics.

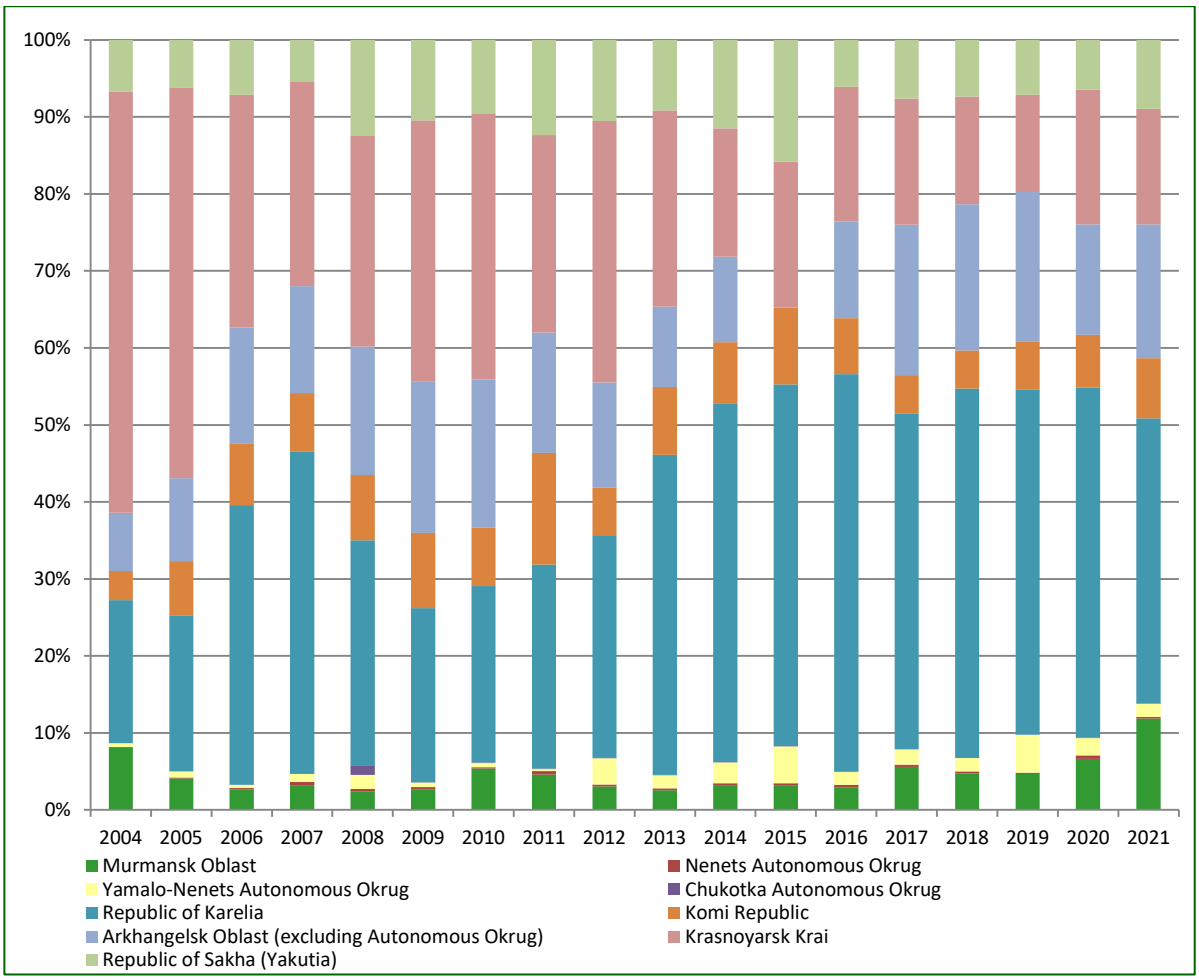

Fig. 5. Formation of outbound domestic tourist flow in the regional context for the period 2004–2021, % [5].

In the choice of residents of the Krasnoyarsk Krai, there has been a steady decline in interest in the Russian destination; other regions are characterized by a sufficient stability of preferences in choosing tours around the country.

The intensity of outbound organized tourism in the Arctic regions of the Russian Federation

The calculation of the indicator of the intensity of outbound organized tourist flows in the context of international and domestic tourism makes it possible to compare the objective mobility of the population of the studied subjects. The tourist preferences formed in the pre-pandemic period are reflected in the indicator for 2019, the calculation of data for 2021 allows us to consider overcoming modern challenges in the focus of the tourist interests of residents of the Arctic regions (Table 1).

Table 1

The intensity of outbound organized tourism in the Arctic regions of the Russian Federation [6]

	region	international tourism		domestic tourism	
		2019	2021	2019	2021
No.					
1	Murmansk Oblast	37.2	17.1	10.0	27.8
2	Nenets Autonomous Okrug	46.0	15.1	6.1	7.4

[5] Source: compiled by the author based on state statistics.
[6] Source: compiled by the author based on state statistics.

3	Yamalo-Nenets Autonomous Okrug	14.5	6.9	14.3	5.5
4	Chukotka Autonomous Okrug	0.04	n.d.	0.9	0.3
regions partially included in the Arctic zone of the Russian Federation					
5	Republic of Karelia	39.0	20.2	115.7	140.4
6	Komi Republic	49.4	21.1	12.0	16.2
7	Arkhangelsk Oblast (without AO)	59.0	25.3	28.3	27.5
8	Krasnoyarsk Krai	25.7	11.6	7.0	9.0
9	Republic of Sakha (Yakutia)	16.3	7.7	11.7	15.6
median by Arctic region		*37.2*	*16.1*	*11.7*	*15.6*
median for the Russian Federation		-	*11.6*	-	*14.0*

The calculation of intensity confirms the fundamental change in the choice of tourist destinations by the population of the Arctic regions of the Russian Federation. Thus, on average, the organized tourist flow abroad in 2021 decreased by 2.3 times compared to 2019, while the intensity of domestic tourism increased by 25%. In the regional context, the most significant reduction in the flow of tourists abroad occurred in the Nenets Autonomous Okrug (a decrease by 3 times), the most significant increase in domestic tourism — in the Murmansk Oblast (an increase by 2.8 times). It should be noted that there was an increase in tourist trips within Russia in 2021 compared to 2019 in most Arctic regions. At the same time, the growth of organized tours in Russia among residents of the Arkhangelsk Oblast remained at the level of the pre-pandemic period. In contrast to the general trend, the Chukotka and Yamalo-Nenets Autonomous okrugs show a decrease in the preference for domestic tourism, with the latter region showing similar dynamics in terms of trips abroad. Thus, the Yamalo-Nenets Autonomous Okrug occupies a separate position, characterized by a 2.4-fold decrease in outbound organized tourism in 2021 compared to 2019.

A comparison of the indicators of the intensity of organized outbound tourism in 2021 reveals an increased tourist activity of the population of the Arctic regions compared to the average Russian values, both for tours abroad and for domestic tourism. At the same time, in contrast to the average Russian trend, the preferences of residents of the Arctic regions are to a greater extent related to foreign destinations. The advantage is achieved mainly due to the choice of residents of the Komi Republic and the Nenets Autonomous Okrug.

Geography of outbound organized tourism of Arctic residents of the Russian Federation

The geography of the choice of tourist destinations by residents of the Arctic regions of the Russian Federation seems to be quite interesting, both in comparison with 2019 and 2021, and in comparison with the average Russian values. Since statistical data do not allow us to analyze the geography of domestic tourism destinations in the regional context, this study will consider the Russian destination as a whole. The choice of foreign destinations is analyzed in the country context.

It should be noted that the preferences of the population of the Arctic regions are quite similar, the only exception is the Chukotka Autonomous Okrug, where in 2019 only two residents made organized tourist trips abroad, choosing the United Arab Emirates for recreation.

The preference for warm and hot countries of the Mediterranean Sea, Indian or Pacific Ocean basin states is quite expected (Table 2).

Table 2

Comparison of tourist preferences of Arctic residents in the context of the countries (2019 and 2021) [7]

	group of countries	total tourist flow, thousand people		share of tourist flow to groups of countries in the total outbound tourist flow of the Arctic regions, %	
		2019	2021	2019	2021
1	Mediterranean countries (Greece, Egypt, Spain, Italy, Cyprus, Tunisia, Turkey)	138.2	91.1	55.9	79.36
2	countries of the Indian and Pacific Ocean basins (Vietnam, Thailand)	59.6	1.6	24.1	1.4
3	countries of the Indian Ocean basin (India, UAE, Republic of Maldives)	11.7	5.7	4.7	5.0
4	countries of the Atlantic basin (Dominican Republic, Cuba)	7.4	7.3	3.0	6.4
5	China	11.4	0.03	4.6	0.02
Total:		*228.3*	*105.8*	*92.4*	*92.5*

In 2019, the selected 15 states account for almost the entire outbound organized tourist flow of residents of the Arctic regions of the Russian Federation, the share of other countries is insignificant. When comparing the choice of tourist destinations under the influence of modern challenges (2019 and 2021), we can identify several multidirectional trends that are also typical for the Russian Federation as a whole:

1. rapid growth in the number of Russian tourists received (Egypt by 16.4 times, the Republic of Maldives by 4.3 times);
2. sharp decline in the number of tourists from the Russian Federation (China by 379 times, India by 180 times, Vietnam by 87.5 times, Italy and Spain by more than 40 times, Thailand by 26.7 times);
3. preservation of the number of tourists with an increase in the share of Arctic regions in the outbound tourist flow of the Russian Federation (Dominican Republic, Cuba);
4. reduction in the number of tourists while maintaining a share in the tourist flow of the Russian Federation (Turkey).

Thus, under the influence of the challenges of our time, on the one hand, there is a halving of the outbound organized tourist flow abroad, on the other hand, it is redistributed. Thus, in 2021, nine states (in descending order of tourist flow) became the leading destinations: Turkey, Egypt, the Dominican Republic, the United Arab Emirates, Cuba, Cyprus, the Republic of Maldives and Tunisia. At the same time, Turkey serves the dominant number of tourists from the outbound tourist flow from the Arctic regions abroad (58.7%), the fifth part falls on Egypt (17.5%). In the regional context, the leader in the number of Russians sent on tours abroad is the Arkhangelsk Oblast, the Krasnoyarsk Krai, the Murmansk Oblast and the Republic of Karelia.

[7] Source: compiled by the author based on state statistics.

Conclusion

The study of the preferences of tourist destinations by the local population of the Arctic zone of the Russian Federation for the period 2004–2021, as well as their comparison with the choice of the average resident of the state, made it possible to identify a number of general patterns and specifics of the development of organized outbound tourism based on official statistics. It is necessary to indicate the observed change in the volume of the organized tourist flow, as well as its redistribution between tourist destinations under the influence of the challenges of our time.

Thus, a long period of prevalence of international tourism over domestic one (median 63.1%) under the influence of modernity challenges was replaced in 2020–2021 by the reorientation of tourist flows to domestic tourism, which correlates with the all-Russian trends. In addition, the indicators of domestic tourism both for the Russian Federation as a whole and for the Arctic regions in 2021 reached their maximum, exceeding the values of the pre-pandemic 2019 (+37.1% and +7.5%, respectively).

On average, the organized tourist flow of the population of the Arctic zone of the Russian Federation abroad in 2021 decreased by 2.3 times compared to 2019. Although the geography of international tourism of the residents of the Arctic zone of the Russian Federation is characterized by some stability in the choice of warm countries for recreation (Mediterranean countries, states of the Indian or Pacific Ocean basins), the challenges of our time have redistributed the tourist flow between foreign destinations. Thus, outbound tourism to the countries of the European Union has almost completely stopped and, on the contrary, it has increased to countries with a visa-free or simplified regime for tourists. The leading positions of Turkey among the Mediterranean states are periodically weakened by the influence of negative factors of both a geopolitical and biomedical nature, as well as the latest natural disasters. A series of disastrous earthquakes in February 2023 and the possibility of their recurrence, including in a number of resort provinces of the country (for example, Antalya, Istanbul), according to the forecasts of seismologists and geologists [8], introduces significant uncertainty, increasing the fears of tourists when choosing a Turkish destination.

In general, the population of the Arctic regions of the Russian Federation, under the influence of the challenges of modernity, with the introduction of various incentive programs for tourism, as well as due to the development of the tourism and recreational sphere with an active marketing policy of promoting the tourism and recreational opportunities of the Russian regions, is actively beginning to be included in consumption of domestic tourism products. In

[8] Gde udarit v sleduyushchiy raz v 2023 godu: opublikovana karta seysmicheski opasnykh rayonov Turtsii. Ofitsial'nyy sayt Informatsionnoy gruppy «TURPROM» [Where will it hit next in 2023: a map of seismically dangerous regions of Turkey has been published. Official website of the TURPROM Information Group]. URL: https://www.tourprom.ru/news/58815/ (accessed 28 February 2023); Turetskie uchenye: Antaliya vkhodit v zonu riska sleduyushchego zemletryaseniya. Ofitsial'nyy sayt Informatsionnoy gruppy «TURPROM» [Turkish scientists: Antalya is at risk of the next earthquake. Official website of the TURPROM Information Group]. URL: https://www.tourprom.ru/news/59062/ (accessed 28 February 2023).

addition, the economic opportunities of the inhabitants of the Arctic regions, the severity of natural and climatic conditions of living and working, along with the formed tourist preferences, stimulate the choice of warm and hot foreign destinations. In any case, we can assume a positive result: the choice of domestic tourism has a positive effect on the socio-economic development of the state and, in general, on the development of the Russian destination; opportunities for recreation in favorable natural and climatic conditions in the spring-autumn and especially winter period contribute to the restoration of the physical and emotional strength of a person, the reproduction of human capital. At the same time, preferences in the organization of tourist trips and in the choice of tourist destinations among residents of the Arctic regions of the Russian Federation require a detailed study based on sociological tools in order to develop recommendations for improving the efficiency of functioning of the tourist and recreational complex of the studied regions and the state as a whole, as well as directions for the development of the tourism sphere of the Russian Arctic in the context of tourist services for international and domestic tourists, taking into account the need for recreation of the local population in places of permanent residence.

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Demographic Situation in the Arkhangelsk Oblast: Analysis and Solutions

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Abstract. The issue of differentiation of socio-economic development indicators is relevant for the regions of the Russian Federation. An important condition for the effective and stable development of territories is a favorable demographic situation. This requires a competent and thoughtful demographic policy that will ensure population reproduction and economic development of the constituent entities of the Russian Federation. The study area is the Arkhangelsk Oblast, partly included in the Arctic zone of the Russian Federation, which is of strategic interest to Russia due to its geopolitical, geo-economic position in the modern world. The aim of the work is to analyze the changes in the qualitative and quantitative composition of the population of the Arkhangelsk Oblast, determined by the processes of fertility, mortality, migration, as well as the socio-economic situation and state policy. To analyze the demographic situation, the paper uses traditional methods of analysis (comparison, relative and average values, graphic method). The paper presents the territorial differentiation of the demographic situation in the regions of the Northwestern Federal Okrug. The information base is national and regional statistical information for the last 10 years. The article discusses the interim results of the implementation of the national project "Demography" in the Arkhangelsk Oblast. The results of the study can be useful for state authorities and local governments that manage the regional development of territories within the framework of the national project "Demography".
Keywords: *demography, demographic policy, national project, population size, natural increase, migration increase, poverty rate, unemployment rate, analysis, demographic differentiation*

Introduction

In order to form an effective socio-economic policy in the region, it is necessary to address issues related to population. Human resources are a determining factor in the development of the economy of the territory. Demographic problems can negatively affect the development of the national economy. Currently, there is a territorial differentiation in demographic indicators. This is explained by a number of reasons: different natural and climatic conditions, different levels of development of industrial and transport infrastructure, preferences provided by the state to individual subjects of the Russian Federation.

The indicated problem is relevant not only at the regional, but also at the federal level. In accordance with the Decree of the President of the Russian Federation "On the approval of the concept of the demographic policy of the Russian Federation for the period up to 2025" [1], the

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[1] Ukaz Prezidenta RF ot 9 oktyabrya 2007 g. № 1351 «Ob utverzhdenii Kontseptsii demograficheskoy politiki Rossiyskoy Federatsii na period do 2025 goda» (s izmeneniyami i dopolneniyami) [Decree of the President of the Russian

main guidelines are improvement of the quality of life, stabilization and subsequent growth of the population, and increase of life expectancy. The implementation of the demographic policy is carried out in stages. According to the proposed concept, the third stage is currently being carried out, which consists in consolidating positions and leveling the impact of negative factors. The forecast figures of this document do not differ from the data presented in the population forecast until 2035 [2].

According to the Federal State Statistics Service of the Russian Federation, the population of the country in 2025 will be 144 million people in the pessimistic scenario and 147.4 million people in the optimistic scenario. Life expectancy is 74.21 years and 77.38 years, respectively, the total fertility rate is 1.28 and 1.605, respectively [3].

In order to solve the demographic problems, the national project “Demography” is being actively implemented both at the federal [4] and regional levels [5]. As part of the implementation of this project, five projects have been developed aimed at supporting families, promoting employment, helping the older generation, health improvement and sports.

Many researchers are addressing the issue of studying demographic processes. This topic is relevant, since population decline can become a long-term barrier to the development of the national economy (regional economy). The deterioration of the demographic situation in the Russian Federation and the constituent entities of the Russian Federation, the problem of migration is becoming of great importance for most regions and the Russian Federation as a whole.

Analysis and assessment of the demographic situation are presented in the works of the following authors [1, 2–12].

Vasilyeva E.V. and Vasilyev A.V. revealed that changes in the demographic situation depend on the aging of the population and migration processes, affect the development potential of the country and the economic security of territories [2, pp. 35–47].

Kashepov A.V. considered the main approaches to assessing the demographic situation in Russia, identified the factors influencing the problem of population reproduction [3, pp. 35–47].

Nizamutdinov M.M. and Oreshnikov V.V. hypothesized that the social infrastructure is an important component in predicting the level of mortality and life expectancy and forms the demographic situation in the regions of Russia [4, p. 209].

Popova L.A. analyzed the factors influencing life expectancy and the mortality rate of the population by gender [6, p. 186].

Federation of October 9, 2007 No. 1351 "On approval of the Concept of the demographic policy of the Russian Federation for the period up to 2025" (as amended)]. URL: https://base.garant.ru/191961/ (accessed 28 June 2022).

[2] Federal State Statistics Service. URL: https://rosstat.gov.ru/folder/12781 (accessed 28 June 2022).

[3] Ibid.

[4] Official site of the Ministry of Labor of the Russian Federation. URL: https://mintrud.gov.ru/ministry/programms (accessed 29 June 2022).

[5] Official site of the Government of the Arkhangelsk Oblast. URL: https://dvinaland.ru/gov/national_projects/demogr/12781 (accessed 28 June 2022).

In [9, Simonov S.N., Bukina V.M., Simonova D.L., pp. 85–95], the authors noted that the demographic situation is characterized not only by quantitative indicators that assess the state of the population (number, birth rate, mortality, migration, life expectancy), but also by qualitative indicators (level of education, culture, health, professional skills). The authors paid special attention to medical and demographic factors, since they believe that it is the level of health care that to a greater extent characterizes the indicators of population reproduction and their dynamics.

In order to study and analyze demographic processes, not only traditional demography, which considers the patterns of reproduction and population migration, but also the concept of "digital demography" are currently used. Smirnov A.V. clarified the term "digital demography" and proposed to forecast migration processes based on data obtained from social networks [11, p. 135].

The article [12, Trynov A.V., Kostina S.N., Bannykh G.A., p. 810] studied theoretical approaches to the investigation of the influence of factors on fertility. The authors proposed a model of the relationship between the birth rate and socio-economic factors, such as real money income, unemployment rate, marriage rate, life expectancy, etc.

In works [7, 13, 14, 15, 16, 18], the authors focus on the issues of longevity, migration of the population of the European North, Siberia and the Far East.

Particular interest in these territories is explained by the fact that they are fully or partially part of the Arctic zone of the Russian Federation, which has a favorable geopolitical position, enormous hydrocarbon reserves and biological resources (more than 80% of combustible natural gas and 17% oil) [6].

Taking into account the role of the Arctic zone at the federal level, a number of documents was developed that form the state policy of the Russian Federation for the time period up to 2035 [7] and the strategic development of the territory up to 2024 [8]. As part of the Strategy, the state program "Socio-economic development of the Arctic zone of the Russian Federation" is being implemented, which focuses on increasing the level of socio-economic development of the Arctic zone of the Russian Federation by creating 13.274 jobs, increasing life expectancy, reducing migration outflow and decreasing unemployment rate [9]. In each subject of the Russian Federation belong-

[6] Postanovlenie Pravitel'stva RF «Ob utverzhdenii gosudarstvennoy programmy Rossiyskoy Federatsii «Sotsial'no-ekonomicheskoe razvitie Arkticheskoy zony Rossiyskoy Federatsii» ot 30.03.2021 № 484 (red. ot 30.10.2021) [Decree of the Government of the Russian Federation "On approval of the state program of the Russian Federation "Socio-economic development of the Arctic zone of the Russian Federation" dated March 30, 2021 No. 484 (as amended on October 30, 2021)]. URL: http://www.consultant.ru/document/cons_doc_LAW_381261/ (accessed 16 June 2022).

[7] Ukaz Prezidenta RF «Ob Osnovakh gosudarstvennoy politiki Rossiyskoy Federatsii v Arktike na period do 2035 goda» ot 05.03.2020 № 164 [Decree of the President of the Russian Federation "On the Fundamentals of the State Policy of the Russian Federation in the Arctic for the period up to 2035" dated 05.03.2020 No. 164]. URL: https://www.garant.ru/products/ipo/prime/doc/73606526/ (accessed 16 June 2022).

[8] Ukaz Prezidenta RF «O Strategii razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsio-nal'noy bezopasnosti na period do 2035 goda» ot 26.10.2020 № 645 (red. ot 12.11.2021) [Decree of the President of the Russian Federation "On the strategy for the development of the Arctic Zone of the Russian Federation and ensuring national security for the period up to 2035" dated October 26, 2020 No. 645 (as amended on November 12, 2021)]. URL: https://www.garant.ru/products/ipo/prime/doc/74710556/ (accessed 16 June 2022).

[9] Postanovlenie Pravitel'stva RF «Ob utverzhdenii gosudarstvennoy programmy Rossiyskoy Federatsii «Sotsial'no-ekonomicheskoe razvitie Arkticheskoy zony Rossiyskoy Federatsii» ot 30.03.2021 № 484 (red. ot 30.10.2021) [Decree of the Government of the Russian Federation "On approval of the state program of the Russian Federation "Socio-

ing to the Arctic zone, documents are being developed at the mesolevel, taking into account the characteristics of the region. Monitoring of the Arctic in terms of key economic indicators is also presented in foreign sources [10].

The development of territories is impossible without a well-thought-out demographic policy, which contributes to the effective functioning of the subject.

Analysis of the demographic situation in the Arkhangelsk Oblast

The study area is the Arkhangelsk Oblast, which is partially included in the Arctic zone of the Russian Federation (the municipality "Arkhangelsk City", the municipality "Mezenskiy municipal district", the municipality of the urban district "Novaya Zemlya", the municipality "Novodvinsk City", the municipality "Onega municipal district", the municipal formation "Primorskiy municipal district", the urban district "Severodvinsk", the municipal formation "Leshukonskiy municipal district", the municipal formation "Pinezhskiy municipal district"). The Arkhangelsk Oblast belongs to the Far North and equated areas.

The region is rich in bioresources, which predetermines the developed infrastructure of forestry, woodworking and fish processing complexes. Large shipbuilding and ship repair enterprises are located on the territory of the region; diamonds, bauxite and limestone deposits are being developed and effectively exploited. Accordingly, this predetermines the scope of employment of the Oblast population and the development of certain industries.

The population of the Arkhangelsk Oblast has negative dynamics: every year it decreases by 0.6–1.02% (Fig. 1). In the period under review, the population decreased by 110.44 thousand people. A decrease in the rate of population decline is observed from 2014 to 2017 and from 2019 to 2020 (by 0.6–0.7%). The highest rate is observed from 2010 to 2011 — by 1.019% or by 12.6 thousand people.

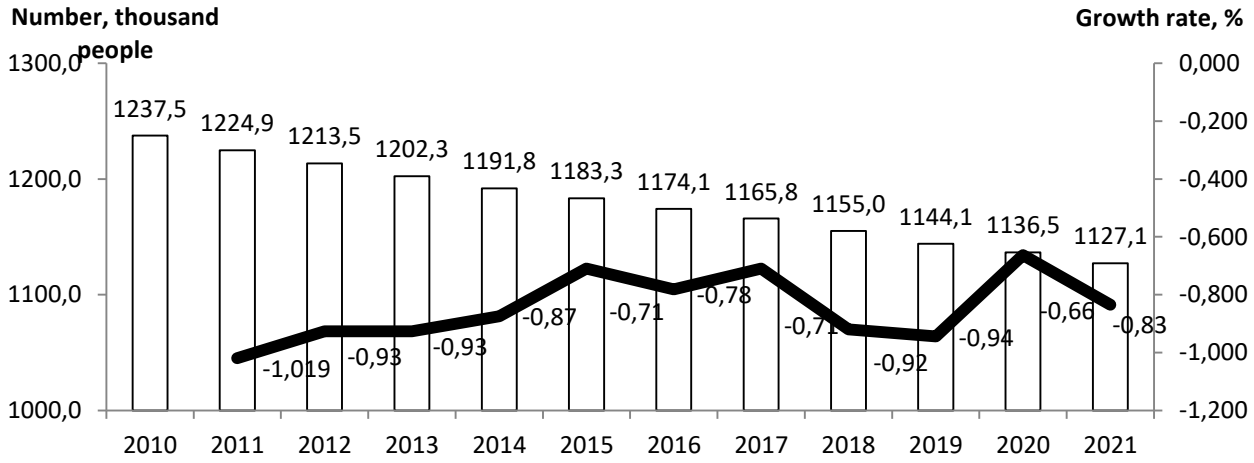

Fig. 1. Population of the Arkhangelsk Oblast in 2010–2021 [11]

economic development of the Arctic zone of the Russian Federation" dated March 30, 2021 No. 484 (as amended on October 30, 2021)]. URL: http://www.consultant.ru/document/cons_doc_LAW_381261/ (accessed 16 June 2022).

[10] Arctic Monitoring and Assessment Programme (AMAP). Oslo, 2017. 280 p.

[11] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 16 June 2022).

This situation has a negative impact on the socio-economic indicators of the territory, does not allow the effective development of the region, which belongs to a strategically significant territory, is of interest to Russia and the world community, based on geopolitical, geo-economic positions in the modern world.

The dynamics of population decline is observed both in the number of men and women (Fig. 2). The number of men over the past 6 years has decreased by 25.45 thousand people (from 553.91 thousand to 528.46 thousand), women — by 30.83 thousand people (from 629.42 thousand to 598.59 thousand).

It should be noted that the number of women every year is on average 70 thousand people more than the number of men.

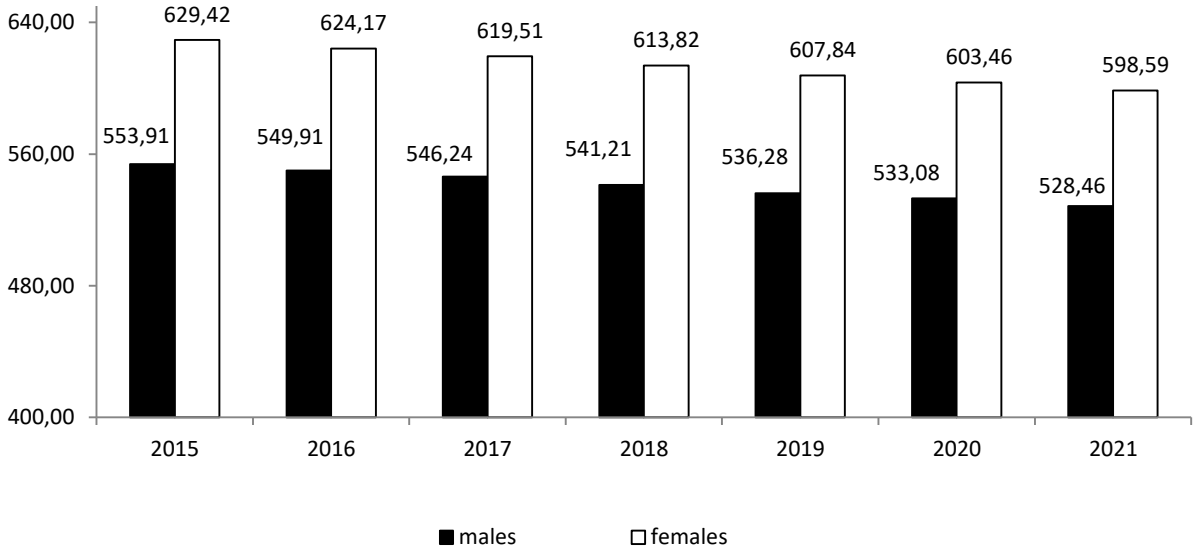

Fig. 2. Number of men and women in the Arkhangelsk Oblast in 2015–2021, thousand people [12].

According to the average forecast of Rosstat, the number of men in the Arkhangelsk Oblast over the next 10 years will decrease by another 40.55 thousand people (by 7.72%), women — by 54.51 thousand people (by 9.21%).

[12] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 16 June 2022).

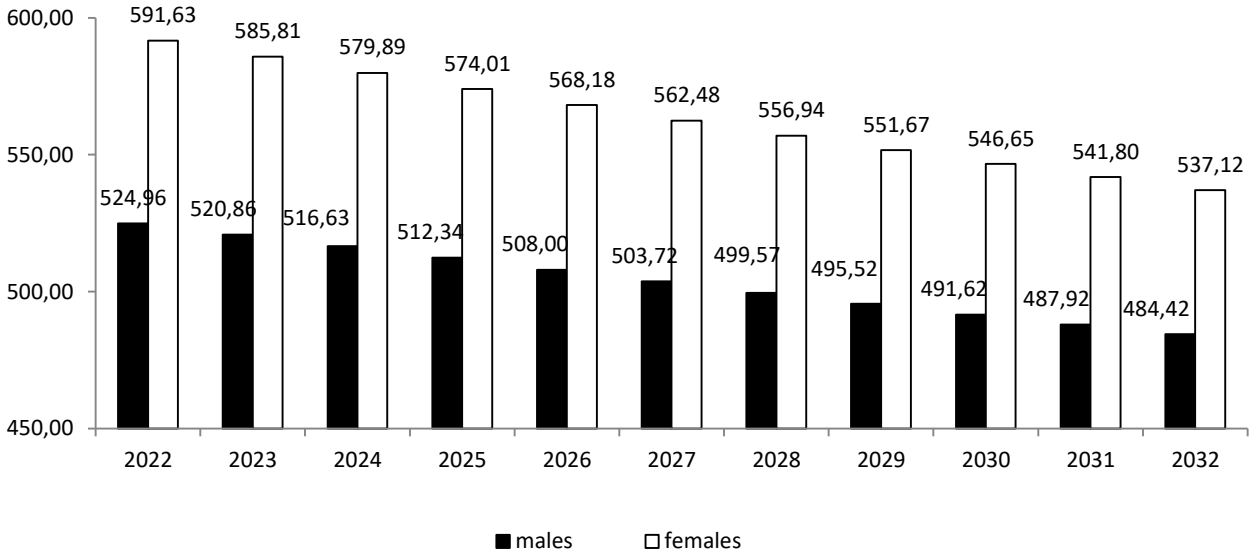

Fig. 3. Average forecast for the number of men and women in the Arkhangelsk region in 2022–2032, thous. people [13]

The age structure of the population of the Arkhangelsk Oblast (Table 1) has practically not changed over the period under review. Insignificant structural shifts of 1–3% towards an increase (decrease) in certain age categories are observed.

Table 1

The structure of the population of the Arkhangelsk Oblast by age [14]

Age	2015		2022		Structure change, %
	Number, people	Share, %	Number, people	Share, %	
total	1 183 323	100	1114322	100	-
0–4	74 613	6.31	51768	4.65	-1.66
5–9	68 593	5.80	71478	6.41	0.62
10–14	61 483	5.20	69999	6.28	1.09
15–19	54 806	4.63	61876	5.55	0.92
20–24	63 619	5.38	53684	4.82	-0.56
25–29	93 877	7.93	55662	5.00	-2.94
30–34	96 858	8.19	76947	6.91	-1.28
35–39	92 921	7.85	91294	8.19	0.34
40–44	81 106	6.85	87419	7.85	0.99
45–49	73 675	6.23	81296	7.30	1.07
50–54	89 623	7.57	67424	6.05	-1.52
55–59	94 876	8.02	72813	6.53	-1.48
60–64	82 606	6.98	82793	7.43	0.45
65–69	52 868	4.47	74350	6.67	2.20
over 70	101 799	8.60	115519	10.37	1.76

[13] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 24 June 2022).
[14] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 30 June 2022).

The structure of the population in the context of the main age groups is stable (Table 2). 25% of the population are people over working age. Slightly less than this indicator (18–19%) are children and adolescents younger than working age. The main share, more than 56%, is people of working age.

Table 2

Composition and structure of the population of the Arkhangelsk Oblast by age groups [15]

Indicator	2015		2022		Structure change, %
	Number, people	Share, %	Number, people	Share, %	
Total	1 183 323	100	1 114 322	100	-
Younger than able-bodied	215 250	18	205 646	19	1
Able-bodied	677 513	57	625 689	56	-1
Older than able-bodied	290 500	25	282 987	25	0

Despite the preservation of the structure, analysis of the dynamics of the absolute values of these indicators indicates that the number of able-bodied population has decreased over the past 7 years the most — by 51.9 thousand people (7.66%). The decrease in the number of people younger than working age was 9.6 thousand people (4.46%), and older than working age — 7.5 thousand people (2.59%).

According to the average forecast of Rosstat, the working-age population of the Arkhangelsk Oblast will not change in the next 10 years (Fig. 4). However, the number of children and adolescents younger than working age will decrease by 57.6 thousand people (by 27.9%), and the number of people older than working age — by 38.0 thousand people (by 13.2%).

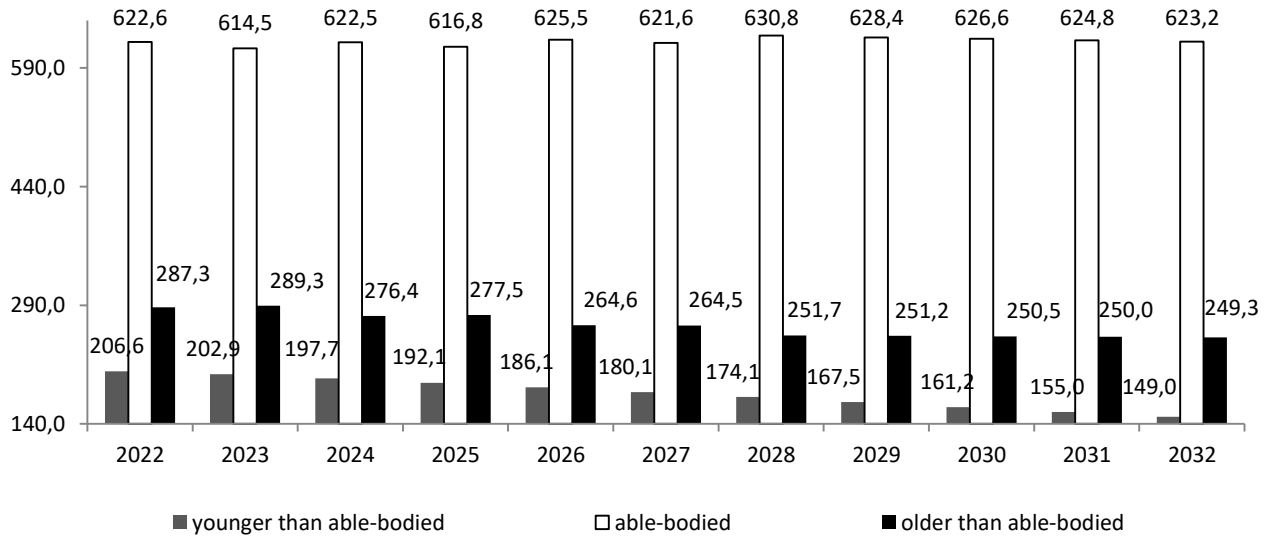

Fig. 4. The average version of the population forecast for the Arkhangelsk Oblast in 2022–2032, thousand people [16].

[15] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 30 June 2022).
[16] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 30 June 2022).

For the entire period under review, the death rate in the region exceeds the birth rate, this trend has been negative since 2013 (Fig. 5). The natural loss per 1000 people over the past 8 years has increased from 0.5 to 9.6.

More often, the inhabitants of the region die from diseases of the circulatory system — about 7 thousand people annually. Statistical observations show that in the region in 2020, mortality from respiratory diseases (by 24%), infectious and parasitic diseases (by 4.3%), diseases of the digestive system (by 4.1%), neoplasms (by 0 .7%) increased. This is due to the unfavorable northern climatic conditions, the low income of the population and the inability to provide adequate nutrition and recreation.

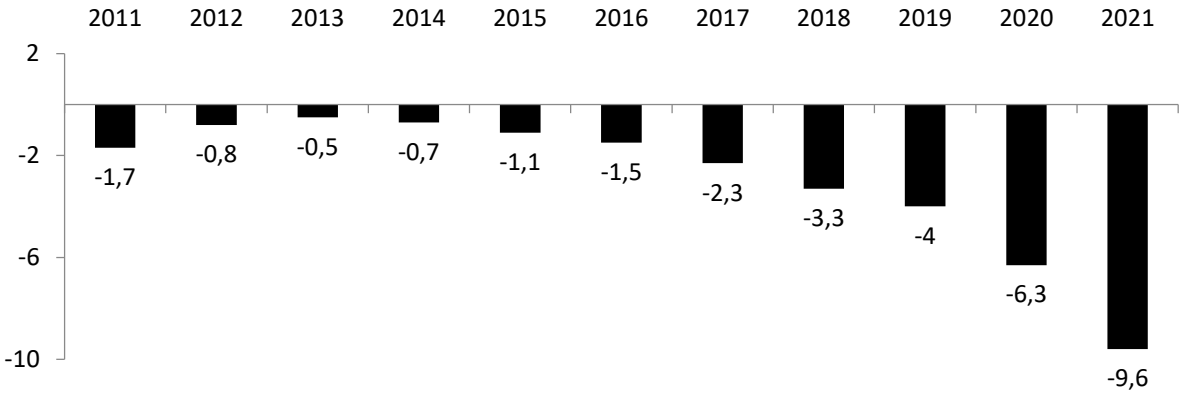

Fig. 5. Natural population decline in the Arkhangelsk Oblast in 2011–2021 per 1000 people [17].

A comparative analysis of the urban and rural population showed that the size of both categories of the population is decreasing, and the rural population is declining faster: in the period from 2015 to 2021, the rural population decreased by 34.3 thousand people, and the urban population — by 21.9 thousand people. The gap between the urban and rural population increased over the period under review from 3.34 to 3.73 times (Fig. 6).

[17] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 01 July 2022).

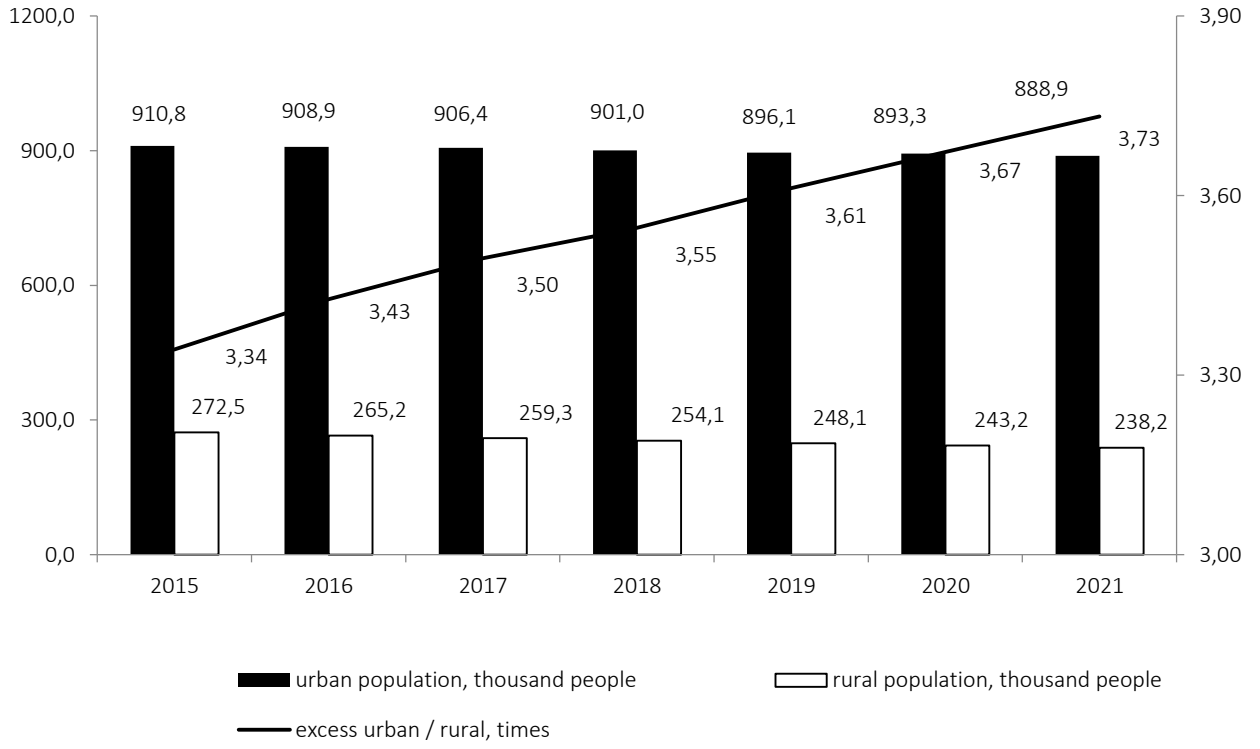

Fig. 6. Urban and rural population of the Arkhangelsk Oblast in 2010–2021 [18].

Over the past 10 years, there has been an active outflow of residents from rural areas (Fig. 7). Peaks (from -6.5 to 7.0 thousand people) were recorded in 2011–2012 and 2014, when significant political and economic events took place in the country. The population in rural areas is actively declining, which is associated with low standard of living, unfavorable climatic conditions for the development of animal husbandry and agriculture. A slight revival occurs in the summer period, when there is an increase in the population of villages due to vacationers and children leaving the city for holidays.

The population of cities is declining less actively due to the departure of northerners to other regions. The main reasons for migration are the change of place of residence to a region with a more favorable climate and higher standard of living, as well as the relocation of school graduates due to enrolment in the country's leading universities. The peaks of migration loss of the urban population are observed in 2013 and 2017: -4.2 thousand people and -4.5 thousand people, respectively. In the past two years, the migration movement of the urban population has acquired a positive trend: in 2020, the increase amounted to +0.4 thousand people, in 2021 — +1.0 thousand people. This is largely due to the employment of specialists from other regions at large enterprises of the region (for example, at JSC Sevmash, JSC Zvezdochka).

[18] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 16 June 2022).

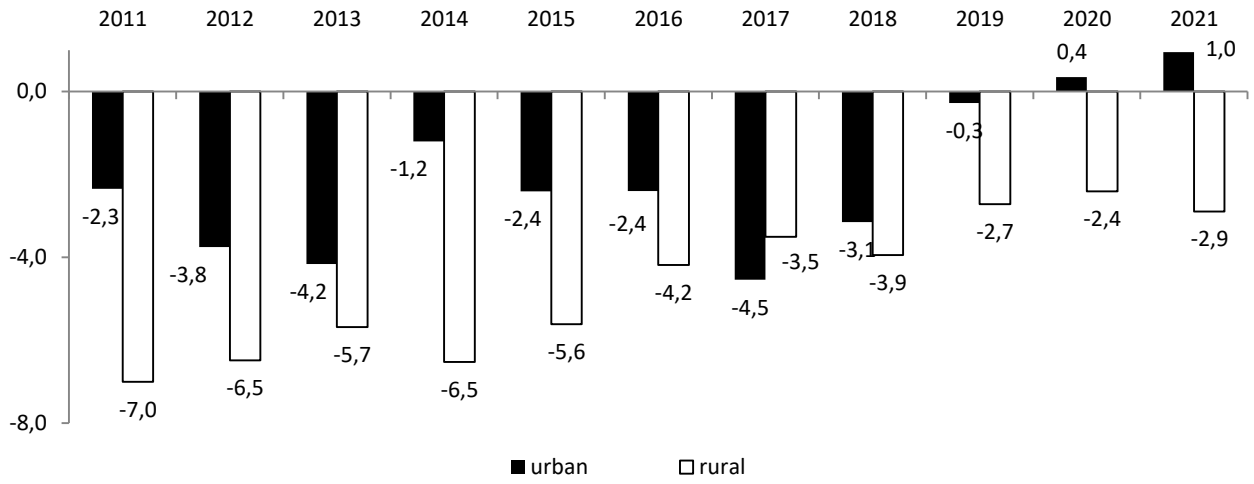

Fig. 7. Migration increase/decrease in the Arkhangelsk Oblast in 2011–2021, thousand people [19].

In 2021, 3.4 thousand males and 3.3 thousand females younger than working age left the region. The outflow of the able-bodied population exceeded these figures by 4 times: 13.2 thousand men and 14.3 thousand women. As a result, as can be seen from Fig. 8, the migration loss of women of working age amounted to 942 people. For men of working age, there is a migration influx, which, as noted above, is mainly associated with employment at large enterprises in the region (for example, JSC "United Shipbuilding Corporation"). The migration outflow of people older than working age is explained by the change of residence after retirement.

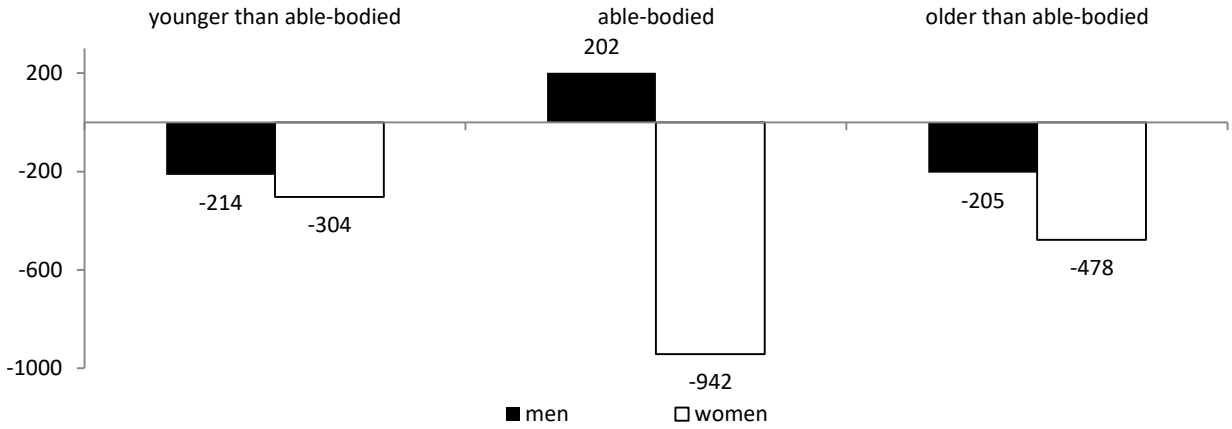

Fig. 8. Migration increase/decrease in the Arkhangelsk Oblast in 2021, people [20].

The outflow of the population from the Arkhangelsk Oblast, as noted above, is partly due to the population moving to regions with higher incomes. Thus, in 2021, the average per capita income of the population of the Arkhangelsk Oblast was 2.71 times higher than the subsistence minimum, which is 1.27 times lower than the average Russian level and 1.77 times lower than in St. Petersburg (Fig. 9). According to this indicator, the Arkhangelsk Oblast is in fourth place among the regions of the North-West Federal District.

[19] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 01 July 2022).
[20] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 01 July 2022).

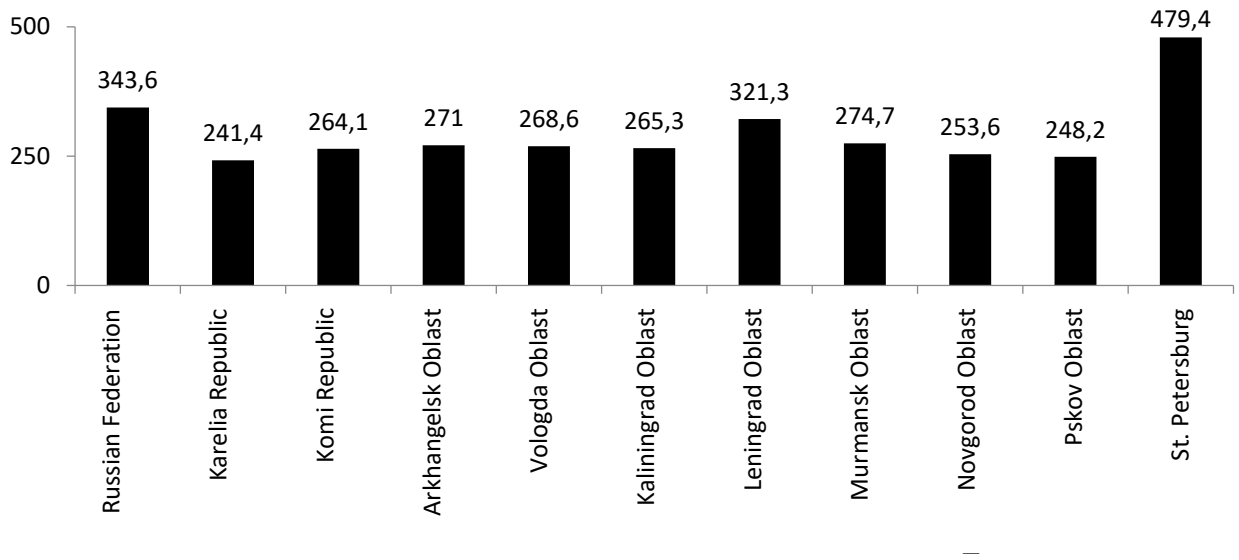

Fig. 9. Ratio of average per capita cash income with the subsistence minimum in the Russian Federation and in the regions of the North-West Federal District in 2021, % [21].

In 2021, the Arkhangelsk Oblast ranks fifth among the NWFD in terms of the "share of the population with cash incomes below the poverty line". This figure is 12.5% (Fig. 10) and exceeds the national average by 1.5%.

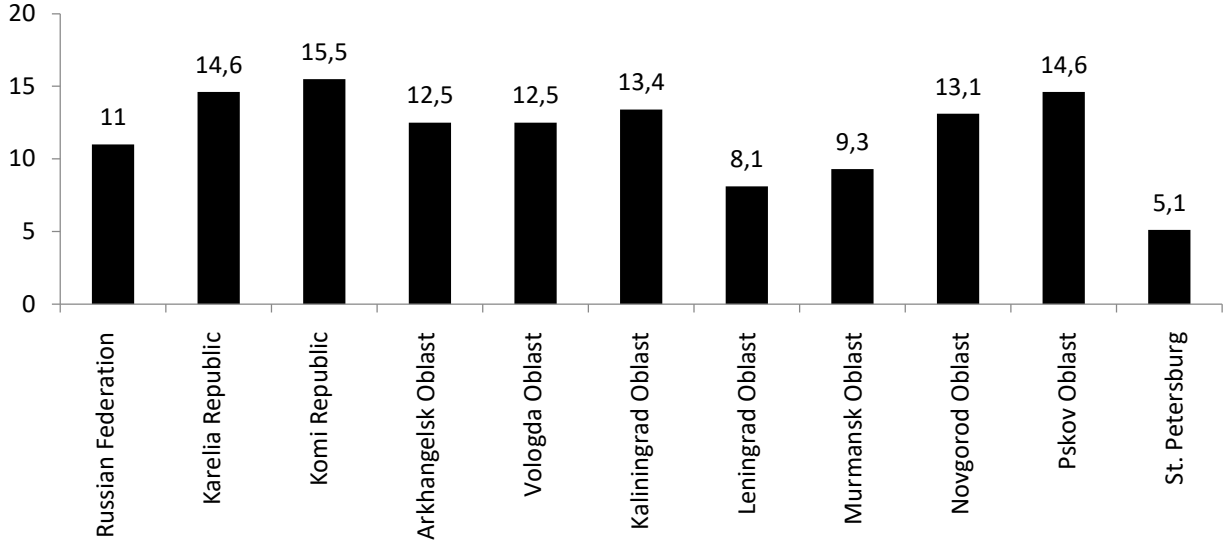

Fig. 10. Share of the population with cash incomes below the poverty line in the Russian Federation and in the regions of the North-West Federal District in 2021, % [22].

The low income level for the northern region led to the fact that the unemployment rate in the Arkhangelsk Oblast in 2021 exceeded the average Russian indicator by 1.38 times and by 3.3 times the level in St. Petersburg, ranking second in the North-West Federal District (Fig. 11).

[21] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 02 July 2022).
[22] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 02 July 2022).

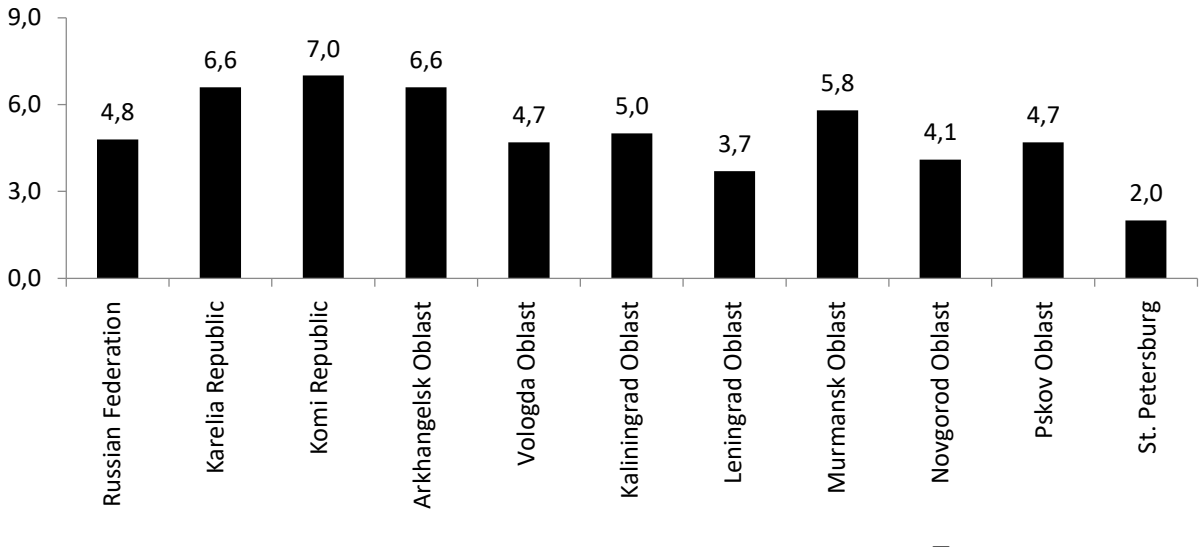

Fig. 11. Unemployment rate in the Russian Federation and in the regions of the NWFD in 2021, % [23].

In order to study the territorial differentiation of the demographic situation in the North-West Federal District, Table 3 was formed, which presents summary information on the size and composition of the population, on general indicators of population reproduction: fertility, mortality, migration.

Table 3

Summary of key demographic indicators for 2021 [24]

Region	Population, thousand people	Life expectancy at birth, years	Total birth coefficient per 10.000 people	Infant mortality per 1.000 people	Migration growth rate per 10.000 people.
Republic of Karelia	609.1	69.6	1.4	4.4	-0.8
Komi Republic	813.6	70.3	1.6	2.3	-41.7
Arkhangelsk Oblast	1 127.1	71.4	1.4	3.4	-20.6
Vologda Oblast	1 151.0	70.7	1.5	5.5	-17.8
Kaliningrad Oblast	1 018.7	72.9	1.4	3.8	101.1
Leningrad Oblast	1 892.7	71.5	1.1	3.9	168.0
Murmansk Oblast	732.9	69.8	1.5	3.8	-69.2
Novgorod Oblast	592.4	69.6	1.4	4.1	31.9
Pskov Oblast	620.2	69.1	1.4	4.0	16.7

[23] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 02 July 2022).
[24] Compiled by the authors. Source: Federal State Statistics Service data. URL: https://rosstat.gov.ru/ (accessed 31 October 2022).

The data presented in Table 3 show that the Arkhangelsk Oblast:

- in terms of population: ranks second in the NWFD, behind the Leningrad and Vologda Oblasts. However, it is necessary to take into account the differences in territorial areas and population density (for example, the Kaliningrad Oblast — 15.125 sq. km, population density — 68.1 people per 1 km^2, Arkhangelsk Oblast — 589.913 sq. km, population density — 1.73 people per 1 km^2);
- in terms of life expectancy: the third place in the presented list of regions. The lowest values of the indicator are observed in the Republic of Karelia (69.6 years), Murmansk (69.8 years), Novgorod (69.6 years), Pskov oblasts (69.1 years);
- in terms of infant mortality: the second place in the ranking (3.4 per 1000 people). This indicates that the level of medical services provided to pregnant women is higher than in other areas;
- in terms of the migration growth rate, the situation is critical (-20.6). The studied region is an outsider, the Republic of Komi (-41.7) and the Murmansk Oblast (-69.2) are behind.

The analysis of the demographic situation showed that there is a negative trend. Negative demographic changes occur due to natural population decline, migration processes, adverse climatic conditions, low incomes and high unemployment.

Implementation of the national project "Demography" in the Arkhangelsk Oblast

The main reasons for the decrease in the number of residents of the Arkhangelsk Oblast are natural losses. The generation of the 1990s, early 2000s is in working and reproductive age. As a result, despite the ongoing policy in the field of changing the demographic situation, the outlined guidelines are becoming difficult to implement.

The decline in the birth rate is sustainable, determined by objective changes (aging of the population, decrease in the number of women of reproductive age). Negative impact on natural population decline in 2020–2021 had an unfavorable epidemiological situation (COVID-19).

Currently, there is a steady decline in the share of migration loss of the population. In 2021, the share of migration outflow in the structure of the total population loss decreased to 16.1%. In 2017, this figure was 72.5%, in 2018 — 62.4%, in 2019 — 39%, in 2020 — 25.3%. The reduction of migration mobility and the decrease in population outflow in 2020–2021 was influenced by the epidemiological situation in large cities of the Russian Federation, which are attractive for the residents of the Arkhangelsk Oblast.

In order to reduce the population decline in the Arkhangelsk Oblast, it is necessary to pay attention to improving the standard of living and quality of life of population in order to reduce the migration outflow to other regions of the Russian Federation, increase the birth rate and reduce mortality. This will stabilize the population.

At the regional level, a number of state programs related to improving the quality of life have been developed: "Social support for citizens in the Arkhangelsk Oblast" (includes 7 subpro-

grams) [25], "Promotion of employment in the Arkhangelsk Oblast, improvement of working conditions and labor protection" (5 subprograms) [26], "Ensuring quality, affordable housing and engineering infrastructure facilities for the population of the Arkhangelsk Oblast" (3 subprograms) [27]. The responsible executor of state programs in the field of social support and employment of the population is the Ministry of labor, employment and social development of the Arkhangelsk Oblast, in the field of providing high-quality, affordable housing — the Ministry of construction and architecture of the Arkhangelsk Oblast.

The integral assessment of the effectiveness of the programs listed above in 2020 was 82.2 (medium), 85.4 (medium), 92.2 (high), respectively. In 2021, these indicators have not changed significantly and are equal to 86.4 (medium), 91.0 (high), 91.5 (high). The presented values of program effectiveness indicators demonstrate that attention should be paid to the first two programs that directly affect the quality of life of the population. The implementation of these programs in 2020–2021 was significantly affected by restrictive measures resulting from the current unfavorable epidemiological situation (COVID-2019).

It should be noted that when calculating the integral assessment of the effectiveness of the implementation of any of the listed programs, the largest share falls on the assessment of the implementation of the program by performers — 0.8. The assessment of the quality of planning and management of the implementation of the state program has the smallest weight — 0.2. The authors of the study believe that the effectiveness of program implementation depends on the quality of planning indicators in the future, so it is worth adjusting the weights in the direction of reducing the value of the first indicator and increasing the last one. Such a change will make it possible to formulate correct conclusions about the effectiveness of a particular program.

According to the forecast for the socio-economic development of the Arkhangelsk Oblast for 2022–2024 [28], it is assumed that the population of the region (excluding NAO) will decrease by 8.8 thousand people per year in the baseline scenario, and by 10.15 thousand people per year in the conservative scenario. Life expectancy increases by 0.65 years on average in the baseline scenario, and by 0.1 years in the conservative scenario. Total fertility and mortality rates in the baseline and conservative scenarios decrease by 0.4 and 0.25, 0.33 and 0.2 respectively. The decrease in the total mortality rate is a positive trend. The projected migration balance for the period of 2022 and 2024 decreases and reaches -2530 people (baseline scenario) and -2890 people (con-

[25] Postanovlenie Pravitel'stva Arkhangel'skoy oblasti ot 12 oktyabrya 2012 goda № 464-pp (s izmeneniyami ot 29 sentyabrya 2022 g. № 751-pp) [Decree of the Government of the Arkhangelsk Oblast dated October 12, 2012 No. 464-pp (as amended on September 29, 2022 No. 751-pp)] (accessed 31 October 2022).
[26] Postanovlenie Pravitel'stva Arkhangel'skoy oblasti ot 08 oktyabrya 2013 g. № 466-pp (s izmeneniyami ot 23 iyunya 2022 g. № 451 pp) [Decree of the Government of the Arkhangelsk Oblast of October 08, 2013 No. 466-pp (as amended on June 23, 2022 No. 451 pp)] (accessed 31 October 2022).
[27] Postanovlenie Pravitel'stva Arkhangel'skoy oblasti ot 11.10.2013 № 475-pp (s izmeneniyami ot 25.08.2022 g. № 634-pp) [Decree of the Government of the Arkhangelsk Oblast dated October 11, 2013 No. 475-pp (as amended on August 25, 2022 No. 634-pp)] (accessed 31 October 2022).
[28] Rasporyazhenie Pravitel'stva Arkhangel'skoy oblasti ot 28.10.2021 № 503-rp (s izm. ot 16.12.2021 № 611- rp) [Decree of the Government of the Arkhangelsk Oblast dated October 28, 2021 No. 503-rp (as amended on December 16, 2021 No. 611-rp)] (accessed 31 October 2022).

servative scenario) in 2024. These values indicate that measures to improve the standard of living and quality of life in the region are insufficient.

In order to stabilize the demographic situation in the region, within the framework of the national project "Demography", the Arkhangelsk Oblast participates in 5 projects that are aimed at financial support for families at the birth of children, increasing employment, supporting the older generation, improving health, and developing sports. For each direction, a regional project passport has been developed [29], which indicates the main provisions, results and financial support of the project, the relationship with government programs aimed at improving the level and quality of life in the region.

One of the most important projects is financial support for families at the birth of children (monthly payments at the birth of the third and subsequent children under the age of 3 years, monthly payments to low-income families at the birth of the first child, free in vitro fertilization of women diagnosed with infertility, one-time payments to women who gave birth to their first child between the ages of 18 and 25, social support for large families in the form of compensation for utility bills, indexation of maternity capital). In addition, conditions are being created for women to enable them to return to work more quickly after the birth of child (creation of additional places in preschool institutions, career guidance for women during maternity leave, etc.). Such measures should help to improve the demographic situation and increase the birth rate in the region.

In the Arkhangelsk Oblast, special attention is paid to increasing life expectancy. For this purpose, people are motivated to a healthy lifestyle, active sports. Within the framework of the regional project (sport development), it is planned to build at least 6 sports and recreation complexes, sports facilities, purchase sports equipment and inventory for 2 sports schools. The regional project (health promotion) is aimed at creating public health centers, developing and implementing corporate programs to improve the health of workers at enterprises. Such measures make it possible to increase life expectancy and the period of active longevity, and to reduce mortality rates. This has a positive effect on a person's ability to be in demand by society and the labor market.

Support for the older generation becomes a priority and is aimed at medical and social assistance to people over 65 (leisure, retraining, home care, volunteering). In the Arkhangelsk Oblast, in order to improve the availability and quality of medical and sanitary services for the elderly, the following were created: 12 paramedic and paramedic-obstetric stations, medical outpatient clinics, a unified regional emergency medical dispatch system, a regional geriatric center to provide medical care to elderly and disabled people. This improves the quality of life of this category of the population, increases their life expectancy.

[29] National project "Demography". URL: https://dvinaland.ru/gov/national_projects/demogr/ (accessed 06 October 2022).

Monitoring of the implementation of the national project "Demography" in the region is presented on the portal of the Government of the Arkhangelsk Oblast in the section "Information on the implementation of national projects" (reference of documents) in the form of reports for each of the five projects, divided by quarters and indicators (results, milestones, budget implementation). In 2021, the results of the national project "Demography": "Social support for citizens in the Arkhangelsk Oblast" — 81% (20 out of 105 activities were not implemented), "Providing high-quality, affordable housing and engineering infrastructure facilities for the population of the Arkhangelsk Oblast" — 94.7% (1 out of 19 activities was not implemented), "Promotion of employment in the Arkhangelsk Oblast, improvement of working conditions and labor protection" — 86.0% (6 out of 43 activities were not implemented). These figures testify to the effective work within the framework of the national project.

The work on changing the demographic situation is also carried out at the municipal level. Each municipality of the Arkhangelsk Oblast (21 municipalities) formed a passport of the municipal project for the period from 2019 to 2024, where the main provisions are written (goal, objectives, project indicators by years, calendar plan, risks, sources of funding).

The target indicators for improving the demographic situation in municipal projects are: the proportion of the population systematically involved in physical culture and sports, the creation of additional places in preschool institutions, the number of young families who received certificates for the purchase of housing, the number of activities aimed at conducting preventive medical examinations , general mortality rate per 1.000 people, mortality rate of the working-age population per 100.000 people. The list varies by municipality.

The differentiation of target indicators by municipalities for 2022 is presented in Table. 4. A comparative analysis was carried out according to 2 target indicators: "total mortality rate of the population" and "share of the population systematically engaged in physical culture and sports". Data from municipal passports of municipal entities, which have both indicators, are used for the analysis [30]. This allows for data comparability.

Table 4

Target indicators of the demographic situation in the municipalities of the Arkhangelsk Oblast

Municipality	Population mortality per 1.000 people	Share of population systematically engaged in physical culture and sport, %
Velskiy municipal district	12.5	53.0
Verkhnetoemskiy municipal district	20.8	47.2
Kargopolskiy municipal district	14.9	44.5
Kotlasskiy municipal district	14.9	35.0
Lenskiy municipal district	13.9	48.5
Leshukonskiy municipal district	25.8	47.0
Mezenskiy municipal district	19.1	40.0
Nyandomskiy municipal district	13.1	47.2
Plesetskiy municipal district	16.2	47.2

[30] Compiled by the authors. Document directory. URL: https://dvinaland.ru/gov/national_projects/demogr/ (accessed 06 November 2022).

Ustyanskiy municipal district	17.2	56.6
Kholmogorskiy municipal district	18.1	35.0

The data presented in Table 4 indicate that:

- the highest mortality rate per 1.000 people is expected in Leshukonskiy municipal district (25.8), Verkhnetoemskiy municipal district (20.8), Mezenskiy municipal district (19.1). The reason: remoteness of the districts from the regional center, inaccessibility (lack of logistics), high percentage of the population of the older generation;
- the leaders in terms of the "share of population systematically engaged in physical culture and sports" are Ustyanskiy municipal district (56.6%), Velskiy municipal district (53%), Lenskiy municipal district (48.5%). The high values of the target indicator in the Ustyanskiy municipal district and the Velskiy municipal district are explained by the proximity to the Malinovka ski center, the active development of the sports infrastructure;
- several municipal districts have a value of 47.2% for the indicator "share of population systematically engaged in physical culture and sports". These are Verkhnetoemskiy municipal district, Nyandomskiy municipal district, Plesetskiy municipal district. It should be noted that the Verkhnetoemskiy municipal district has the highest mortality rate, but at the same time, in this territory, the emphasis is on increasing the proportion of people involved in sports, leading an active lifestyle;
- outsiders in terms of the "share of population systematically engaged in physical culture and sports" are Kotlasskiy municipal district (35%), Kholmogorskiy municipal district (35%). This indicates that it is necessary to carry out motivational work among the population, promote a healthy lifestyle and active sports, and create conditions for the development of infrastructure there.

Achievement of target indicators is carried out at the expense of the actions specified in municipal projects. Currently, there are no reports on the implementation of municipal projects on the portal of the Government of the Arkhangelsk Oblast. Therefore, there is no possibility to assess the effectiveness of projects.

Thus, the demographic problem in the region does not remain unattended. Currently, the national project "Demography" is being actively implemented in 5 areas. Based on the federal project, the implementation of regional projects is carried out on the territory of the Arkhangelsk Oblast, which in turn are the basis for the formation of municipal projects.

Conclusion

The object of study is the Arkhangelsk Oblast, which is partially included in the Arctic zone of the Russian Federation and is of strategic interest for Russia based on the geopolitical and geoeconomic positions of the region in the modern world.

The paper analyzes the changes in the qualitative and quantitative composition of the population of the Arkhangelsk Oblast, determined by the processes of fertility, mortality, migration, as well as the socio-economic situation and state policy.

Traditional methods are used to analyze the demographic situation. A comparative analysis of the demographic situation in the regions of the North-West Federal District showed that the Arkhangelsk Oblast is an outsider in terms of the migration growth rate. For other indicators, the region occupies an intermediate value in the list of subjects that are part of the NWFD.

It should be noted that the demographic problem in the region is not neglected. The interaction of all levels of government ensures the effectiveness of measures aimed at improving the demographic situation (increase in the birth rate, decrease in mortality, increase in life expectancy, migration population growth) and at improving the quality of life.

The results of the study can be useful for public authorities and local governments that manage the regional development of territories within the framework of the national project “Demography”.

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Prospects of Arctic Tourism in Russia in Current Conditions

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Abstract. Arctic tourism is an important mechanism for sustainable development of territories in the Far North. Russia has developed strategies for the development of Arctic tourism, which is one of the areas of international cooperation. However, the complicated relations of Russia on the international stage have endangered further successful development of tourism in the Arctic. Numerous problems of tourism development in underdeveloped territories are exacerbated by new obstacles that have caused changes in the tourism services market. The article analyzes the problems of Arctic tourism development in Russia in the context of a difficult geopolitical situation that emerged in 2022. We have identified priority issues hindering the development of Arctic tourism and predicted which of them will be the most relevant at the present stage. Based on this, possible directions for planning Arctic tourism in Russia in the regional context were proposed. In order to identify problems and justify the prospects for overcoming them, we conducted a content analysis of the reviews of tourists who visited the main tourist destinations in the Russian Arctic, and made a SWOT analysis of Arctic tourism logistics. As a result, we found that the main problem for the development of tourism in the Arctic will be the deterioration of transport accessibility due to difficulties in organizing air travel, especially in regions that do not have land-based communications with places where tourist interest is formed. Therefore, the focus in planning the development of Arctic tourism should now be given to the regions of the European sector of the Russian Arctic, the most accessible and popular among tourists.

Keywords: *Arctic, Arctic tourism in Russia, development, content analysis*

Introduction

Before the pandemic, 1.2 million tourists visited the Arctic annually. Russia ranked 4th in the number of visits (after Norway, Iceland, USA) [1, Loguntsova I.V., p. 39]. D.A. Medvedev called Arctic tourism one of the eight directions of international cooperation in the Arctic. The tourism development strategy up to 2035 was approved by a Decree of the government of the Russian Federation in 2019. The development strategy for the Arctic zone of the Russian Federation provides for the development of Arctic tourism and the promotion of regional tourism clusters. As a type of economic activity, Arctic tourism is costly and takes a long time to pay back. But as a way of restructuring the economy in the Arctic regions, it is a promising direction for sustainable development, and the creation of tourism infrastructure will improve the quality of life of the local population.

Due to the high cost of Arctic tours, the discrepancy between the price and quality of the tourist product, Arctic tourism remains a non-mass destination and generates income for its or-

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ganizers only locally. In the current political and economic situation in Russia after February 2022, the existing problems of the development of Arctic tourism are likely to be aggravated, and its prospects are in doubt. The priorities of the tourism development strategy need to be reviewed, taking into account the newly emerging obstacles associated with the geopolitical situation. The current situation in the Arctic tourism is illustrated by the reduction in the flow of tourists in 2022, especially foreign ones. The most profitable area of Arctic tourism — cruises to the North Pole — is practically not used due to the lack of solvent foreign tourists. At the same time, the restriction of travel abroad for Russians increased their interest in domestic tourism, including Arctic routes. The Russian tourist industry has new opportunities for the development in the regions. The purpose of this work is to identify problems that will hinder or contribute to the further development of Arctic tourism in Russia in the current political and economic situation.

Materials and methods

Numerous studies that have appeared in the last few years are devoted to the Arctic tourism. These works consider the conceptual features of Arctic tourism, its motivation, resources, types, logistics, new directions are proposed, prospects are predicted [1, Loguntsova I.V.; 2, Zhelnina Z.Yu., Tereshchenko N.V.; 3, Kunnikov A.V.; 4, Lukin Yu.F.; 5, Meltsov A.V., Dracheva L.A., Savinkina L.A.; 6, Sevastyanov D.V.; 7, Timoshenko D.S., 8, Tsvetkov A.Yu.; 9, Shindina Yu.A.; 10, Heldt Cassel S., Pashkevich A.; 11, Steward E. J., Ligget D., Dawson J]. In 2022, the existing strategies for tourism development, including the Arctic one, were affected by factors unforeseen at the time of their development. Their further implementation is associated with overcoming unexpected obstacles. Studies of the influence of the new geopolitical reality on Arctic tourism began to appear in scientific publications. Thus, A.V. Meltsov, E.L. Dracheva, L.A. Savinkina believe that “complex geopolitical relations of Russia limit the development of the Arctic potential, primarily in the field of Arctic tourism” [5, p. 5]. At the same time, according to D.S. Timoshenko, Arctic tourism is a tool for reducing conflict potential and an element of civilizational development of the North [7, p. 50]. Therefore, no matter what, Arctic tourism should be developed for the benefit of humanity.

At the beginning of our work, we analyzed the situation resulting from the difficult geopolitical conditions of 2022 in terms of its impact on the development of Arctic tourism in Russia. For this purpose, we used information from the portal of the Association of tour operators of Russia on the state of domestic tourism in the past year and data on tourist arrivals from the official website of the State Statistics Committee.

In order to identify shortcomings in the organization of tourism, problems that reduce the impression of tourists from the visited destinations, we turned to the opinion of the tourists themselves. Content analysis is used as one of the tools for studying the opinions of tourists. Tourists’ feedback on the popularity of attractions and problems of development of tourist centers were studied using content analysis by many authors. For example, I.A. Potapov conducted a content

analysis of tourist reviews about a small Finnish town that has become a popular tourism center, which allowed to identify the factors that influenced this process [12].

We conducted a content analysis of reviews of tourists who visited various regions of the Russian Arctic. As a source of information, we used a popular Internet review site [1]. The reviews posted there represent a cross-section of tourists' opinions about the main Arctic destinations, give an idea of the greater popularity of some destinations and the "non- promotion" of others, and show the links between tourist sites and places where tourist flows to them are formed. For greater objectivity, we excluded from the analysis reviews given by local residents. Non-quantitative and quantitative types of content analysis were used. With the help of non-quantitative content analysis, we identified natural and non-natural factors that influenced the formation of qualitative characteristics of the impressions of tourists received when visiting the main places of tourist interest in the Arctic. Quantitative content analysis allowed identifying and comparing the main factors that were perceived negatively by tourists and those that were noted positively. In addition, quantitative analysis made it possible to compare the relevance of these issues in the territorial context of the Russian Arctic, to determine the most and least visited destinations and places where tourists come from. Using SWOT-analysis, we identified the main strengths and weaknesses of Arctic tourism logistics. Next, we made a conceptual forecast of the further state of the identified problems, taking into account the current political and economic situation in the country. As the destinations participating in the analysis, we chose those that are marked on the tourist portal of the Arctic zone of the Russian Federation [2]. These are the village of Teriberka, the Khibiny, the Solovetskiy Islands, Naryan-Mar, Vorkuta, Salekhard, Norilsk, Taimyr, the Republic of Sakha (Yakutia), Chukotka. We intentionally did not take large cities for analysis (Murmansk, Arkhangelsk).

Results and discussion

In 2022, due to the difficult political and economic relations between Russia and foreign countries, a situation is emerging in which the tourism industry in the Arctic is losing a significant part of its market. Foreign tourists were the main consumers of cruise tours to the Pole. Before the COVID pandemic, in 2019, 23 cruises were made in the Arctic Ocean to the North Pole during the season, with a visit to the Franz Josef Land archipelago, and in 2022, the icebreaker "50 Let Pobedy" made only 3 voyages, of which one was for tourists, and two — as part of a youth science popularization project. The number of cruise participants decreased by more than 5 times. The reasons for this were problems of a political, legal and logistical nature, due to which foreign tourists practically stopped visiting Russia. According to the Association of tour operators of Russia, there were practically no foreign organized tourists in 2022. Single visits to Russia by foreigners for business purposes were recorded. A few tourist groups came from India, China, Philippines, Vi-

[1] Otzovik. URL: https://otzovik.com/travel/ (accessed 06 January 2023).
[2] The Arctic is closer than you think. URL: https://www.tourism.arctic-russia.ru/ (accessed 08 January 2023).

etnam, Qatar, Iran, Turkey. At the same time, the entry flow to Russia increased by 1 million people compared to 2021 (but decreased by 3.5 times compared to 2019), although this is due to non-tourist visits by citizens of Central Asian countries [3].

The Russians also found themselves in a situation where it became difficult to travel abroad. Therefore, they are increasingly travelling within the country, including to the regions of the Russian Arctic. According to Rosaviatsia (Federal Air Transport Agency), in 2022, the airports of the Arctic zone of Russia served 9% more passengers than in 2021, but 10% less than before the pandemic in 2019 [4]. It is difficult to single out tourists among passengers, but at the same time it indicates the growth of arrivals to the Arctic of Russians, including for tourism purposes. The open data of the Statistical Committee does not give an accurate calculation of the tourist flow. The number of arrivals, determined by the number of people in collective accommodation facilities, does not give an exact number of tourists among them. In 2022, arrivals of conditional tourists were recorded in the Arctic regions of Russia as follows: 572.949 people in the Murmansk Oblasy, 318.175 people in the Yamalo-Nenets Autonomous Okrug, 30.068 people in the Chukotka Autonomous Okrug, and 17.628 people in the Nenets Autonomous Okrug. For other subjects that are part of the Arctic, statistics are given within the administrative boundaries; it does not give an idea of the number of tourists visiting the Arctic destinations. 1.492.467 arrivals were recorded in the Krasnoyarsk Krai, 617.806 people visited the Republic of Karelia in 2022, 517.315 people visited the Arkhangelsk Oblast, 435.112 people visited the Komi Republic, and 237.467 people visited the Republic of Sakha (Yakutia) [5]. Therefore, it is impossible to say unequivocally about the growth of Arctic tourism, although there is interest in a direction that is new for most Russians, and this should be used before the market situation changes.

In order to make Arctic tourism attractive not only because of the exoticism, to encourage tourists to return to the Arctic, it is necessary to solve its specific problems. For this purpose, we have studied the feedback from tourists who have been on various Arctic trips, both independent and organized. Of all the variety of places of tourist interest, we focused on those that are promoted on a special tourist portal of the Arctic zone (Table 1). A total of 195 reviews were considered. In the Republic of Sakha (Yakutia) and Chukotka, more than half of the reviews were left by local people or people who moved from there to other regions. We excluded them from the analysis.

[3] V"ezdnoy turizm v Rossiyu nakhoditsya na urovne statisticheskoy pogreshnosti [Inbound tourism to Russia is at the level of statistical error]. URL: www.atorus.ru/node/50115 (accessed 09 January 2023).
[4] Rastet li na samom dele turpotok v arkticheskie regiony Rossii [Is the flow of tourists to the Arctic regions of Russia actually growing?]. URL: www.atorus.ru/node/50677 (accessed 10 January 2023).
[5] Federal State Statistics Service. URL: https://rosstat.gov.ru/storage/mediabank/turpotok-12.xlst (accessed 06 February 2023).

Table 1

Analysis of positive and negative tourist reviews of Arctic destinations (%)

Evaluation	Solovetskiy Islands	Teriberka	Khibiny	Cruise	Naryan-Mar	Vorkuta	Salekhard	Norilsk	Taimyr	Yakutia	Chukotka
Positive evaluations											
nature, history	56	81	44	100	32	43	50	14	100	80	75
privacy	9	*	*	*	*	*	*	*	*	*	*
active rest	5	*	*	*	*	*	*	*	*	*	*
winter	*	*	*	*	*	*	*	*	33	*	*
inexpensive	*	*	41	*	*	*	*	*	*	*	*
service	*	*	13	*	*	*	*	14	*	*	*
not far away	*	*	11	*	*	*	*	*	*	*	*
people	*	*	*	*	25	*	*	*	*	50	*
Negative evaluations											
climate	22	17	44		42	57	50	71	67	70	37
ecology	*	*	*	*	*	*	*	43	33	*	*
prices	22	15	11	100	25	14	43	14	33	*	25
far away	13	13	7	*	*	*	*	*	*	*	25
infrastructure	22	49	26	*	*	14	14	*	*	30	12
devastation	5	13	*	*	*	29	*	*	*	*	*
number of reviews (%)	28	24	14	1	5.7	2	7.3	7.3	1.7	5	4

* — there are no reviews, or their number is insignificant.

First of all, the analysis of tourist reviews allows us to identify the most popular destinations in Arctic tourism. The Solovetskiy Islands in the Arkhangelsk Oblast (28% of the total number), Teriberka village in the Murmansk Oblast (24%) and Khibiny (ski center in the Murmansk Oblast, 14%) lead in the number of reviews. In general terms, the percentage of popularity of these destinations corresponds to the rating of the administrative entities on the territory of which they are located [1, Loguntsova I.V., p. 40]. The number of reviews and, consequently, the popularity of destinations decrease when moving eastwards (exceptions are Arctic cities with developed infrastructure — Salekhard, Norilsk, Naryan-Mar). This may be due to the greater remoteness and inaccessibility of destinations in the Asian sector of the Arctic for potential tourists, the insufficient development of infrastructure and the tourism industry in its regions, and fewer offers of various tours. Polar cruises are the most elite because of their high cost.

Analysis of reviews allows us to determine residents of which regions most often visit these tourist destinations. Since the portal used for the analysis is Russian-speaking, the reviews on it are mainly from tourists from Russia. The geography of tourists who left feedback indicates their preference for regions that are closer and cheaper to get to. Many places are visited by previously left citizens (“guest tourism”), which does not bring much income, since such tourists usually do not have overnight stays in hotels. Destinations in the European sector of the Russian Arctic are mainly visited by tourists from the European part of Russia, while the Asian part of the Arctic is more often visited by residents of Siberia and the Far East.

Thus, the Solovetskiy Islands are most often visited by residents of Moscow and the Moscow Oblast (38% of reviews), St. Petersburg (13%), Murmansk, Arkhangelsk (6% of reviews each). Teriberka is more often visited by tourists from St. Petersburg (22% of reviews), Moscow and the Moscow Oblast (22% of reviews), Murmansk and the Murmansk Oblast (9% of reviews). The next destination — the ski center of Khibiny (Kirovsk) — is much less popular in terms of the number of reviews left about it. It is most visited by tourists from St. Petersburg (42% of reviews), Moscow, Murmansk and the Murmansk Oblast (19% each). Ski tourism requires special training, so this center, despite the development of infrastructure and accessibility, is less visited than Teriberka and the Solovetskiy Islands.

Other destinations are significantly inferior in terms of popularity among tourists. There are no clear leaders among the centers of tourist flows formation. These are the nearest regional centers, random cities where business travelers come from. Thus, Naryan-Mar is more often visited by residents of Arkhangelsk (27% of reviews), St. Petersburg (18%). The number of reviews about Vorkuta is the same from all cities where tourists or business travelers came from. 50% of reviews about Salekhard are from residents of Moscow. Norilsk is relatively more visited by residents of St. Petersburg (13% of reviews), the number of reviews from other cities is the same. In general, 40% of reviews about Norilsk are from tourists from places in the Asian part of Russia. The situation is similar throughout Taimyr. The Republic of Sakha (Yakutia) is more often visited by tourists from Moscow and Novosibirsk (20% of reviews each). But 75% of tourists are from the Asian part of Russia. Chukotka is more often visited by Moscow residents (50% of reviews). Unlike Sakha (Yakutia) and Taimyr, Chukotka is more visited by tourists from the European part of Russia, despite the considerable distance and high cost of tickets. This can probably be explained by the exoticism and exclusivity of tourist destinations there, oriented to individual tourists, which further increases the cost of such a trip. The most solvent tourists inside Russia are in large cities of the European part.

Reviews of tourists show that they are most attracted to the Arctic by its beautiful nature and interesting history. Tourists in all studied destinations left more positive reviews on these characteristics. Among the advantages of Arctic tourism, some respondents also noted privacy, possibility of active reast, presence of real winter, likelihood of seeing the northern lights, etc. Many people mentioned the kindness and hospitality of the local population (especially in Naryan-Mar and Yakutia). Positive feedback on various elements of service for tourists, infrastructure was left only in cities and developed tourism centers (Khibiny, Norilsk), although some tourists left negative reviews about the Khibiny infrastructure. Of all the directions reviewed, only the Khibiny Mountains, which are close to the main places of tourist flows formation (St. Petersburg, Murmansk, Moscow) and well connected with them by regular transport routes, received positive feedback about inexpensive, logistically accessible holidays.

The most negative evaluations were given to the cold climate, unpredictable weather, polar day and night. Only the reviews of the pole cruise have no comments on the climate, but its

negative side is the high cost. In the reviews about the village of Teriberka, the main negative aspect is associated with a poorly developed infrastructure. High prices (for travel, accommodation, shopping), problems of logistics and tourist infrastructure (lack of roads, public transport, places of accommodation, catering establishments), devastation and despondency that settlements leave — these are the main negative features of a non-natural character that are noted in the reviews. The high cost is noted in reviews in all directions, but especially in Salekhard, Naryan-Mar, Taimyr, Chukotka, Solovetskiy Islands. Poor infrastructure was also noted in Yakutia, the Solovetskiy Islands, Vorkuta, Salekhard and Chukotka. Some tourists are disappointed by the devastation in Vorkuta, Teriberka, in a village on the Solovetskiy Islands. There are relatively few reviews about the remoteness of the considered directions. Most of all tourists wrote in their reviews about the remoteness of Chukotka and, strangely enough, the Khibiny, Teriberka and Solovetskiy Islands, which are closer to the places of formation of tourist flows than the other studied destinations. Most likely, this is due to the complexity of direct logistics to the Solovetskiy Islands and Teriberka. In Norilsk and Taimyr, there are many negative reviews related to the poor environmental situation of the area, the impact of large industrial enterprises on it.

Thus, according to tourists, the main problems that may be the reason for refusing to travel to the Arctic are complicated logistics, lack of roads and poor transport connectivity of objects of tourist interest, underdevelopment of services and special infrastructure for serving tourists, neglect of many settlements. At the same time, the cost of Arctic tours is high while a quality of service is low. The exotics of Arctic travels are interesting for potential tourists, but the listed negative factors prevent them from realizing these trips, although this will not be a problem for those who like “spartan amenities”. Improving transport accessibility and quality of service will attract more tourists to the Arctic, despite the fact that local climatic conditions are a problem for many of them.

Solving the problems of transport logistics of Arctic tourism and reducing the negative impact on its development requires serious attention. Not all Arctic destinations will be able to develop successfully in the current conditions precisely because of their inaccessibility to tourists.

We conducted a SWOT analysis of the strengths and weaknesses of tourism logistics for major Arctic tourism destinations. As a result, it turned out that the strengths of Arctic tourism logistics are the presence of its own icebreaker fleet, in addition, it is planned to build six new icebreakers by 2030 (although in the current economic situation this period may be postponed due to sanctions); the presence of regular transport links with the main places of formation of tourist flows in most logistical centers of Arctic tourism.

The weaknesses of the logistics of Arctic tourism are the following: the absence of land transport routes connecting some logistics centers of Arctic tourism with places of tourist flows formation (this is especially true for Chukotka, the north of Sakha (Yakutia), the north of the Krasnoyarsk Krai); the remoteness of many Arctic regions from places where tourist flows are formed; the high cost of sea transportation due to the expensive freight of icebreakers; a small number of

regular air and rail trips to Moscow and St. Petersburg as the main centers for the formation of tourist flows.

Opportunities for transport logistics are the ongoing construction of new roads (for example, roads will connect with the main territory of the country through the Republic of Komi, Nenets and Yamalo-Nenets Autonomous okrugs).

Threats to the further development of transport logistics are associated with the emergence of competitors in sea cruise transportation to the Pole (a French icebreaking class liner); the exhaustion of flight resource of aircrafts and impossibility of their replacement in the present geopolitical conditions; the great dependence of transport in the Arctic on weather conditions; the complication of logistics for arrival of foreign tourists.

When planning Arctic tourism at the present stage of development, it is necessary to focus on the most accessible areas for tourists, which are already more often chosen by them to explore the Arctic, and to organize transport corridors to reach them. The main regions from which tourists most often come to these areas should be taken into account. In terms of transport accessibility for tourists from the places of formation of tourist flows, the destinations of the Russian sector of the Arctic considered in the work can be divided into three groups: accessible by road, rail and air transport (Murmansk Oblast, some Arctic regions of the Arkhangelsk Oblast and the Komi Republic), accessible mainly by rail and air transport (Yamal-Nenets Autonomous Okrug, which can be reached by road only from the south, through the Khanty-Mansi Autonomous Okrug), accessible only by air transport (Taimyr, the Arctic uluses of Yakutia, Chukotka Autonomous Okrug). Water transport should be mentioned separately. As a means of delivering tourists from places where tourist flows are formed, it can be used in places where large rivers flow, which in Russia are directed from south to north (the Ob River — the Yamalo-Nenets Autonomous Okrug, the Yenisei River — Taimyr, the Lena River — the north of the Republic of Sakha (Yakutia)).There are large cities along the banks of these rivers, potential places for the formation of tourist flows (Novosibirsk, Krasnoyarsk, Yakutsk), but the time of their use is limited by navigation. Water transport is best used for organizing river and sea cruises, especially since the subjects of the Arctic zone, as a rule, are located along the shores of the Arctic Ocean and its seas.

In the current geopolitical situation, Russian aviation is under threat. Most of the aircraft are foreign-made; they also have to undergo technical regulation abroad, which has become impossible since 2022. Therefore, the number of aircraft in operation is decreasing. Consequently, the problem of transport accessibility of the regions of the Arctic, which have a connection with the rest of the territory of Russia only by plane, will become an obstacle to the development of tourism there. These include the Nenets Autonomous Okrug, the north of the Krasnoyarsk Krai (Taimyr), the Arctic uluses of the Republic of Sakha (Yakutia), the Chukotka Autonomous Okrug.

In other Arctic regions of Russia, this problem is offset by the availability of land transport, but there is a problem of increasing travel time to places of tourist interest. For the Arkhangelsk Oblast, the situation with the reduction of operated aircrafts will be aggravated by the closure of

the main airport Talagi for reconstruction during the tourist season of 2023. Visiting settlements on the coast of the White Sea, the Solovetskiy Islands from Arkhangelsk by small aircraft is complicated by the fact that tickets are sold primarily to passengers with local residence registration, as they are subsidized from the regional budget.

Thus, the advantages that emerged in the domestic tourism market after the restriction of outbound tourism for Russians during the current political and economic situation cannot be fully realized due to problems with transport. It follows that there will be no significant breakthrough in the development of Arctic tourism in Russia in the coming years, since we cannot influence the geopolitical and logistical factors that hinder its development. A significant increase in the number of tourists in some Arctic regions should not be expected. The main emphasis in the development of Arctic tourism should be made on the creation of high-quality world-class infrastructure, the construction of roads between objects of tourist interest, the development of public transport in the regions most visited by tourists now. These are the Murmansk Oblast, the Yamalo-Nenets Autonomous Okrug, the Arctic regions of the Arkhangelsk Oblast, the Republic of Karelia and the Komi Republic.

Particular attention should now be paid to the creation of tourism infrastructure in the Murmansk Oblast. The presence of objects of tourist interest, relative transport accessibility, even in the absence of basic tourist infrastructure, makes the destinations of the Murmansk Oblast popular even now. The advantages of the transport and geographical position of the Murmansk Oblast and Murmansk as an ice-free port and a major transport hub should be used for its maximum development as the main center of Arctic tourism, including cruise tourism, since the base of the Russian icebreaker fleet is located there. This region is at the same time close to the main places of formation of tourist flows within the country and in Europe, and is located not far from the North Pole.

Arkhangelsk is another major logistics hub for Arctic tourism. It is more distant from the North Pole, but is closer to the places where the country's tourist flows are formed than Murmansk. It is planned to build a railway that will connect Arkhangelsk with the regions of the Urals and Siberia ("Belkomur"). This will expand the delivery options for potential tourists.

Salekhard, the capital of the Yamalo-Nenets Autonomous Okrug, as well as nearby Labytnangi and Vorkuta are complementary logistics centers. Their strength is the presence of two airports (Salekhard, Vorkuta), railway stations (Vorkuta, Labytnangi), and a port (Salekhard). The creation of a single cluster could make them an original Arctic tourist center, combining the directions of ethnographic and industrial tourism, which could increase the time tourists spend there.

In order to attract tourists to the Arctic, it is necessary to develop tours for various categories, create new routes that may become popular among foreign tourists in the future. This is especially true for the border areas of the Murmansk Oblast and Karelia, as well as areas of the Asian sector of the Arctic. For example, for the Murmansk Oblast, it is possible to propose the development of a tour along the historical road "Road to the Arctic Ocean", built by Finland in 1931, con-

necting the Finnish city of Rovaniemi with the former Finnish port on the Barents Sea, Linahamari. Immediately after construction, this path attracted tourists (in 1936, 14.000 people traveled along the road). In the future, this road could also be used for cross-border Arctic travel. Arctic cruises around the Chukotka Peninsula and other exclusive routes in the Asian sector of the Arctic could be developed for tourists from East and Southeast Asia, which would be visited now.

Conclusion

The geopolitical situation that has developed around Russia in 2022 has affected the development of Arctic tourism. First of all, it influenced the change in the market of tourist services consumption, from which foreign tourists, who used to be the main participants of the most expensive type of Arctic tourism — pole cruises — have been almost completely excluded. The interest of Russian tourists in the destinations of the Arctic region has intensified, which is indirectly evidenced by an increase in passenger traffic at Russian Arctic airports in 2022 by about 9–10%. However, they did not become consumers of the cruise tourism product due to the high price of tickets. As a result, the number of cruise tourists in the Arctic decreased by 5 times.

The most popular destinations for Russian tourists in the Arctic are the Murmansk Oblast, the arctic regions of the Arkhangelsk Oblast and the Republic of Karelia, the Yamalo-Nenets Autonomous Okrug. Most often, tourists visit the Solovetskiy Islands (Arkhangelsk Oblast), the village of Teriberka and the Khibiny ski center (Murmansk Oblast). Most of the tourists visiting these regions live in the European part of Russia. The main centers for the formation of tourist flows to these destinations are Moscow and the Moscow Oblast, St. Petersburg, Murmansk and Arkhangelsk oblasts. This is due to the proximity and transport accessibility of this sector of the Arctic for tourists of the European part of Russia, more developed infrastructure and a variety of tourist offers. The Arctic regions of the Asian sector are less popular with tourists due to poor transport accessibility and underdeveloped infrastructure. Basically, these directions are visited by residents of Siberia and the Far East.

The analysis of the negative reviews of tourists visiting the main Arctic destinations showed a set of standard problems inherent to tourism in underdeveloped regions. These include the lack of roads and tourist infrastructure, the high cost of importing all the goods and equipment necessary for normal life, and the complicated logistics of transporting tourists. In the current geopolitical situation, the problem of the logistics of Arctic tourism is seen as the most serious, and it becomes the main obstacle to its further development. Since the regions of the Russian Arctic are significantly remote from the main places of formation of tourist flows, the main transport for tourists is plane, especially since many regions of the Arctic have no land connections with the rest of Russia. The planes used by Russian airlines are mostly foreign-made and cannot be serviced in Russia due to economic sanctions, so the number of machines in operation will decrease, which will affect the reduction in tourist traffic and an increase in fares. It will further raise the price of expensive Arctic tourist products, resulting in a reduction in the number of tourists. This is espe-

cially true for the regions of the Arctic that can only be reached by plane (Nenets Autonomous Okrug, Taimyr, the north of the Republic of Sakha (Yakutia), Chukotka Autonomous Okrug). When planning tourism in the Russian Arctic, it can be suggested to concentrate efforts on already operating areas that have land transport links with the main centers for the formation of tourist flows. This applies to the Murmansk Oblast, the Yamalo-Nenets Autonomous Okrug, the Arctic regions of the Republic of Karelia and the Arkhangelsk Oblast. For the rest of the Russian Arctic regions, the main directions should be the development of local tourism and the creation of tourism infrastructure. After the geopolitical situation changes, it will be easier to develop these areas on the basis of the existing infrastructure.

Thus, in modern conditions, the development of Arctic tourism in Russia will slow down due to the aggravation of logistics problems. The main promising destinations for Russian tourists will be the most transport-accessible destinations in the European part of the Russian Arctic, to which there was an increase in interest in 2022. Stimulating the tourist flow requires the improvement of local tourist infrastructure and the development of tourist offers designed for different categories.

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Research by M.V. Lomonosov on the Arctic and the Concept of Creating an Electronic Database "Digital Lomonosov" in Russian and Chinese

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Abstract. Currently, against the background of sanctions from the West, Russia and China should strengthen cooperation in all sectors, especially in scientific research and resource development in the Arctic, as well as in combating problems associated with climate change and the use of the Northern Sea Route to enhance mutually beneficial trade activities between the two countries. The digitalization of Arctic culture should become a paramount branch of cooperation between universities in Russia and China, which cannot be done without considering and disseminating the scientific works of M.V. Lomonosov on the North and the Arctic. In China, Lomonosov was a completely understudied Russian scientist from all sides of his achievements in the sciences. The article gives an overview of M.V. Lomonosov's contributions to the development of the Russian North and the Arctic, describes the processes of shaping his scientific interests in the study of Arctic spaces, analyzes his main theoretical positions on the phenomenon of Arctic lights and the natural conditions for the development of Arctic spaces, reveals his historical views on the role and importance of mastering the Arctic for the language possession of small peoples in this region against the background of the spread of world civilization and culture, which still has not lost its importance. Moreover, the relevance of creating an electronic database "Digital Lomonosov" in Russian and Chinese in parallel for the development of modern Lomonosov's science and translation studies on the scientific achievements of Lomonosov in China is considered, the main concept of the Project development and specific stages of digitalization of Lomonosov's works in two languages by joint efforts of scientists from NArFU and CHU are analyzed.
Keywords: *joint development of the Arctic space, digital Lomonosov in Russian and Chinese*

Introduction

Russia and China currently attach particular importance to the joint development of the Arctic. Cooperation between the two countries in this area is considered as an integral part of the conjugation of the Greater Eurasian Partnership and the Chinese "The Belt and Road Initiative" [1, Zhuravel V.P., p. 70]. China actively cooperates with Russia in the development of the Arctic; according to Chinese experts, China looks at the NSR as a potential branch of its "Silk Road" [2, Li Q., Zhang Ch.; 3, Sun S.]. President of Russia V.V. Putin, during a meeting with Chinese representatives, said: "The silk way reached the North. Let's unite it with the Northern Sea Route, and there will be that is necessary, and the Northern Sea Route will be made Silk" [1]. Against the background of China's rapidly growing demand for natural gas and the increasing dependence of energy consump-

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[1] Putin poobeshchal sdelat' Shelkovym Severnyy morskoy put' [Putin promised to make the Northern Sea Route Silk]. URL: https://news.myseldon.com/ru/news/index/179567153 (accessed 07 February 2023).

tion on foreign countries, Russian LNG projects in the Arctic seem very attractive to China. According to the Sputnik agency, on May 18, 2022, Doctor of Political Sciences, Professor of the Russian Academy of Sciences, Professor of St. Petersburg State University Yana Leksyutina, while participating in the Valdai International Discussion Club, said that "Russia and China can successfully open cooperation in the Arctic, especially in the field Northern Sea Route. Within the framework of political sanctions from the West, the French and Japanese partners are gradually withdrawing from the Arctic LNG-2 project, and we fully expect opportunities for increased investment in this project from the Chinese partners. Cooperation in the Northern Sea Route will bring successful results; in particular, we will be able to increase the volume of hydrocarbon transportation through this route" [2]. According to Deputy Prime Minister of the Russian Federation, Presidential Plenipotentiary Envoy to the Far Eastern Federal District (FEFD) Yuriy Trutnev, Russia is leading in a number of areas related to the development of the Arctic. These include the development of the Northern Sea Route, science and technology, and environmental protection. International cooperation can give a new impetus for developing existing and launching new scientific projects, promoting university-level collaboration between Russia and China, and strengthening partnerships between the business communities and economic ties between the two countries [3].

As part of its chairmanship of the Arctic Council in 2021–2023, Russia has begun implementing its plans for cooperation with the countries participating in the intergovernmental forum in four priority areas: the population of the Arctic, including the indigenous peoples of the North; protection of the Arctic environment, including climate change; socio-economic development of the region and strengthening the role of the Arctic Council as the main platform for multilateral cooperation in high latitudes [4]. In 2022, Russia continued to implement the two-year action plans, the main theme of which was the responsible management of the Arctic. For the implementation of the goals and plans, 43 events were organized. Since May 2021, as a country chairing the Arctic Council, Russia for the first time organized forums to discuss issues of protecting the intellectual property of indigenous peoples, the social responsibility of entrepreneurs and public-private partnerships for the sustainable development of the indigenous peoples of the North. Many projects and initiatives have been put forward in such areas as the digitalization of the national culture and languages of the indigenous peoples of the North, the development of creative industries and traditional Arctic medicine, the creation of an international Arctic scientific research station based on carbon-free energy, ensuring biosecurity in the Arctic, the creation of a unified platform for digital museums [5]. Among these tasks, the digitalization of the Arctic culture cannot do without the con-

[2] Mnenie eksperta: Rossiya i Kitay v nastoyashchee vremya mogut uspeshno razvivat' sotrudnichestvo [Expert opinion: Russia and China can now successfully develop cooperation]. URL: https://sputniknews.cn/20220518/1041453702.html (accessed 07 February 2023).
[3] News. Russian Government. URL: http://government.ru/news/42186/ (accessed 07 February 2023).
[4] Ibid.
[5] Russia, as the leader of the Arctic Council, successfully organizes more than 40 important events related to the Arctic in 2022. China.org. URL: http://zjnews.china.com.cn/yuanchuan/2022-12-28/363870.html (accessed 07 February 2023).

sideration and dissemination of scientific works on the North and the Arctic by M.V. Lomonosov.

At the same time, the creation of an electronic database “Digital Lomonosov” in Russian and Chinese will become one of the important tasks in understanding the history of Arctic exploration, so the implementation of the project in order to digitize the Arctic culture has become more relevant than ever for joint research and humanitarian cooperation between China and Russia, and in the perspective in all other areas as well.

Review of M.V. Lomonosov’s contribution to the development of the Russian North and the Arctic

The founder of the northern and Arctic geostrategy of Russia was the great son of the Pomor land M.V. Lomonosov. The Russian North and Lomonosov are two phenomena inseparable from each other. The North, where Lomonosov spent his childhood and youth, had a great influence on his scientific interests. The north, hitherto motionless and almost unknown, was an integral part of Lomonosov’s poetry and science [6]. At that time, the features of the socio-economic and cultural environment of the Russian North, its unique historical and cultural wealth played a leading role in shaping the personality of M.V. Lomonosov [4, Butorina T.S., pp. 8–13]. In the North he formed patriotism, honesty, collectivism, a humane attitude towards others, courage, having absorbed folk traditions, the culture of the region and spiritual values [5, Lukin Yu.F., pp. 275–302]. He made a huge contribution to the study of the northern lights, the nature of cold and heat, the features of sea ice, the possibility of conducting northern sea expeditions, the conditions for moving through the Arctic Ocean and a number of other issues related to the development of the Arctic territories [6, Shirin D.A., pp. 3–7].

He began to study and observe the northern lights from 1743 and continued this topic until his death. Despite the fact that he did not complete the theory of atmospheric electricity, in his works “A word about aerial phenomena occurring from electric force”, “On observations confirming the electrical nature of the northern lights”, “Testing the cause of the northern lights and other similar phenomena”, “A brief description…” he convincingly wrote about the electrical nature of the northern lights, which was confirmed only in the 20th century [7, Eliseev A.A., p. 519, 583–584]. In his poem “An evening meditation on God’s greatness on the occasion of the great northern lights”, he also described the most majestic phenomenon of the North — the northern lights [7]:

[6] Markov N.F. Russkiy sever v proizvedeniyakh M.V. Lomonosova: Rech', chitannaya v torzhestvennom sobranii «Vologodskogo obshchestva izucheniya Severnogo kraya» v den' chestvovaniya 200-letiya pamyati Lomonosova 8 noyabrya. 1911 g. [The Russian North in the works of M.V. Lomonosov: Speech read at the solemn meeting of the "Vologda Society for the Study of the Northern Territory" on the day of honoring the 200th anniversary of the memory of Lomonosov on November 8, 1911]. Vologda, 1912, 17 p. URL: lomonosov.niv.ru/lomonosov/kritika/markov-russkij-sever.htm (accessed 08 February 2023).

[7] Mikhail Lomonosov – Vechernee razmyshlenie [Mikhail Lomonosov – Evening meditation]. URL: https://rustih.ru/mixail-lomonosov-vechernee-razmyshlenie/ (accessed 07 February 2023).

Лице своё скрывает день; *Поля покрыла мрачна ночь;* *Взошла на горы черна тень;* *Лучи от нас сокрылись прочь;* *Открылась бездна звёзд полна;* *Звездам числа нет, бездне - дна.*	*The day has turned its face aside;* *With dusky night the fields are spread;* *Upon the hills black shades abide;* *And far from us all lights are fled;* *The void has opened, stars abound;* *Stars numberless, and void profound.*
Песчинка, как в морских волнах, *Как мала искра в вечном льде,* *Как в сильном вихре тонкий прах,* *В свирепом как перо огне,* *Так я, в сей бездне углублён,* *Теряюсь, мысльми утомлён.*	*Within a wave as grain of sand,* *Or spark in ice from ancient days,* *As speck of dust in whirlwind and* *Like feather in a raging blaze,* *So by this void am I devoured,* *I'm lost, with thoughts I'm overpowered!*
Уста премудрых нам гласят: *Там разных множество советов;* *Несчётны солнца там горят,* *Народы там и круг веков:* *Для общей славы Божества* *Там равна сила естества.*	*From lips of wisest men we learn:* *Out there shine lights in multitude;* *There suns uncountable must burn,* *Folk, too, with histories imbued:* *That God's great glory is to flourish* *There also nature must He nourish.*
Но где ж, натура, твой закон? *С полночных стран встаёт заря?* *Не солнце ль ставит там свой трон?* *Не льдисты ль мешуть огнь моря?* *Се хладный пламень нас покрыл.* *Се в ночь на землю день вступил,*	*But, nature, what is this you've done?* *At midnight see a dawn arise!* *Have you set throne there for the sun?* *Is fire trapped in floes of ice?* *This frozen flame suffuses sight!* *This places day on earth in night!*
О, вы, которых быстрый зрак *Пронзает в книгу вечных прав,* *Которым малый вещи знак* *Являет естества устав* *Вам путь известен всех планет;* *Скажите, что нас так метет?*	*If any, whose revealing gaze* *Into the book of truth can see,* *To whom in things the smallest trace* *Shows charter of reality,* *To whom is known the planet's way* *That which so confounds us — say!*
Что зыблет ясный ночью луч? *Что тонкий пламень в твердь разит?* *Как молния без грозных туч* *Стремится от земли в зенит?* *Как может быть, чтоб мёрзлый пар* *Среди зимы рождал пожар?*	*Why trembles clear light in the dark?* *Why can a thin flame strike the earth?* *Without dark clouds how does the spark* *From land to zenith issue forth?* *And how does frozen steam aspire* *In winter to conceive a fire?*
Там спорит жирна мгла с водой; *Иль солнечны лучи блестят,* *Склонясь сквозь воздух к нам густой;* *Иль тучных гор верхи горят;* *Иль в море дуть престал зефир,* *И гладки волны бьют в эфир.*	*There water battles darkling haze* *Or shine forth beams of sun, rays bright,* *Aslant through air to our gaze;* *Or cloudy hills in fire alight;* *Or Zephyr blows at sea no more* *And smooth waves beat on airy shore.*
Сомнений полон ваш ответ *О том, что окрест ближних мест.* *Скажите ж, коль пространен свет?* *И что малейших доле звёзд?* *Несведом тварей вам конец,* *Скажите же, коль велик Творец?*	*Your answers will not doubt disperse,* *These questions neither hard nor far.* *Tell then how large the universe?* *And what is past the smallest star?* *You know not what for us is fated?* *How great then He the world created?*[8]

[8] Lyrics Translations. URL: https://lyricstranslate.com (accessed 08 February 2023).

The poem is an ode by genre, iambic in size with cross and adjacent rhymes, 8 stanzas. The poet reflects on God's greatness, observing the northern lights. In this poem, Lomonosov called the strikingly beautiful northern lights "great", this reflects the deep consciousness of God's majesty of the scientist and poet himself [9]. His own hypothesis about the electrical nature of the phenomenon is woven into the poem: *waves beat on airy shore*.

Lomonosov's contribution to the exploration and development of the Arctic territories is significant. As a true Russian northerner, M.V. Lomonosov understood the strategic role of exploration of the northern spaces for the future development of the Russian economy and geopolitics in international relations. In many of his literary works, M.V. Lomonosov touched upon the development and settlement of the Arctic [8, 9, 10], substantiating the great importance of the discovery of the North and the use of the Northern Sea Route to strengthen the power of the country and to develop international trade relations.

M.V. Lomonosov is the ideological inspirer and official scientific leader of the first Russian transarctic expedition. He considered expeditions to be an effective way to explore the Arctic territories, for which he seriously prepared for a long time and which he called a necessary condition for their successful implementation [6, Shirin D.A., p. 6]. At the time of his appointment as the scientific leader of the expedition, he had extensive geographical knowledge, literary sources and information obtained from personal communication with sailors, merchants and industrialists, and he had already developed several options of the transarctic crossing routes from Arkhangelsk to the Pacific Ocean along the coast of Siberia, and at that time, he was the most informed in the field of Arctic navigation studies scientist with personal experience of Arctic voyages [11, Lisnichenko V.V., p. 40]. Navigation along the Siberian coast showed that, to the north of the coastal ice fields, vast areas of water free of ice are formed during the warm period, suitable for navigation. According to the most conservative estimates, young Mikhail Lomonosov travelled more than 7000 nautical miles on small fishing vessels in the Arctic seas [ibid., p. 42]. Before expressing his main ideas about the passage of the Siberian Ocean to the east, he studied the theoretical possibility of such a voyage. Therefore, long before the generally accepted scientific theories were formed, M.V. Lomonosov had already formulated many provisions of modern polar oceanography and related areas of geographical science [12, Ogorodov S.A., Romanenko F.A., Solomatin V.I., p. 11].

In the reports of the Academy of Sciences for 1754–1756, Lomonosov's attention was drawn to the problems of the Arctic for the first time. The report for 1754 stated that M.V. Lomonosov investigated the waters of the Arctic Ocean to determine the conditions of their freezing

[9] Markov N.F. Russkiy sever v proizvedeniyakh M.V. Lomonosova: Rech', chitannaya v torzhestvennom sobranii «Vologodskogo obshchestva izucheniya Severnogo kraya» v den' chestvovaniya 200-letiya pamyati Lomonosova 8 noyabrya. 1911 g. [The Russian North in the works of M.V. Lomonosov: Speech read at the solemn meeting of the "Vologda Society for the Study of the Northern Territory" on the day of honoring the 200th anniversary of the memory of Lomonosov on November 8, 1911]. Vologda, 1912, 17 p. URL: lomonosov.niv.ru/lomonosov/kritika/markov-russkij-sever.htm (accessed 08 February 2023).

[13, Lomonosov M.V., p. 391]. In 1755, he compiled a “Letter on the northern passage to the Ost-India by the Siberian Ocean”, the contents of which he used in a work written 8 years later: “A brief description of various voyages in the northern seas ...”, in the chapter “On the possibility of navigation in the Siberian Ocean to the Ost-India” [7, Eliseev A.A., p. 603]. During the period from 1757 to 1759, Lomonosov studied natural resources of the North, icebergs, complexity of ship navigation and factors affecting the safety of travel by sea and the reliability of observations of the instruments of that time. In his treatise “On the layers of the Earth” and in his speech “Discourses on the great accuracy of the sea route” at the General Meeting of the Academy of Sciences (May 8, 1759), M.V. Lomonosov touched upon the topic of navigation and methods of nautical astronomy. In his work “Discourse on the origin of icebergs in the north seas” (published in the Proceedings of the Royal Swedish Academy in 1763), he discussed the origin and movement of icebergs “floating in the north seas”, explaining that their formation and movement were subordinated to the sea currents [6, Shirin D.A., p. 3]. In the paper “Discourse on the origin of ice mountains in the northern seas” (1760), M.V. Lomonosov tried to explain this phenomenon by the fact that in the spring, the great Siberian rivers throw a huge amount of ice into the ocean, which accumulates near the coast. Further to the north, there should be less ice, and the conditions for navigation are more favorable [14, Lisnichenko V.V., p. 441].

From 1761 to 1765, in the last 5 years of his life, M.V. Lomonosov prepared and published his works on the possibility of northern sea expeditions and conditions for advancement on the Arctic Ocean. He also wrote about the Russian North in many of his poetic works, for example, he touched upon the Arctic/northern themes in such poems as “Ode on the accession of Elisaveta Petrovna” (1747), “Ode on the accession of Elisaveta Petrovna” (1748), “A praise to Elisaveta Petrovna, the Sovereign of All Russia, spoken on November 26, 1749” (1749), “Ode in which Her Majesty is thanked from the writer for the highest mercy shown to him in Sarskoe Selo on August 27, 1750” (1750–1751), “Ode on the accession of Elisaveta Petrovna” (1752), “Ode on the birth of Pavel Petrovich on September 20, 1754” (1754), “Dedication to the Brief Russian Chronicler” (1760), “Peter the Great”, heroic poem (1760), "Ode to Petr Fedorovich on the day of accession to the throne” (1760) [12, Ogorodov S.A., Romanenko F.A., Solomatin V.I., pp. 12–13].

It should be noted that all of the above mentioned works were preparatory for the writing in 1763 of the work “A Brief description of various voyages in the northern seas and an indication of a possible passage of the Siberian Ocean to East India”, which occupies a special place in the study of M.V. Lomonosov. This work is, in fact, the first scientific project for the development of the Northern Sea Route, containing the rationale for one of the important state objectives [6, Shirin D.A., p. 4].

In this work, Lomonosov noted the great importance of increasing the population in the Arctic. He considered the population as the most important component of the economic potential of the state. According to M.V. Lomonosov, the demographic situation depends on the migration mobility of the population. He recommended creating more favorable living conditions and easing

taxes. Lomonosov regarded immigration of foreign subjects to Russia as a positive phenomenon [15, Okunev Yu.P., p. 88]. Moreover, he saw the significance of the Northern Sea Route in the opportunity to strengthen Russia's trade relations with Europe, Japan, China, India, America and to achieve state unity on a vast territory stretching to the Pacific Ocean [6, Shirina D.A., p. 4].

Later, relying on the Pomors' reports on climate, time of sea ice clearance, fogs, and new reports on the northern coasts of America, he wrote "Addendum on northern navigation to the east along the Siberian Ocean" (1764), "Second addendum, compiled by new reports of industrialists from the American Islands and on the issue of the Tobolsk merchant Ilya Snegirev and the Vologda merchant Ivan Burenin" (1764), "Notes on equipping the expedition" (1764), "Sample instruction for marine officers, sent to search for ways to the east by the Siberian ocean" (1765) [14, Lisnichenko V.V., p. 436]. M.V. Lomonosov found "sufficient space" for the ship's passage northwards to Japan and the Ost-India in the tales of Siberian industrialists and speechless animals [Ibid., p. 478; 480–481]. Moreover, M.V. Lomonosov put forward the theme of developing native language and culture. According to him, language, being the basis of culture, is also the basis of the spiritual unity of people [16, Arapov O.G., p. 18]. He believed that the development of the Arctic would expand the horizons of knowledge of Russian national culture. "Judging by time, we see that the Russian language from the reign of Vladimir to the present century, more than seven hundred years, has not been changed so much that it was impossible to understand the old one: not as many peoples, not learning, do not understand the language, which their ancestors wrote for four hundred years, for the sake of its great change, which happened after that time" [17, Lomonosov M.V., p. 402].

So, M.V. Lomonosov is known in Russia and in the world as a scientist of all branches, he managed everywhere and brought something new, unexpected, progressive. The range of branches of science with which his discoveries are associated is wide and varied. However, he is known in China mainly as a scientist of natural sciences, while his research in various specific branches of sciences, including the Arctic exploration, was little known. The state of Lomonosov studies in China was described in detail in our article "Lomonosovovedenie in the People's Republic of China: Current State and Development Trends" [18, Wang Q., Wang Ch.].

The concept of creating an electronic database "Digital Lomonosov" in Russian and Chinese

The legacy of the great scientist should be widely studied, discussed and disseminated by Lomonosovists both in Russia and in other countries of the world. Digitalization of such a world scholar as M.V. Lomonosov through the translation and dissemination of his scientific achievements in different languages is very significant. At present, the compilation of the electronic database "Digital Lomonosov" in parallel in Russian and Chinese and the popularization of his scientific works on the Arctic by means of information technology in China are of particular relevance to deepen the research spectrum of Lomonosov studies and the comprehensive introduction of his thoughts to promote modern science in China.

In order to achieve the goal of popularizing M.V. Lomonosov in China, databases of all his works of art and scientific researches should be created both in Russian and Chinese. These works never lose their relevance for the study of modern sciences. The creation of the "Digital Lomonosov" database in Russian and Chinese is also due to the unprecedented need to learn the history of science, to foster patriotism among modern young people, to strengthen scientific cooperation between Chinese and Russian scientists in different fields.

The works of Lomonosov in China have been very little studied and very rarely translated into Chinese, except for some natural science axioms [18, Wang Q., Wang Ch., p. 127]. Little attention has been paid to the analysis of his odes in terms of the theory of the "three styles" and the variation of Church Slavonic and Old Russian, the contribution of Lomonosov to the development of philosophy, philology, literature and translation studies, pedagogy and other humanities, and his views on the development of the Arctic and the historical development of Russia have been underestimated. His correspondence with his contemporaries on the discussion of all important scientific issues has not been studied at all in the Chinese scientific community. Besides, scientific works of Russian authors on Lomonosology form large gaps in China. Few scientists, humanists, linguists, historians and translators in China pay attention to the works and thoughts of Lomonosov in different fields of science, and especially few discuss his achievements in the exploration of the Arctic. We see the great relevance of creating the "Digital Lomonosov" database by the joint efforts of scientists from Russia and the world. This project becomes real and possible with the comprehensive development of information technologies.

Nowadays, any science and technology cannot develop without the support of information technology. The digitalization of Lomonosov's scientific achievements refers to the use of modern computer and network technologies in traditional research. It is related both to the digitalization of the subject of research itself and to the intellectualization of research methods, which implies multidisciplinary participants in the research team, high speed in information dissemination and in cultural exchange [19, Zhang Sh., p. 56].

The main goal of digitalization of Lomonosov's achievements was to integrate modern information technology with the scholar's research results.

Digitization of Lomonosov's heritage is a synthesis of digitization, informatization, management and data analysis of the author's achievements. All these processes are a transition from information coding to conventional notation. The processing of text codes of Lomonosov's scientific achievements is the technical basis for using data on the Internet and creating information links [20, Ouyang J., p. 68]. As a scientist from Zhejiang University Jiang Wentao pointed out, "Digitalization of scientific achievements reflects the typical intersection of the humanities and natural sciences, changing the traditional ways of researching scientific results oriented on paper sources and careful studying of paper texts" [21, Deander J.W., Zhao W., p. 26]. With the help of text codes, all informational knowledge relating to different languages of different nations can be linked to each other by a single public digitalized language, which will lead to a significant change

in the acquisition of knowledge, information and research paradigms.

Digitalization of Lomonosov's works means using modern computer and network technologies for a quick search and access to all materials on the research and work of Lomonosov in all sciences in Russian and Chinese, as well as for conducting research on Lomonosology. The creation of the Lomonosov database on the basis of digitalization changes the forms of knowledge acquisition, ways of marking, comparing, interpreting, sampling, as well as re-creating and transforming his scientific results through design, calculation, analysis and visualization [22, Berdick A.J., Drucker P. p. 3]. Digitization of scientific works and ideas of Lomonosov is closely linked to numerical computing, data networking, statistics, text recognition, subject classification, mathematical modelling, information preservation and other types of information technology. Digitization of scientific results of Lomonosology in Russia and other countries will guarantee the intellectualization of Lomonosov's research methods, high speed of search and distribution of information about his ideas and contribution to various aspects of the humanities and natural sciences and thereby popularize him among modern Russian and Chinese Internet users and researchers [19, Zhang Sh., p. 56]. This process requires, first of all, bringing all available works of art and scientific papers written by Lomonosov himself and documents in which his main ideas on relevant issues were recorded into electronic format. This requires the involvement of professionals in the field of translation and information technology.

The works of M.V. Lomonosov and the literature on his scientific and creative activity in the database should be presented in Russian and Chinese in two parallel headings of each web page. To create the database, all materials should be grouped by type of publication: books, articles from journals and newspapers. Information about publications will be arranged in alphabetical order of authors and titles for each category of sciences. The list should begin with information on books in a particular science, followed by information on publications in periodicals.

The multidisciplinarity of the joint research team from Changchun University and Northern (Arctic) Federal University will provide gradual steps for joint work of the Project participants. First of all, it is necessary to gather all materials and all translators and to distribute tasks in order to perform quality translations of all Lomonosov's works and articles from journals and newspapers in Chinese. In this process, there will be many difficulties for the Chinese translators to understand the texts of the 18th century correctly. To resolve this issue, it is necessary to organize a consulting group of Lomonosov researchers in various areas of science to help Chinese translators. Without proper understanding, there can be no question of adapting the materials and adequately reflecting them in Chinese. The stylistic and genre features of Lomonosov's work also create great difficulties for conveying the content and thought of Lomonosov in the form of a version in Chinese.

At the second stage of creating the "Digital Lomonosov" database, after the translation of all his works and scientific articles about his work into Chinese, it is necessary to introduce digital technologies for intelligent text processing, formatting data, pictures and audiovisual resources explaining his viewpoints and ideas in the cultural background of the 18th century in order to re-

vive and clarify Lomonosov's thought to compare the historical development of different sciences with the contemporary research results. Moreover, it is necessary to constantly improve and process the databases with the help of computer and network technologies.

When digitizing all Lomonosov's works and writings in Russian and Chinese, it is also important to use pictures, video and audio with additional comments on cultural background knowledge to help Chinese readers to understand Lomonosov's translations in Chinese. Diversification of professions among the Project participants from the Russian and Chinese sides will increase the field of research on Lomonosov and extend the influence of the developed database in Russia and in China for more in-depth research on Lomonosov and his ideas in all fields in the future. In addition, to carry out the "Digital Lomonosov" database project, a specialized translation, dissemination and research site should be created to attract more scholars to participate in the joint research and dissemination of Lomonosov in China. Further, after the digitalization of all data regarding M.V. Lomonosov, it is necessary to develop research software, to make multilateral statistics of digital data, their classification, analysis, comparison of texts, to analyze data, to create metaknowledge contained in Lomonosov's works, to reveal his core thoughts and concepts, regularly holding conferences and forums online and offline, as well as to create consulting teams in Lomonosology to serve native speakers of Russian and Chinese. Moreover, forums and conferences should be held regularly to collect new questions for further research, supplement data resources and enhance the exchange of research experience, as well as to develop cultural dialogue between researchers. The created databases of "Digital Lomonosov" should be open and shareable among all researchers and translators with the aim of long-term training of young scientists and involving them in a comprehensive study of the Lomonosov phenomenon in China and in the world.

Conclusion

The ideas of developing the "Digital Lomonosov" project require every possible effort on the part of Russia and China in order to strengthen the joint development of natural resources in the Arctic, and expand scientific and humanitarian cooperation between both countries in the future.

M.V. Lomonosov, as a scholar-encyclopedist, should be given more attention among scientists of the humanities and natural sciences. The digitalization of his scientific works and studies will ensure the expansion of the influence of his ideas in the international scientific community and the dissemination of his scientific thoughts and achievements throughout the world. The "Digital Lomonosov" project will undoubtedly open up new directions of cooperation in the development of the Arctic space and the Northern Sea Route between scientists from Russia and China. At the same time, the digitalization of all his works will expand the horizons of researchers of Chinese Lomonosology and create new fields of connections in the development of Russian philology, literature, rhetoric, history, philosophy, and will also increase Lomonosov's influence on the modern

development of sciences in general. Digitalization of scientific works of M.V. Lomonosov in Russian and Chinese requires the Project participants to have multidisciplinary knowledge and information technology, which is the challenge and difficulty of the Project.

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Resilience of Arctic Communities: Concept, Methodology and Research Directions

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Abstract. This article is aimed at scientific review of theoretical and methodological approaches to the study of social (community) resilience and its empirical applicability in the context of territorial development of the Arctic. The relevance of this research is determined by the need to solve the problems of sustainable development of the Arctic region in the context of economic, social and natural challenges. Using the method of knowledge contextualization, the paper analyses various definitions of the concept of resilience, and describes factors and strategies for community resilience. It concludes that social resilience is the ability of communities to be flexible and able to adapt in response to external influences. Social resilience is difficult to measure and control; however, resilience factors are potentially observable using quantitative and qualitative methods, enabling the development of community resilience strategies. These strategies should be based on local realities, since they will take different forms depending on the community, and the idea of resilience itself will manifest in different ways. This justifies the need for empirical studies that would provide longitudinal data on social resilience in a particular area. Using the Arctic region as an example, the article presents foreign and Russian experience of research on social resilience in the context of global changes. It concludes that the development of resilience in Arctic communities requires a systematic approach, which should be based on knowledge of how local communities respond to global challenges.
Keywords: *resilience, social system, contextualization, theory, practice, methodology, sustainable development, Arctic, local community*

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Introduction

For a long time it was assumed that the main interest in the Arctic would be associated with the development of natural resources, but today one of the central topics of Russian and foreign scientific research is the global changes that are taking place in the region. Scientists are actively discussing the issues of Arctic development in the context of natural and socio-economic challenges. It is noted that against the background of global changes, the probability of various kinds of risks, which are characterized by unexpectedness and can endanger the livelihoods of local communities, is increasing. Under these conditions, the sustainable development of socio-

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economic systems of the Arctic becomes a fundamental problem. Attempts to solve this problem are being made in studies of the phenomenon of resilience as the ability of social systems to withstand external challenges and threats.

The term “resilience” came to social sciences at the beginning of the 21st century from natural science, where it literally translates as “elasticity” and reflects the ability (measured in quantitative values) of physical objects to recover shape after some impact without transitioning to another state. In the late 1960s and early 1970s, the term was used by analogy in the theory of ecological resilience with a focus on studying how ecosystems respond to various external influences [1, Folke C.]. From the late 1970s to the 1990s and in subsequent years, the resilience metaphor was tested on socio-ecological systems, initiating the consideration of a new concept as a “borderline” phenomenon between the natural and social sciences [2, Adger W.N.; 3, Norris F.N. et al.; 4, Wilson G.; 5, Davidson D.J.; 6, Barrett C.B. et al.]. Since the early 2000s, the concept of resilience began to gradually replace the concept of sustainability. Over the past two decades, there has been a revival of attention to society as a crucial arena for solving a range of problems. Scientists argue that it is important to understand how communities respond and adapt to various challenges and changes at the local level, and then move on to national and regional programs and plans for sustainable development [2, Adger W.N.; 5, Davidson D.J.]. For this aspect of the topic under consideration, foreign literature uses the concepts of social resilience or community resilience.

Thus, taking into account the novelty, relevance and prospects of the topic, the goal was to review foreign and Russian perceptions of the phenomenon of social resilience and to find out how this concept is represented in Arctic research.

Materials and methods

The main subject material of the study was scientific articles by foreign and Russian authors in the field of social and socio-economic sciences. Scientific articles were selected from the international scientific database Scopus, on the information platform ScienceDirect of Elsevier publishing house and in Russian scientific electronic libraries, mainly Elibrary.

The literature review was carried out on three aspects of the problem: concept, factors and strategies of social resilience. For this purpose, the method of contextualization of knowledge was used, the essence of which is to find contexts in the subject areas under consideration, which reveal the genesis, development and functioning of the concept of social resilience. This method allows us to identify gaps and problematic issues in the existing theoretical knowledge and to identify promising areas of research on the topic under consideration.

In order to analyze the resilience of the Arctic communities, we studied the Arctic Resilience Report [7, Carson M. et al.], prepared by experts of the Arctic Council, as well as scientific articles by foreign and Russian authors, which provide examples of empirical studies of the resilience of Arctic communities.

Review of foreign studies

Currently, there is no single definition of the concept of "social resilience" in Western science, as well as no uniformity in the linguistic expression of this phenomenon, for which the phrases "social resilience" or "community resilience" are used. According to the available theoretical approaches, resilience is understood as the ability of a system to respond to disturbing influences and to change, while maintaining its structure and functions [3, Norris F.N. et al.; 5, Davidson D.J.; 6, Barrett et al.; 8, Convertino M., Velverde Jr.]. In this approach, resilience is an element of adaptive potential, which is understood as the ability of communities to adjust to external changes and maintain their initial state.

The general methodological approach to the consideration of social resilience is based on the study of a specific territory in the totality of its geographical, natural, climatic, and economic characteristics, which form the context for studying the specifics of social organization and life activity of local communities. Within the framework of the concept of territorial development, social resilience is most often understood as the ability of local communities to successfully cope with various challenges and maintain viability under the influence of external threats [3, Norris F.N. et al.; 5, Davidson D.J.; 6, Barrett C.B. et al.; 8, Convertino M., Velverde Jr.].

A threat is considered to be the probability or actual occurrence of such phenomena or events that are anomalous, contain an element of surprise and carry a high risk of negative consequences for local communities. The authors emphasize that the more complex the social systems are, the more likely the occurrence of such events is; therefore, in such systems, unexpectedness is more common than predictability [3, Norris F.N. et al.; 6, Barrett C.B. et al.].

The analysis of the definitions of social resilience allows us to conclude that community resilience should be viewed not as a result, but as a process of development of key elements of resilience. Unlike the theory of stability adopted in natural science, a return to the initial state is not necessary. It is much more important that a social system is able to change and/or adapt in response to external influences [9, Holling C.S.].

Social resilience can be considered at the micro, meso and macro levels of social life. However, the resilience of individuals does not determine the resilience of social systems as a whole. Local communities are interpreted as heterogeneous systems, therefore, social resilience, unlike individual one, covers various connections and relations that cross all levels of social organization [3, Norris F.N. et al.; 4, Wilson G.; 8, Convertino M., Valverde Jr.; 6, Barrett C.B. et al.].

One of the debated issues is the question of what determines the resilience of communities. Based on the existing social theories, researchers argue that social capital is the most significant factor of community resilience in crisis situations [3, Norris F.N. et al.; 5, Davidson D.J.; 6, Barrett C.B. et al.]. The idea of social capital was originally proposed by P. Bourdieu and supplemented by R. Putnam; it is based on stable social ties, interaction, communication and trust between community members. This concept was then expanded to include "economic" and "natural" capital. Thus, social, economic and natural capital form the adaptive potential of communities, which

makes it possible to assess resilience both at the level of individuals and at the level of the community as a whole. According to scientists, communities that combine strong economic, social and natural capital are characterized by a high level of resilience. Communities where only two capitals are well developed can be characterized as moderately resilient or vulnerable, and communities that have only one well-developed capital (monofunctional communities) or do not have it at all, as a rule, are characterized by low resilience and high vulnerability [2, Adger W.N.; 4, Wilson G].

In practice, communities with a high level of resilience are extremely rare. In most cases, they have a certain set of indicators of vulnerability, such as high population migration or dependence on a particular economic sector. In this regard, Western researchers believe that the maximum possible viability probably cannot be achieved, so it should be considered as an ideal state [8, Convertino M.].

There is currently no consensus among Western scholars on the best ways to create resilient communities, due to the small number of empirical studies on this topic. Since most of the works focuses on just a few countries and selected examples of external impacts, the lack of generalizable evidence makes it impossible to objectively assess whether communities can build resilience and how.

According to available research, social resilience can be developed in two ways: either preventively, by developing risk-based territorial management strategies (formal development), or "bottom–up" through the development of social capital (informal development) [6, Barrett C.B.]. Informal resilience development can include providing support for local community activities that will help to involve local residents in various functions, develop their activity, sense of ownership and strengthen trust in authorities. It is also believed that the implementation of resilience strategies can find its most direct expression only at the level of an individual community, since political decisions have tangible results only at the local level [3, Norris F.N. et al.; 4, Wilson G.; 8, Convertino M., Velverde Jr.; 6, Barrett C.B. et al.]. In other words, any political decisions, such as the adoption of regional programs, are ultimately mediated and turned into actions with tangible consequences for local communities and its individual members. This is because local communities are embedded in more complex hierarchies of social organization at the regional, national and global levels. Accordingly, resilience strategies should be grounded in local realities, as they will take different forms depending on the community and available resources, and the idea of resilience will manifest itself in different ways.

Review of Russian studies

The main directions of Russian research on resilience are related to solving the problems of sustainable development of territories (territorial resilience) in the context of economic, social, and natural factors affecting it. Russian scientific discourse often uses the calque "resistance" [10, Klimanov V. et al.; 11, Odintsova A.; 12, Korezin A.S., Murashov S.B.]. Howev-

er, in some works, there are such options as shock resistance [13, Zhikharevich B.S. et al.] and viability [14, Zamyatina N.Yu. et al.].

The territorial resilience of socio-economic systems is understood as the ability of the system to endure, to respond to sudden changes in external conditions, and also to quickly recover from them. In terms of content, this concept includes the following elements: the ability of the system to a) anticipate and prevent, b) resist and absorb, c) react, d) adapt, and e) recover [13, Zhikharevich B.S. et al.]. In turn, for each component of resilience, Russian scientists propose to develop a system of indicators, as well as methods for their quantitative and qualitative analysis for each element [11, Odintsova A.]. The assessment of each of the components makes it possible to identify the resilience potential, reflecting the degree of reliability of the system under disturbing influences. Such an expanded understanding of resilience makes it possible to use it as a methodological framework for researching and explaining various socio-economic phenomena and processes, studying ways to reduce the vulnerability of socio-economic systems in the context of global challenges, as well as developing specific measures to increase the resilience of societies and their adaptation to external influences [11, Odintsova A.; 12, Korezin A.S., Murashov S.B.].

Economic resilience, or shock resistance, of territories is considered on the example of cities, labor markets, infrastructure, logistics chains, etc. [15, Vazhenin S.G., Vazhenina I.S.; 11, Odintsova A.; 14, Zamyatina N.Yu.]. In the context of economic development of territories, various aspects of social resilience, or resilience of social systems, are studied [12, Korezin A.S., Murashov S.B.]. This direction analyses aspects of the applicability of the concept of social resilience to social systems, defines its essence, factors affecting the formation of resilience of individual social groups in crisis, instability or shock, develops tools for assessing the resilience of socio-economic systems.

A separate block of scientific works is devoted to the resilience (or sustainability) of socio-economic systems in the context of various environmental risks. The impact of global warming and an increase in extreme climatic phenomena in the Northern and Arctic regions of Russia on human living conditions is considered in the works of V.V. Vinogradova. The author and her colleagues believe that the assessment of climatic conditions in the Arctic and forecasting the future are very important for the life of the local population [16], it can be used to develop a system of indicators of natural and climatic factors that affect the living conditions of the population at the regional level and for the zoning of the territory, as well as the development of regulatory documents governing the life of the population in the Northern and Arctic regions [16].

Resilience of Arctic communities: research directions

Western science emphasizes that the intensification of economic activity, as well as the global nature of environmental changes, can have serious consequences for the inhabitants of

the Arctic. In this regard, the development of comprehensive strategies for the resilience of the Arctic communities is of particular relevance. The main research in this direction is conducted within the framework of the ecosystem approach and is related to the consideration of how various theoretical models of social resilience manifest themselves in the practice of resilience of Arctic communities to various natural risks caused by climate change [17, Desjardins S.P.A. et al.].

In 2016, the Arctic Council, in an attempt to understand climate risks for sustainable development, released a report on Arctic resilience [7, Carson M. et al.]. The main conclusion of the Arctic Council experts is that understanding and responding to the threats caused by climate change requires a systemic approach, which should be based on knowledge of how local communities react to these changes. In this context, resilience is seen as a way to respond to natural challenges. It is emphasized that social data are important for climate change modeling studies, which focus on ecological and climatic datasets, while the use of social data remains minimal [7, Carson M. et al.].

Distinctive features of the Arctic communities are that they are linked by natural-geographical, social and cultural ties, forming a single whole. However, the nature of this relationship is defined as weak. In practice, this is reflected in the fact that even within the boundaries of a single municipality, communities with different social organization and resources (natural, cultural, etc.) may be found. Therefore, the resilience of Arctic communities is largely dependent on the local context and is not related to the resilience of other communities.

Within a particular locality, the resilience of Arctic communities is determined both by internal resources (what the community has), and by external resources, which include local authorities that should assess possible threats and risks, plan and finance any resilience-related activities in the community. The internal resilience resources of the Arctic communities include the local culture, which consists not only of specific facilities, such as houses of culture or churches where local people meet, but also the values, formal and informal ties, mechanisms of relationships and social interaction between people that are characteristic of the area. This also includes the traditional culture of the indigenous peoples of the Arctic, for whom beliefs, customs, knowledge and practices are part of their daily life [18, Ford J.D. et al.]. For example, one of the articles by Canadian researchers shows how climate change has a serious impact on Canadian Inuit fishermen's traditional fishing activities [19, Galappaththi E. et al.]. These changes are manifested in changing weather conditions, redistribution of sea ice, habitats and number of fish. Drawing on the concept of resilience and qualitative interviews, the authors identify individual and collective ways of Inuit fishermen’s responding to climate change. They believe that their adaptation is influenced by the indigenous worldview, social organization, traditional culture, and the Inuit knowledge system about the natural environment [19, Galappaththi E. et al.].

One cannot but agree with the opinion of scientists that local knowledge, culture and level of social organization, being an internal resource for the resilience of the inhabitants of the Arctic, determine adaptive strategies at the community level, but they do not compensate for the overall readiness for external influences. Resilience requires the development of strategies to respond to threats. Researchers believe that these strategies, more than anywhere else, require spatial planning for all aspects of socio-economic development.

Despite the available fruitful and promising Russian studies of the phenomenon of resilience, it is worth noting that there are few studies on the regional specifics of the resilience of socio-economic systems in the Russian Arctic. This is partly due to the fact that the practical viability of the Arctic territories is a little-studied issue, even though the number of works devoted to the Arctic is constantly growing. Today, systematic research based on qualitative methods of obtaining information, and their integration into the development of the theory and practice of socio-economic management of the northern territories, are still in demand. In the context of this direction, it is equally important to analyze and define numerous aspects of social resilience, including the identification, quantitative and qualitative characteristics of indicators of local resilience, as well as factors that negatively affect the ability of Arctic communities to cope with socio-economic and natural challenges. For example, I.V. Nikulkina and her colleagues explore the factors and methodology for assessing the resilience to economic shocks in the Arctic settlements of the Republic of Sakha (Yakutia). Scientists argue that the current way of life and traditional economic activities ensure the resilience of Arctic communities. The authors propose to use resilience as a methodological approach for implementing the policy of sustainable development of the Arctic both at the state and at the municipal level [20].

A team of scientists led by N.Yu. Zamyatina also considers the concept of resilience to be relevant, which, in their opinion, complements the theory of sustainable development. The researchers conducted a cluster analysis of 27 Arctic settlements of the Russian Federation according to six subsystems, including socio-cultural, and concluded that the sustainable development of Arctic cities is possible with the simultaneous fulfilment of the conditions of resilience in different subsystems of urban development [14].

Conclusion

- Global changes occurring in the Arctic have a significant impact on the livelihoods of local communities and necessitate the search for new approaches to the sustainable development of the region. One of them is related to the study of the phenomenon of resilience as the ability of local communities to withstand external challenges while maintaining their structure and function.
- Foreign and Russian researchers use a common methodological approach to the research of social resilience based on the study of a specific territory in the context of socio-economic and natural factors influencing it.

- The main components of community resilience are social, economic and natural capital, which determine the level of social resilience and the degree of vulnerability of communities to external influences. For each component of resilience, scientists propose to develop a system of indicators, as well as methods for their quantitative and qualitative analysis, which allow assessing the level and potential of community resilience.
- Assessing the level and potential of social resilience is important for developing ways to reduce vulnerability and increase the resilience of societies, as well as measures to adapt them to external influences.
- The socio-economic systems of the Arctic are very diverse, so the study of the resilience of the Arctic communities should be carried out taking into account the internal resources of local communities, as well as reflect the socio-economic characteristics of the Arctic territory.

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Russian-Chinese Transfer of Humanitarian Scientific Heritage of M.V. Lomonosov in the Context of Digitalization and Education in the North of Russia

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Abstract. The purpose of this article is to present the conceptual ideas of innovative interdisciplinary Russian-Chinese project “Digital Lomonosov”, the idea of which appeared five years ago and is based on a decade of experience of Chinese studies development in the North of Russia and at the Northern (Arctic) Federal University named after M.V. Lomonosov. In accordance with the goal, the work solves the following main tasks: 1) justifies the relevance of the project “Digital Lomonosov” and its demand in China; 2) provides an overview of scientific works and interdisciplinary research on the humanitarian ideas of Lomonosov — a great scientist, an outstanding personality of the Russian North; 3) summarizes the main results of ten-year development of Chinese studies in the North of Russia and at NArFU; 4) briefly presents the experience of five-year network project of federal universities as the basis for developing the concept of innovative Russian-Chinese project; 5) outlines the prospects for the project and the promotion of Lomonosov Studies in China. The methodology of the review article is based on an interdisciplinary vision of the directions of humanities development in the focus of digitalization and further development of Lomonosov Studies in the interaction of Russian and Chinese scholars. The authors substantiate a new conceptual idea of international transfer of M.V. Lomonosov’s heritage digitally from the North of Russia to China. The results of the analysis are summarization and systematization of the experience of five years of cooperation between federal universities in the field of applied linguistics and education in the context of digitalization, ten years of experience in the development of Chinese studies in the North of Russia and NArFU, actualization of possibilities of international transfer of M.V. Lomonosov humanitarian heritage, and presentation of prospects of Lomonosov Studies in China.
Keywords: *Lomonosov studies, Chinese studies, digitalization, network project of federal universities, Russian-Chinese project, Russian North, Lomonosov's humanitarian heritage*

Introduction

The idea of the international network project “Digital Lomonosov” appeared in 2020 in the course of cooperation of the Northern (Arctic) Federal University named after M.V. Lomonosov and Changchun University (China); it was actively discussed at international meetings, scientific events and during business correspondence between partners. The first conceptual vision of the large-scale project development from the Russian and Chinese sides was presented at the All-Russian scientific conference with international participation “The Russian Arctic: new meanings and values” in November 2022. The conference was prepared by the organizing committee under

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the leadership of the Doctor of Philosophy, Professor, Rector of the Northern (Arctic) University named after M.V. Lomonosov Elena Vladimirovna Kudryashova and was held under the auspices of the Russian Philosophical Society with the assistance of the Interregional Public Lomonosov Foundation. One of the most significant inter-international events within the framework of this conference was the Russian-Chinese video conference "The language of science and technology: from the ideas of M.V. Lomonosov to the digitalization of the humanities", prepared by the Russian-Chinese team, which, among many other colleagues, included the main organizers: Doctor of Philology, Professor, Head of the Department of Translation and Applied Linguistics Alexander Mikhailovich Polikarpov, Doctor of Pedagogy, Professor of the Department of Translation and Applied Linguistics Maria Vyacheslavovna Druzhinina, Doctor of Philology, Professor, Director of the Institute of Foreign Languages, Director of the Silk Road Institute of Changchun University Wang Jinling. The international event was of a hybrid nature, since Russian teachers and students participated in it in person, while Chinese teachers and students made presentations in a distance format. About 100 people took part in the event.

Relevance of the "Digital Lomonosov" project, its demand in China

In the modern world, digitalization is rapidly developing, including in the humanitarian sphere, and the pronounced dynamism of this process is undeniable for anyone involved in digital humanities. That is why the key idea of this international event and the innovative project presented at it was the digitalization of the humanities. The main trends are considered to be the increasing role of digital culture, the formation of modern network practices, including audio-visual ones, new methodology and fundamentally different worldview that correspond to the ideas of digitalization, change the way of life and human activity, lead to an increase in the volume of information and contribute to the dynamism of the process of its transfer through digital technologies and the use of "virtual bridges between the past, present and future", focus on "multiflows" of information. This determines the involvement of users in "constantly updated and increasingly complex digital communication and technological processes" [1, Shlykova O.V., pp. 22–31]. The role of education in the current digital environment is also increasing due to the active process of forming IT skills among representatives of professions not directly related to the Internet sphere, increasing digital literacy of students, creating and improving a motivation system for mastering digital technologies, and developing human potential in the interests of the state [2, Suraeva M.O., Cmolkova A.Yu., pp. 63–73]. Following these and some other trends of the information age and relying on the ideas of the dynamism and relevance of the digitalization of the humanities, on the one hand, and the need for not only domestic, but also international transfer of humanitarian knowledge of the great scientist and encyclopedist M.V. Lomonosov in digital format, on the other hand, during the Russian-Chinese video conference, the possibility of cooperation with colleagues from Changchun University on the implementation of the international network scientific and educational project "Digital Lomonosov: fundamentality of the humanitarian ideas of M.V. Lomono-

sov in an electronic database in Russian and Chinese" (hereinafter referred to as the "Digital Lomonosov" project). The idea of interdisciplinarity is promising for the implementation of this project. One cannot but agree with M.A. Lukatskiy about the need to integrate various sciences in order to conduct modern research: "It is hardly possible to seriously doubt that the trend of modern science is the expansion of the range of interdisciplinary research jointly conducted by scientists representing different fields of knowledge. This is also evidenced by the numerous projects being implemented today, uniting the efforts of various scientists aimed at understanding certain phenomena of reality" [3, pp. 62–76]. Doctor of Philology, Professor Wang Jinling, Director of the Institute of Foreign Languages, Director of the Silk Road Institute of Changchun University stated in her scientific report "The concept of creating an electronic database of M.V. Lomonosov in Russian and Chinese", presented at the Russian-Chinese video conference "The language of science and technology: from the ideas of M.V. Lomonosov to the digitalization of the humanities", the fact that information about the life and scientific work of M.V. Lomonosov are little known in China. Professor Wang Jinling has extensive experience of cooperation with Russian scientists, from whom she received information about the world achievements and discoveries of the famous scientist. In the works and books about him, she, as a philologist, translator, who is fluent in Russian, saw the high potential of enlightenment and educational work among the youth and the population of China to get acquainted with the scientific and creative heritage of M.V. Lomonosov. In this regard, it is quite relevant to develop the concept and implementation of the "Digital Lomonosov" project, which can considerably increase the level of international significance of the research of Russian scientists in the field of humanities, including Lomonosov scholars. The presentation of the book "Mikhail Lomonosov: Pomor Encyclopedia" took place at the event [4, p. 604]. Editor-in-Chief of the NArFU Pomor Encyclopedia V.P. Bazarkina told about the encyclopedic publication containing information about the life and scientific achievements of M.V. Lomonosov. The presentation was accompanied by a display of rare photographs, drawings, a story about historical facts, which interested the Chinese representatives and motivated teachers and students of NArFU and Changchun University to participate in the international project "Digital Lomonosov".

Brief information about Lomonosov's innovative ideas in the humanities

Mikhail Vasilyevich Lomonosov, the great genius of Russia, an outstanding scientist-encyclopaedist, the first Russian academic naturalist, the most profound theorist and experimenter, an outstanding philologist, as well as a historian, artist, poet and translator, who today is often called a universal person (lat. homo universalis) [4, p. 10], was born in the village of Mishaninskaya, Kurostrovskaya volost, Dvinskoy district, Arkhangelsk province, on November 8 (19), 1711. He was a versatile person and had a great influence on the development of Russian science. The works of Lomonosov gave a powerful impetus to the development of such exact and natural sciences as physics, chemistry, astronomy, and geography in Russia. The scientific activity of Lomonosov contributed to the enrichment of new ideas in a number of domestic applied sciences,

such as geology, metallurgy, instrument making, mechanics, and meteorology. Scientific heritage of M.V. Lomonosov includes theories that help to understand the world and explain the phenomena observed in the Arctic territories. We should mention, for example, practice-oriented research on the drift of ice in the Arctic Ocean from east to west, on the electromagnetic nature of the northern lights, features of sea ice, and the possibility of conducting northern marine expeditions.

Being an outstanding, talented person, a person with extensive advanced knowledge, M.V. Lomonosov managed to advance many humanities, such as philology, history, philosophy and economics. He made an outstanding contribution to the development of the Russian literary language, laying its foundations and for the first time determining the correlation of the elements that made up Russian literary speech. Being a talented poet, he created works of various genres: odes, lyrical and satirical poems, fables, epigrams, but his favorite genre was the ode. Lomonosov developed the theory of Russian versification, contributed to the development of rhetoric, the doctrine of the three styles. Skillfully using the experience of his predecessors in the grammatical description of the Church Slavonic language, he created the first Russian grammar of the new, secular Russian language. M.V. Lomonosov made a huge contribution to the formation of the norms of the literary Russian language not only through his works, but also through his translations, and called upon to consider translations of foreign authors' works as a powerful means of enriching Russian literature with new ideas and forms.

The works of modern Russian researchers of the scientific heritage of Lomonosov, representatives of the Northern (Arctic) Federal University, largely reflect the special value of Lomonosov's humanitarian heritage.

NArFU Professor M.Yu. Elepova considers the phenomenon of the humanitarian universe of M.V. Lomonosov in the context of modern scientific knowledge [5, p. 59–63]. The article analyses the contribution of M.V. Lomonosov as a universal scientist in the development of Russian humanitarian thought. Emphasis is placed on the application by the scientist-encyclopaedist of both specific and interacting with each other humanitarian directions of scientific knowledge. The author points out the necessity to take into account both the principles of the methodology of science developed by him and the integrity of his worldview, when studying the humanitarian ideas of the great scientist. Specific examples show that Lomonosov's contribution to the development of the humanities (the creation of the first academic grammar of the Russian language, of the concept of antinormanism in history, the coverage of the role of the church calendar in theology, etc.) is becoming very relevant today for the development of the humanities.

The name of Lomonosov is closely connected with the North of Russia. According to Doctor of Historical Sciences, Professor Yu.F. Lukin, the concept of "Russian North" has a hybrid character, as it is based on the principle of interdisciplinarity. The researcher emphasizes that the ethnographic, historical, philological, cultural, i.e. interdisciplinary study of the North began in the 18th century, in the time of M.V. Lomonosov. M.V. Lomonosov is presented as a master of scientific discussion, who had the courage to criticize the Norman theory, "proved the Slavonicity of the Va-

rangians as Rus, cited the names of the country found in foreign sources: Russi, Russia, Rugia, Ruthenia, Risaland". Yu.F. Lukin notes that "Christian Orthodoxy, parish churches, monasteries, chapels, votive crosses played an important role in the settlement of the Slavic oecumene of the Russian North", which, in turn, had a spiritual influence on the formation of character traits of a brilliant scientist, a native of the Russian North [6, pp. 275–302].

Doctor of Pedagogical Sciences, Professor T.S. Butorina, in her monograph, which examines the Lomonosov period in the history of Russian pedagogical thought in the 18th century, proved that M.V. Lomonosov is the founder of pedagogical science. As T.S. Butorina notes, the formation of pedagogical views of the great scientist was greatly influenced by the Pomor folk pedagogy. According to the scientist, Lomonosov was able to substantiate the subject of pedagogy, the essence of upbringing and education, to explain the ways of organizing training, its content. These and many other statements allow us to conclude that the scientist formulated the methodological foundations of pedagogical science. M.V. Lomonosov is rightly called the founder of the national pedagogical theory of Russia. Work with archival documents and historical and educational materials, a content analysis of the pedagogical terminology of the Enlightenment period in the studies of T.S. Butorina convince that M.V. Lomonosov was not only a brilliant theoretician of pedagogical science, but also a prominent representative of scientific, educational and organizational and managerial practice, which is confirmed by numerous facts of his active work in the field of education: the foundation of Moscow University, the idea of opening St. Petersburg University, which was realized half a century after his death, writing textbooks, outlining didactics of teaching disciplines and much more [7, Butorina T.S.]. Thus, the foundation for the development of public education and the preservation of patriotic traditions, laid down by Lomonosov, determined the further positive dynamics in the development of science and education in Russia.

Born in the North of Russia, M.V. Lomonosov learned everything new through the prism of perception of the surrounding world, not limiting himself to the knowledge of sciences for the development of the northern territories and Russian society as a whole. As a result of visiting other countries, studying and working abroad, learning foreign languages, studying the works of foreign scientists, translating them into Russian, constantly comparing, contrasting and analyzing scientific information and facts, taking into account the needs of people, M.V. Lomonosov expanded the range of his scientific and creative thinking. The example of M.V. Lomonosov's multilingual and multicultural personality, his courage to approve everything new and non-standard can motivate the development of multilingual pedagogy, innovative didactic concept and the creation of a multilingual manual on the cultural phenomena of the Russian North [8, Druzhinina M.V., Zashikhina I.M., pp. 124–135].

Everything that the great scientist designed, created, developed and implemented in science and education is associated with the ideas of creativity and design. The originality of innovative thought, non-standard thinking, original solutions, outstanding abilities in the field of a number of sciences and in art were constantly improved by him, never ceased to amaze his contempo-

raries and everyone who today turns to the creative works of Lomonosov. The trajectory of movement from scientific thought through creativity to implementation in practice is the design idea that Lomonosov laid down and implemented already in the 18th century. Understanding the special properties of glass, its advantages and benefits is an example of the embodiment of a scientist's design ideas and best practices. For Lomonosov, the study of glass was a mystery of nature that can be embodied in telescopes, microscopes, barometers, thermometers, glasses, and various instruments. For scientists, this is an example of design research and creativity. The relationship between theory and practice, design and implementation of the experiment is valuable in his achievements. Scientific and applied research of M.V. Lomonosov always had a systematic approach. He believed that any scientific research should serve people. Lomonosov also urged to focus on the aesthetic principles of the embodiment of new ideas. These postulates of Lomonosov's design thinking are harmoniously combined with the provisions of modern pedagogical design. Pedagogical design in vocational education, for example, can be implemented both in educational processes and in scientific research. The main tasks of the pedagogical design of educational processes include the development of innovative educational programs, the design of new courses, individual routes, scientific disciplines, and the examination of new educational products. The key principles of pedagogical design are the understanding of scientific approaches to the problem under study, the logic of following from the idea and systematization of materials to the development of models, technologies and innovations. Thus, the scientific foundations of various approaches and research methodology are implemented into the practice of educational activities. These two components of the design project are linked by the aesthetics of the activities of the researcher, teacher, pedagogical designer [9, Druzhinina M.V., p. 168].

The Northern (Arctic) Federal University actively develops the foundations of integrative translation studies in connection with the need to develop translation for the development of Arctic territories [10, Polikarpov A.M., pp. 6–17]. A.M. Polikarpov expresses the idea that our great countryman M.V. Lomonosov, who had a special creativity of thinking, was at the origin of integrative translation studies. It is pointed out that Lomonosov creatively applied and sometimes created language forms in a completely new way in his translation activities. Attention is drawn to the fact that Lomonosov made a great contribution to understanding the social significance of translation, presenting the "old ideas" in a new way in order to educate and improve the morality of the Russian people. It is important to state that Lomonosov contributed to the development of science and economy of Russia, spreading the best foreign experience on the "Russian land" and forming new scientific terminology [11, pp. 7–10]. Summing up the results of research in the field of translation experience of the great countryman, the author of the article concludes that "M.V. Lomonosov's translation activity is an example of mastery of subject knowledge", which is directly related to the anticipation of the main provisions of integrative translation studies [11, p. 11].

As a result of analysis of M.V. Lomonosov's works and writings, studies of scientists of his creative, cultural, scientific and educational activities, groups of ideas, opinions, statements, rea-

soning in the field of the humanities, to which M.V. Lomonosov contributed, were identified. Humanitarian views and ideas of M.V. Lomonosov were divided into at least nine scientific fields: Russian language, poetry, education, history, culture, translation, philosophy, politics, local history. Consequently, there is a need to involve major specialists in the implementation of the planned project — representatives of various branches of the humanities. The progressive ideas of Lomonosov in the field of the humanities are a systematic work, interdisciplinary research, the unity of theory and practice, logic and non-standard thinking, creativity, the desire for new knowledge, motivation for knowledge and discoveries, patriotism and service to the fatherland, as well as practice-oriented, bringing the benefits of scientific achievements to the peoples of Russia. These progressive features of Lomonosov's activity do not lose their relevance today. That is why the popularization of his heritage is necessary to motivate young researchers and scientists, to understand their capabilities in science and in their professional activities. Thus, the transfer of Lomonosov's scientific ideas to China, the joint scientific, educational and cultural activities of the participants in the network international project should be considered as its integral part.

Experience in the development of sinology in the North of Russia and at NArFU

The development of sinology in the North of Russia began in 2013. This direction of the language education policy of the Arctic zone should be considered as an innovation in the North of Russia. In the current geopolitical situation, the popularization of sinology has both domestic and international significance for Russia. Since 2014, the Asian vector of the multipolar policy of the Russian Federation has been considered a priority. Understanding of Chinese culture and knowledge of the Chinese language is recognized as an urgent need of the Russian population, including its Arctic zone. Ideally, it is necessary to design an educational route of socio-cultural Chinese language learning in the system of kindergarten — school — university. In university education, it is necessary to work, firstly, in the logic of interdisciplinary professional and language training, coupled with sinology, and secondly, to implement successive educational programs at all levels of education: bachelor's — master's — postgraduate studies. Various forms of work in the system of additional education are also in demand. Thus, access to education in the field of sinology should become natural and comfortable for all willing residents of the North of Russia, regardless of their age and profession.

The chronicle of events related to the development of sinology in the North of Russia, in Arkhangelsk, at NArFU contains the following facts. In 2013, a Chinese delegation of representatives of the College of Information Technology of Hainan Island visited NArFU, correspondence and cooperation with the Doctor of pedagogical sciences, Professor Shang Zhiqiang began. We consider this event as the beginning of the development of sinology in the North of Russia and at NArFU. In May 2014, the Department of Translation and Applied Linguistics of the Institute of Philology and Intercultural Communication of NArFU submitted an official application for participation in the competition of the NArFU Development Program 1.1 "Providing relevant educational

content and teaching technologies", 1.1.15 "Development of network educational master's programs". From that moment, the development of the innovative for the North of Russia master's program "International professional communication in the Eurasian context" began. Active work continued until October 2014 and included the following activities: 1) creation of a working group; 2) establishment of a network partnership and conclusion of an agreement with the Ural Federal University named after the First President of Russia B.N. Yeltsin (UrFU), 3) coordination of forms of international cooperation and signing of the Memorandum of Understanding between the Northern (Arctic) Federal University named after M.V. Lomonosov (Arkhangelsk, Russia) and the College of Information Technology of the Hainan Island (Qionghai, Hainan Province, China) with the assistance of the Consulate General of the People's Republic of China in St. Petersburg; 4) involvement in the development and implementation of the program of employers, heads of enterprises and organizations that have confirmed their consent to participate in the implementation of the program; 5) designing the concept of the program; 6) development of the curriculum, educational program, work programs of disciplines, electronic educational and methodological complex of disciplines and modules; 7) drawing up international work programs of two disciplines in practical Chinese and a workshop in cooperation with Chinese colleagues; 8) approbation of remote communication with Chinese colleagues and conducting trial classes with NArFU students; 9) organization of the work of the Chinese Language Club at the Institute of Philology and Intercultural Communication of NArFU by a master student from China, Liu Feng, under the guidance of Professor Druzhinina M.V.; 10) correspondence and organization of cooperation with the Consulate General of the PRC in St. Petersburg on organizing the work of a Chinese lecturer at NArFU. This incomplete list of cases and events that are absolutely new for NArFU and the North of Russia convinces of the innovativeness, complexity and courage of the team of NArFU teachers and specialists in the implementation of their plans. According to the results of the competition, the new network master's program was among the winners, which motivated a group of developers and a team of teachers who were ready to implement the program for further work and became the basis for an even more active development of sinology in the North of Russia [12, Druzhinina M.V., pp. 117–118].

The preparations for the introduction and implementation of the new master's program developed surprisingly quickly. In spring 2015, the Consul of the Consulate General of the PRC in St. Petersburg, Jiang Zhongliang, visited Arkhangelsk and NArFU, and since October 2015, with the assistance of the Consulate General of the PRC, the Chinese lecturer Sun Yanan began to work in NArFU. Since 2014, the Institute of Philology and Intercultural Communication has been actively working with the Chinese Language and Culture Club, which was successfully run by master's student Liu Feng, with scientific, methodological, organizational and didactic support provided by the undergraduate curator, head of the Club, Doctor of Pedagogical Sciences, Professor M.V. Druzhinina. In spring 2015, NArFU allocated special funding for the purchase of educational and methodological literature for learning the Chinese language. The selection of textbooks was car-

ried out with the effective assistance of Chinese colleagues, among them: Doctor of Pedagogical Sciences, Professor Shang Zhiqiang and his colleagues of the College of Information Technology, NArFU master's student Liu Feng, postgraduate student of Transbaikal State University Liu Gopin). In autumn 2015, the NArFU library received the first textbooks, dictionaries, video and audio materials in Chinese. In spring 2014, autumn 2015, winter and spring 2016, Chinese colleagues conducted individual and group remote practical classes, teleconferences, Internet sessions, forums with NArFU students studying in various specialized areas in the system of undergraduate – graduate – postgraduate studies. Generally, the multimedia Chinese communication programme QQ was used for the work. Teachers of the College of Information Technology of Hainan Island, which have become reliable partners of NArFU, developed programs for two disciplines of the master's program "Practical foreign language course (Chinese)" and "Workshop on professional communication (Chinese)". Since 2014, Chinese students have begun studying at NArFU bachelor's and master's programs. In autumn 2014, the Dissertation Council of NArFU hosted two defenses of dissertations by Chinese applicants Liu Guoping and Zhou Zhongcheng for the degree of Candidates of Philology. In 2016 and 2018, first-year master's students got the opportunity to study Chinese language and Chinese culture for two weeks at the College of Information Technology of Hainan Island. These and other events, as well as new opportunities for studying the Chinese language, culture, and the peculiarities of professional communication in the interaction between Russia and China, played a special role in the development of sinology in the North of Russia. Undergraduate and postgraduate students of NArFU received scholarships from the Consulate of the PRC to participate in the Beijing Summer School, annual scholarships for studying and working in China. The graduate students of the program "Professional communication in the Eurasian context" Natalya Makovskaya, Ksenya Vtorygina and Alexey Andreev got scholarships. This increased motivation to study the Chinese language and culture by NArFU students, residents of Arkhangelsk and the North of Russia. The development of sinology in the North of Russia became an integral part of the education, culture and science system in the Arctic zone and at NArFU.

For the development of sinology at NArFU, comparative studies of the mentality of representatives of Russian and Chinese culture, Russian-language websites of Chinese universities, educational technologies, Russian and Chinese education systems, and scientific achievements in the field of the humanities are of particular importance. A great achievement in the development of sinology was the postgraduate training of representatives of the PRC in the specialty "Theory and methodology of vocational education". Under the guidance of scientific supervisor M.V. Druzhinina, interdisciplinary research was conducted in linguistics, pedagogy of professional education, linguodidactics, linguocultural science, philology, including in the context of digitalization. Graduate student Liu Feng successfully defended his thesis "Comparative analysis of the application of e-learning technologies in Chinese and Russian vocational education systems (on the example of teaching foreign languages to bachelors)" in 2021, and in 2022, he was awarded a degree of Candidate of Pedagogical Sciences. NArFU postgraduate Sun Yanan defended her dissertation in the

specialty “Russian language” in 2022 on the interdisciplinary topic “The concept of “education” as a component of the educational potential of Chinese university websites (on the basis of Russian-language versions)”, and in 2022 she got the degree of Candidate of Philological Sciences. The scientific supervisors of the interdisciplinary research in pedagogy and philology were Doctor of Pedagogical Sciences M.V. Druzhinina and Doctor of Philological Sciences V.A. Maryanchik. It is noteworthy that the progressiveness and novelty of the research results were highly appreciated by doctors of pedagogical and philological sciences, professors of many universities of the Russian Federation, including federal ones.

The development of new forms of cooperation with Chinese partners convinces representatives of the university and non-university communities of further mutually beneficial Russian-Chinese cooperation. Thus, in 2022, a framework agreement on cooperation between NArFU and Shandong Pedagogical University was signed. In December 2022, the Winter School of Chinese Language and Culture of China started under the guidance of Professor Guo Wenjuan of the Institute of International Education. The coordinators of the Winter School from NArFU were Doctor of Pedagogical Sciences, Professor of the Department of Translation and Applied Linguistics M.V. Druzhinina and Candidate of Philology, Senior Lecturer of the Department of Translation and Applied Linguistics Sun Yanan. The school has 110 students. In cooperation with the Institute of Foreign Languages of Shandong Pedagogical University, a master’s program “Pedagogical design in language education” is being developed. The responsible coordinators of the work are Doctor of Pedagogical Sciences, Professor of the Department of Translation and Applied Linguistics M.V. Druzhinina and Doctor of Philology, Professor, Dean of the Faculty of Foreign Languages of the Institute of Foreign Languages Sun Songxia.

Long-term cooperation of colleagues from Russia and China shows that knowledge of another culture significantly expands the range of thinking of the participants in communication, ensures the effectiveness of scientific and professional communication. Determining the special role of research in the field of sinology in the North of Russia, it should be noted that further development of this area is promising for the benefit of political, social, cultural and economic relations between Russia and China. The accumulated experience directly influenced the decision to develop the concept and implement the promising Russian-Chinese international innovation project “Digital Lomonosov”, which will be realized in the coming years. The initiators of this project were Doctor of Philology, Professor of Changchun University Wang Jinling and Doctor of Philology, Professor of NArFU A.M. Polikarpov.

From a network project of federal universities to the concept of an innovative Russian-Chinese project

The existing experience of the teaching staff of the Department of Translation and Applied Linguistics of NArFU in the implementation of innovative projects should be noted. Thus, the network project “Scientific interaction of federal universities in applied linguistics and professional pedagogy in the context of digitalization” was developed and launched in 2018. The goal of scien-

tific interaction of federal universities in applied linguistics and professional pedagogy in the context of digitalization became apparent in the process of cooperation between federal universities of Russia as an urgent and natural need for solving complex interdisciplinary problems in the humanities and education.

The set of main tasks of the network project included the following:

- exchange of experience of teachers of federal universities in the digital format of video forums, online workshops, webinars, youth schools on digital practices and technologies, online exhibitions;
- development of a joint discussion platform on digitalization issues in the field of applied linguistics and professional pedagogy;
- development of network master's programs related to digitalization in applied linguistics and pedagogy of vocational education;
- development of network academic mobility of students and graduate students in digital format, including virtual mobility;
- ensuring individualization of students' learning through digital networking;
- critical analysis of the quality of dissertation research, opposition and submission of reviews on dissertations and abstracts of applicants for scientific degrees in dissertation councils of federal universities;
- development and implementation of joint programs of additional education in a distance format, including advanced training programs in digital practices in linguistics and education;
- ensuring the advantage of federal universities in competition with other universities in Russia through digital network cooperation and sustainability of interaction and development of partner universities;
- creation of a single electronic platform with a multilingual terminological database of federal universities in the field of applied linguistics and pedagogy of vocational education.

If we refer to the history of the development of a network scientific and educational project, the innovative project of scientific interaction between federal universities in applied linguistics and professional pedagogy in the context of digitalization was launched on April 5, 2018 at the First Video Forum, which highlighted the need for mutually beneficial cooperation between specialists in the field of linguistics and education of the Northern (Arctic) Federal University named after M.V. Lomonosov and Southern Federal University.

In April 2019, four universities took part in the Second Video Forum of Federal Universities, which was held under the title "Development of applied linguistics in the context of digitalization": Immanuel Kant Baltic Federal University, Kazan (Volga Region) Federal University, Northern (Arctic) Federal University and Southern Federal University.

In April 2020, as part of the Third Video Forum "Scientific interaction of federal universities: translation activities in the context of digitalization", five federal universities took part, including: Immanuel Kant Baltic Federal University, Kazan (Volga Region) Federal University, Northern (Arctic) Federal University named after M.V. Lomonosov, Ammosov North-Eastern Federal University and Southern Federal University.

In September 2020, as part of the Fourth Video Forum of Federal Universities "Scientific interaction of federal universities in postgraduate educational programs: digital communication", the Ural Federal University named after the First President of Russia B.N. Yeltsin was added to the number of participants.

At the Youth School in Digital Linguistics, successfully held on November 28, 2020 by the Southern Federal University in cooperation with the Northern (Arctic) Federal University, three more universities joined the network project: the North Caucasus Federal University, the Far Eastern Federal University and the Crimean Federal University.

In May 2021, at the next Video Forum of Federal Universities, the number of participants in the network project increased to ten. The Siberian Federal University joined the project. As a result, the network project united the federal universities of Russia in its entirety and provided the prospect of creating the Consortium of Federal Universities "Digital practices in linguistics and education".

For the period from 2018 to 2022, eight video forums of federal universities were held, organized by NArFU in cooperation with federal universities. At these forums, plenary speeches by university representatives were presented, scientific discussions on applied linguistics and pedagogy of vocational education in the context of digitalization were held, competitions of scientific reports of students (bachelors, masters) and graduate students on the problems of applied linguistics and pedagogy of vocational education in the aspect digitalization were organized.

Within the framework of the project, youth schools and online workshops in digital linguistics and education are regularly held for undergraduate and graduate students of federal universities; in total, there have already been three youth schools and two online workshops. The organizers, moderators and leading speakers are professors from NArFU, SFU, NCFU. During these events, intensive exchange of experience is carried out, the scientific potential of the regions is presented, informal scientific discussion takes place on topical issues of applied linguistics and professional pedagogy in the context of digitalization, and prospects for further joint interdisciplinary work in digital linguistics and pedagogy of professional education on the basis of digitalization are outlined. The events are notable for the high quality of theoretical and practical materials, in-depth reviews of the methodology and methods of applied research and development, interdisciplinary concepts and digital tools.

The co-leaders of the network project, Doctor of Philology, Professor A.M. Polikarpov and Doctor of Pedagogical Sciences, Professor M.V. Druzhinina, together with the coordinators of the network project from other federal universities responsible for interaction within the framework

of the joint project, held three working meetings to solve the tasks of creating a consortium "Digital practices in linguistics and education" (June 2021, September 2021, January 2022); the Agreement on the Consortium, the Regulations on the Coordinating Council of the Consortium, the road map were developed. Letters were sent to rectors of universities, in which they were invited to acquaint with the statutory documents and join the Consortium.

Since 2018, the network project roadmap has included the Digital Arctic Transfer translation competition (organized by NArFU), which is held annually in May–June, starting from 2015. The organizers are teachers and specialists of the Department of Translation and Applied Linguistics, Scientific-Educational Center "Integrative Translation Studies of the Arctic Space" and employees of the Department of International Cooperation of the Northern (Arctic) Federal University named after M.V. Lomonosov, as well as members of the Arkhangelsk regional branch of the Union of Translators of Russia. Participants of the competition show interest in the profession of a translator and in the Arctic topics, demonstrate a creative approach when translating Internet texts in a remote format. It should be especially noted that not only linguists and philologists, but also future economists, engineers, historians, psychologists, journalists, specialists of various technical specialties show love for foreign languages and translation. In 2022, the competition received 365 applications from students from China, Germany, the Donetsk People's Republic, Belarus, as well as from more than 40 Russian universities, including federal ones. In 2023, the nominations of translation from Chinese into Russian and from Russian into Chinese were included in the contest tasks of the international contest "Digital Arctic Transfer". The international competition was actively supported by teachers and students of Changchun and Shandong Pedagogical Universities. In 2023, Nenets language translation tasks will be included in the competition.

In September 2022, the video forum of federal universities "Scientific interaction of federal universities in the field of postgraduate educational programs: communication in the context of digitalization" was successfully held. As part of the forum, a round table "Science of the young researches to the region!" was conducted. The round table opened a series of online events representing the regions where federal universities are located, scientific developments of graduate students and young scientists related to the development of these regions. Within the framework of the above-mentioned round table, the Arkhangelsk Oblast was presented in the year of its 85th anniversary, its geographical image, economic and scientific potential. Particular attention was paid to the Arctic orientation of scientific research of graduate students in the field of applied linguistics and professional pedagogy. Postgraduate students of the Northern (Arctic) Federal University presented their researches related to the North of Russia and the Arctic zone. Thus, a tradition of representing regions was born. Federal universities have the opportunity to demonstrate the applied nature of linguistic and pedagogically oriented research aimed at regional development.

The network project includes a permanent online exhibition "Virtualica". On February 14, 2022, the exhibition was opened on the website of the Northern (Arctic) Federal University. Its

goal was the digital presentation of new scientific papers and relevant educational literature on applied linguistics and professional pedagogy. In general, the exhibition “Virtualica” presents a wide range of digital products developed by federal universities: unique author’s works, collective projects, theoretical research in applied linguistics. Representatives of federal universities presented textbooks on the disciplines they teach. The exhibits show that each federal university has created digital products that in one way or another reflect the specifics of the region. The exhibition is updatable and open to a wide range of users.

Thanks to the experience of scientific interaction between federal universities and the experience of implementing the international project for the development of sinology in the North of Russia and in NArFU, the methodological foundations and basic ideas for the innovative Russian-Chinese project “Digital Lomonosov” have been outlined. The associogram of the cognitive-conceptual model of the project is a cognitive map consisting of at least eleven components that logically complement each other and interacting elements of an integral system. The most significant components of the model should be considered such keywords as: humanitarian heritage, Lomonosov, Chinese language, methodology, interdisciplinarity, translation, Russian language, knowledge transfer, electronic database, parallel corpus of texts, digitalization.

In connection with the process of digitalization of unique materials related to the scientific heritage of M.V. Lomonosov, it seems logical to use the accumulated experience of foreign and domestic scientists in creating digital products developed in the international and Russian scientific communities. Such a German-language publication as “Der Digitale Grimm” deserves special attention [13, p. 132]. This is an interdisciplinary product of a unique project of the structural units of the University of Trier and the Berlin-Brandenburg Academy of Sciences, on which scientists from various scientific fields worked: linguists, computer scientists, historians, programmers, designers and methodologists. Special attention was paid to the development of the project concept, it consisted of several main components: systematization of materials, analysis and ordering of information, solving technical problems, installation of software for a qualitative presentation of the scientific heritage of Jacob and Wilhelm Grimm, presentation of separate dictionary entries, decoration, design of the publication, recording on discs, searching for sources of financing, sponsors and many other types of work. At the very beginning of the 21st century, the implementation of such a project was a great courage and was associated with risk. The experience of foreign colleagues is worthy of study and application in the international project to popularize the scientific heritage of M.V. Lomonosov in the context of digitalization.

The interdisciplinary project “Chekhov Digital” should be considered a noteworthy digital product. The goal of the project was to prepare a digital semantic edition of the works and letters of A.P. Chekhov in 30 volumes. In addition to the texts, each volume of the academic publication includes editorial and critical materials, which are also supplemented by machine-readable multilevel markup. The developed structure and its implementation based on the TEI (Text Encoding Initiative) digital publishing standard includes encoding of source metadata (description of the

publication/manuscript, title, author's name, text language, changes, etc.), metadata for letters (addressee, date and place of writing, etc.), features of the presentation of information in different types of text (play, short story, novella), and specifically labelled text information within the text module. Thus, the prepared texts become machine-readable and allow the development of tools for a rather complex semantic search not only for the texts of the writer's works, but also for the texts of comments, notes and references. The implementation of the project continues, experience in the field of digitalization of the humanities is accumulating, and there is an intensive exchange of knowledge among scientists and students at federal universities [14, Severina E.M., Bonch-Osmolovskaya A.A., Kudin A.M., pp. 153–165].

The joint work planned within the framework of the project is based on specific organizational, personnel, experimental-analytical and managerial provisions that form the basis for the development and implementation of an interdisciplinary project:

- Reliance on the experience of cooperation and organization of joint activities between NArFU, Changchun University (China), partners in scientific cooperation from other federal universities of Russia, attracting major specialists from other educational and scientific organizations of the international and domestic communities;
- The project is designed for a multi-year (at least five years) and phased implementation period, rational use of the personnel and scientific and educational potential of universities and organizations, attraction of financial resources from international and domestic funds;
- The main idea of the project is the transfer of Lomonosov's humanitarian heritage to China, the creation of the Lomonosov scientific, educational and cultural center at Changchun University;
- The leading conceptual idea of the project is the digitalization of materials in a number of humanitarian areas of M.V. Lomonosov's activity: Russian language, poetry, education, history, culture, translation, philosophy, politics, regional studies.

In accordance with the humanitarian ideas of Lomonosov, scientists and researchers, the following scientific provisions of the project emerged, logically developing organizational and managerial structures:

- The network project is based on the idea of establishing a bilingual parallel corpus of works created by M.V. Lomonosov;
- Materials selected for placement in the electronic database (3 works or fragments from each of the above-mentioned humanitarian spheres of the scientist's activity) should be provided with pre-translation comments in Russian;
- Translations of Lomonosov's texts should be accompanied by comments for Chinese users with the information contained in the electronic database;
- Federal universities have accumulated extensive experience in digitalizing literary sources (SFU and HSE project "Chekhov Digital").

Prospects for the implementation of the project and popularization of Lomonosov studies in China

Project “Digital Lomonosov” is of great importance for further development of cooperation between NArFU and Chinese universities. Thanks to the joint implementation of an international project to create an electronic database related to the scientific and artistic work of Lomonosov, teachers, scientists, graduate students and students from China will be able to obtain information about the role played by M.V. Lomonosov in the development of Russian science and which of his ideas from the field of the humanities are still relevant, including in the context of the implementation of the Russian-Chinese transfer of knowledge. Teachers and students of the North of Russia, in turn, get a chance to penetrate deeper into the meanings inherent in the works of the great countryman. Russian participants of the project will have to interpret the content and form of presentation of scientific and poetic works of M.V. Lomonosov for Chinese colleagues and students who will translate the works of the scientist-encyclopedist from the Russian language into Chinese. Teachers and students from Russia and China will jointly carry out pre-translation analysis of Lomonosov’s texts. The Lomonosov movement of scientists makes a significant contribution to the process of educating young people, contributes to the development of a sense of patriotism, and the spread of humanistic ideas in the world. The proposed project will become the basis for mutually beneficial cooperation between NArFU and Changchun University in the field of humanities. Thanks to the implementation of the project, Lomonosov Studies will find a worthy development in China, awaken interest to the scientist of university mind, poet, translator and art worker. Establishment of the Lomonosov Centre in China, dissemination of information about the life and work of the great Russian scientist in a modern digital format will help to better understand how science in Russia emerged and what it is based on, will introduce the youth of China to the North of Russia through direct cooperation with teachers, scientists and students from the Northern (Arctic) Federal University. The popularization of Lomonosov Studies in China will promote mutual understanding between the Russian and Chinese peoples, cooperation in the field of science and education. Scientific and educational activities of M.V. Lomonosov in the all-Russian and international arena, his patriotism can serve as a worthy example of selfless service to the motherland. The greatness of Lomonosov lies in the fact that he managed to form a progressive scientific worldview and look into the future. It is impossible to understand the originality of the scientific and creative heritage of Lomonosov without having a clear idea of his homeland, the North, northern nature, the peculiarities of Russian culture, northern Russian dialects, customs and traditions, factors that contributed to the growth and development of the personality of the great scientist. The conceptual ideas of the project outlined in the article will be implemented in an innovative Russian-Chinese network project.

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The Origin of the Russkoust'intsy Ethnic Group and Exploration Work in the Indigirka River Delta

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Abstract. The origin of the group of Russian Arctic old-timers living in the lower reaches of the Indigirka River in the village of Russkoe Ustye is still a subject of discussions. Despite the official version, the version about their origin from the Novgorod boyars, who allegedly settled in those places already in the 16th century, is being actively promoted. Written sources deny rather than confirm the legend with a complete lack of information. The article substantiates an attempt to verify the legend by means of ethnoarchaeological complexes, for which purpose archaeological prospecting works were carried out in the Indigirka delta in order to find predecessors of the contemporary village Russkoe Ustye and to assess their relevance for research. As a result, it became clear that the Staroe Russkoe Ustye tract could become the main source of archaeological material. Dating can also be attempted on the basis of materials from burials located in the Gulyanka area.
Keywords: *archeology, Russians, Arctic, exploration, historical tradition, question of origin*

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Among the Russian old-timer groups of Yakutia, the most famous are the Russkoust'intsy living in the lower reaches of the Indigirka River. The uniqueness of this group is in the fact that of the numerous Russian groups formed by the beginning of the 18th century throughout the Russian polar area, only Russkoust'intsy and Pokhodchane living in the lower reaches of the Kolyma River have survived by the beginning of the 21st century. That is why the Russian Arctic old-timers of Yakutia are of scientific interest.

The historiography of the Russian Ustye is quite large, and by the early 2000s, it included more than 200 units of various sources ranging from serious academic works to newspaper publications. The main emphasis in most scientific publications is made on the study of folklore [1], traditional dialect [2] and the preservation of traditional culture [3; 4]; the most striking works are the articles of V.G. Rasputin [5]. Almost every publication touches upon the question of the origin

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of the Russkoust'intsy, the answer to which is found in the historical legend about the fugitive Novgorod boyars who reached the mouth of the Indigirka River already in the 16th century.

This legend, stated in a more or less clear form in the book by A.G. Chikachev [3, p. 6], says that the ancestors of the Russkoust'intsy appeared in the lower reaches of the Indigirka as early as the 16th century as fugitives from Velikiy Novgorod. One of the tragic pages of Russian history of this century was the pogrom committed by the oprichniks of Ivan the Terrible in Velikiy Novgorod in 1570. The Novgorod Republic was a source of problems and an existential threat for the Grand Dukes and then for the Moscow Tsar for centuries. The united army of Mstislav Andreevich of Suzdal went to Novgorod, Ivan the Terrible's grandfather Ivan III came there, putting an end to veche democracy, the Novgorodians themselves ruined Velikiy Ustyug and the Ustyug district several times. The Moscow authorities constantly felt the need to break the spirit of Velikiy Novgorod. Even the trip to the city itself was marked by more than one and a half thousand dead innocent people, as if they were walking through a foreign country. Historians are still arguing about the number of victims of the pogrom: some, relying on the Synodik of Ivan the Terrible, speak of one and a half thousand (which is already a lot for the 16th century), others indicate an incredible figure of forty thousand people, possibly including those who died from a terrible crop failure and the famine and plague epidemic that followed it. In such circumstances, more or less distant migrations of the population are inevitable.

It should be noted that there is also an "official" version of the origin of the Russkoust'intsy from industrial and service people who settled in the lower reaches of the Indigirka from the end of the 17th century. This version is well developed and based on written sources, but is almost always overshadowed by a vivid legend. Being a valuable historical source, legends still convey reality in a modified form and need to be studied and criticized. Unfortunately, the history of the origin of the Russkoust'intsy is still poorly understood, and the legend continues to be used without any scientific criticism. The relevance of such a study is not only in solving a local problem, but also in making a significant contribution to understanding the history of the Russian Arctic development as a whole.

From a scientific point of view, the beautiful legend has quite a few weaknesses. The first thing that comes to mind is the absence of any information about the existing Russian population, originating from the Indigirka discoverers. According to logic, for Ivan Rebrov "and his comrades", a meeting with Russian people after long wanderings along "unknown rivers" among "unpeaceful foreigners" should have had the effect of an exploding bomb and should be reflected in their "tales", "replies" and "questioning speeches". Even with the loss of primary sources, the echoes of these testimonies would have turned into legends, and then would have entered the scientific and pseudo-scientific literature, as happened with the campaign of Panteley Pyanda. But, alas, despite more than two hundred years of studying events and publishing documents on the development of the northeast of Asia in the 17th century, not a single such evidence has been found to this day.

The petitions of Elisey Buza [1] and Ivan Erastov [2], the questioning speeches of Fyodor Chukichev [3] describe in detail the events of the time of the Indigirka discovery, but nothing is said about meetings with anyone except the indigenous population of these places.

Historical realities are not on the side of the legend either. The pogrom of Velikiy Novgorod was a one-time action, it was not followed by long-term repressions. Moreover, already at the end of 1572, Ivan the Terrible temporarily moved the Moscow treasury here and lived for some time himself. The famine and plague epidemic that followed the pogrom were certainly catastrophic for the devastated Novgorod land and caused mass migrations of the population, but there was no need to flee so far away.

It would seem that this is a ready criticism — the question can be closed, but, judging by the vitality and wide spread of the legend among those interested in the subject of Arctic navigation, more solid evidence is needed to confirm or refute it. The most effective way to solve this problem is a comprehensive study involving a wide range of historical, ethnographic and archaeological sources. The method of ethnographic-archaeological complexes, which has already shown its effectiveness in studies of the Russian population of Siberia, requires the coexistence of a group of modern population and archaeological sites associated with its formation. In order to identify sites associated with the formation of the Russkoust'intsy ethnographic group, in August 2016 and September 2022, reconnaissance surveys were undertaken in the delta of the Indigirka River.

The development of the Indigirka delta by Russian industrialists began a little later than its discovery, customs documents record the first runs to this “outside river” since 1642, by the middle of the century they become massive, and by the end of the century they became minimal due to the decline of fur extraction and redistribution of migration flows to the Far East. Map-scheme of the location of Russian settlements in the delta, compiled by local historian V.I. Shakhova [6], although not very accurate geographically, but demonstrates the development of the territory well. The Yakuts did not settle in the lower reaches of the Indigirka north of the Burulgin stone and the mouth of the Elon (Berelekh) river, since there is no food for cattle in the tundra. This is well illustrated by toponymy: all the names in the delta are absolutely Russian, and even those objects that received Yakut names at different times, retained Russian geographical reference — layda, kurya, viska.

[1] Russian State Archive of Ancient Acts, F.1177, Inv.2, act 88, sh. 1–4
[2] Russian State Archive of Ancient Acts, F.1177, Inv. 3, p.2, act 978, sh. 6–12
[3] Russian State Archive of Ancient Acts, F.1177, Inv. 2, act 157, sh. 6–7

Fig. 1. Zaimka Syrovatskoe on the Golyzhinskaya channel. Photo by E.A. Strogova.

Neighbors of the Russians in the lower reaches of the Indigirka were the Yukaghirs, who once settled in the delta itself, but Russians did not find them here already in the 17th century. Presumably, the ancient Yukaghir dwellings — chandals — were already abandoned and became the basis for legends. These dwellings were surveyed by S.A. Fedoseeva in 1959 as part of the work of the Yukagir expedition of the Institute of Nuclear Physics of the Siberian Branch of the USSR Academy of Sciences. During a visit to the Golyzhenskaya channel, 300 m from the coast, the remains of the Zaimka Syrovatskoe were discovered, which existed at the beginning of the 20th century, but was absent both in the Zenzinov's list [7, pp. 130–133] and on the topographic map. The settlement was located in the middle of the tundra on a small low ridge. Six burials with wooden tombstones and crosses were found at the zaimka, and 100 m away from them — the remains of a dwelling, most probably, a balagan (Fig. 1).

A special survey was carried out in the Stanchik site, located at the intersection of the Kolymskaya, Lundin and Keremsit channels; Zaimka Stanchik is apparently one of the oldest in the Indigirka delta, it is mentioned in the Zenzinov's list [7, p. 131] as one of the landmark settlements. Convenient location at the intersection of the channels connecting the large branches of the delta with the ocean, allowed Stanchik to develop into a serious trading post by the end of the 19th century, where, according to the memoirs of the Russkoust'intsy, American trading schooners entered. Building of the church in the 18th century, which was studied and described in detail by A.V. Opolovnikov [8], indicates that already at that time there was a significant for these places settlement, and the name itself suggests the existence here in the 17th century of "district" winter camp of industrialists. The most interesting discovery was a wooden calendar fixed on the wall of the last house preserved on the surface (Fig. 2).

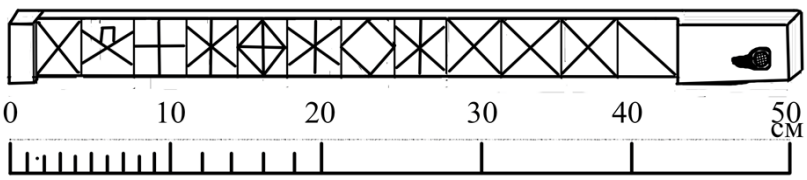

Fig. 2. Drawing figures on the calendar, Stanchik area.

The main purpose of the reconnaissance was the Old Russkoe Ustye tract, which is located on the left bank of the Russkoust'inskaya channel of the Indigirka river, 20 km upstream the modern Russkoe Ustye village (until 1988, the village of Polyarnyy) on the northern coast of a small peninsula formed by a meander of the Indigirka River. Until 1943, the ancient village of Russkoe Ustye was located here; the time of its foundation is unknown, but no later than the first quarter of the 18th century, since D. Laptev mentions the participation of the inhabitants of Russkoe Ustye in rescue his ship [9, pp. 233–234]. The territory of the settlement is a tundra area with small hills and ridges, where the remains of buildings are located [10, p. 232]. In addition, the territory is dissected by three small ravines, at the tops of which ice lenses are clearly seen — streams eroding the soil.

The remains of seven buildings and the cemetery are now clearly visible on the surface. Remains of two more buildings were found at the edge of the shore. One of the buildings was identified on the basis of a drawing found in the Archives of the YSC SB RAS in the materials of the ethnographer N.M. Alekseev, a member of the 1949 expedition [4]. The drawing, judging by the inscription on it, depicts Russkoe Ustye in 1931 [10, p. 233]. The church building and the school are clearly visible here. The school was built in 1929 from the logs of the dismantled Ozhoginskaya church, carefully deconstructed when the settlement was moved to a new place, and nowadays, though in a poor condition, it is located on the territory of the modern settlement. The church, in the traditions of that time, was abandoned; it is likely that in the conditions of a shortage of wood, part of its logs was also eventually used for some kind of construction or for firewood. The image of the graves on both sides of the church helped to identify it, since now crosses are fixed on the ground on both sides of building No. 1.

A study of the bank edge along the entire length of the settlement showed that the cultural remains are concentrated in a layer of wood chips in gray silty loam, the thickness of which varies from 40 cm at the edge to 160 cm in the middle of the settlement. Under this layer, a small brown layer of humus is visible, which may be buried soil.

On the towpath formed after the water left, in a small area about 2 m long, 35 units of lifting material were collected, including 15 metal objects made of copper and iron, 8 bone products, 3 wooden objects, 3 stone weights, 4 fragments of porcelain .

Iron items are represented by fragments of two knives, a forked arrowhead, a massive forged iron ear of a cauldron, and two large forged nails 22 cm long [10, p. 234], a deformed iron ring made of a round wire with a diameter of 0.5 cm. The collection of iron products also includes scissors, which have an analogue in the materials of the Olenyokskiy winter hut [11].

The largest copper product is a deformed fragment of some kind of vessel (bucket, kettle, teapot?). The item was being repaired: a rectangular patch, attached with copper rivets, is clearly visible. Another such patch was found separately. The found earring is made of a tin-zinc alloy

[4] Archive of the YSC SB RAS, F. 5, inv.1, act 771, sh. 2.

with a small copper content and covered with a thin layer of gilding [10, p. 233]. The lock shackle is made of the same alloy with a small addition of iron.

The most interesting piece of bone found at the site is a plate on the skid of the narta (sub-sledge) made of whale rib. Such plates were fixed in the front part of the skid after bending to improve sliding. That is why its front surface is polished to a shine. The Russkoust'intsy did not make such things themselves, but bought them from the Chukchi at the Anyuyskaya Fair.

Another interesting item is a miniature kopoushka (ear pick), made of mammoth bone and decorated with carving [10, p. 234]. The handle of the kopoushka is straight, fixed, rounded in cross section, smoothly connected to the plate and spoon. The handle and spoon are carefully polished. The plate has a complex profiled shape and a complex openwork ornament. Its length from the extreme attachment point to the edge of the spoon is 6.3 cm (Fig. 3).

Fig. 3. Kopoushka from mammoth bone, Old Russkoe Ustye.

A saber-shaped beater for knocking snow off clothes, hats and shoes is made of a reindeer antler trunk, cut in half lengthwise. At the lower end of the beater, there are traces of a horn being cut and a round hole for attaching a cord 0.9 cm in diameter. Several items were identified by local residents as parts of dog harness, but no one could indicate the specific purpose and location of the parts. A small but heavy almost square-shaped weight measuring 5x6 cm was made of mammoth tusk.

In addition, three more wooden objects were found: a leaf-shaped wooden float with a straight base and three through holes. The large 1.6x2.0 cm hole is located in the center of the float, two other holes cut along the straight base, the float measures 10.0x7.4 cm and is 0.6 cm thick. Wooden detail interpreted as a spinner in the form of a round disk with a small hole in the center. In 2022, another unidentified object was added to the collection in the form of two half-moon-shaped wooden handles connected by a half-meter rope, divided by knot marks into 8 almost equal parts, clearly intended for some kind of measurement.

Five small fragments of porcelain were also found, the age of which is not possible to determine due to the lack of hallmarks, and three stone weights-kibasa, attached to rings made of talnika twigs with bald rope. Such “kibasya”, as the Russkoust'intsy call them, are still used by fishermen.

The great thickness of the cultural layer, about 160 cm, suggests that cultural remains were deposited here for at least 200 years. A comparison of the modern outlines of the coast with a map reflecting the state of the area in 1972 showed a significant decrease in the territory of the Russkoe Ustye settlement — the location of an ancient village well known in ethnographic and folklore literature — as a result of destruction by the waters of Indigirka.

In the course of exploration work, it was impossible to miss the legendary Gulyanka — a tract located at the mouth of the Elon (Bereleh) River, which, in the minds of the Russkoust'intsy, is firmly connected with the history of their origin as the first settlement of their ancestors in these places. The settlement at the mouth of the Elon is mentioned in the diary of the astronomer E.F. Skvortsov (1908–1909) [12, p. 60], as non-existent by V.M. Zenzinov (1914) [7, p. 130].

A.G. Chikachev recorded the story of the Russkoust'intsy old-timer A.P. Chikacheva-Strizheva: “They came on kochas along the Golyzhenskaya channel and stopped at the mouth of Elon... and built 14 houses, a pub and a bathhouse. At first they drank and partied a lot. Several people drowned. That is why this place at the mouth of the Elon is still called “Gulyanka”. There was smallpox. Many people died. Afterwards, from Gulyanka, people moved to the place where now the Russkoe Ustye is” [3, p. 22]. It is interesting that our informant P.A. Cheremkin attributes the sad events at the Gulyanka to the beginning of the 20th century and does not connect them in any way with the formation of the Russkoe Ustye.

Fig. 4. Gulyanka tract, absence of a cultural layer in the coastal line, photo by E.A. Strogova, 2022.

The survey of the Gulyanka tract (Fig. 4) showed the complete absence of the cultural layer in the coastal line and any signs of structures (hills or depressions) on the surface. Only old graves indicate that once there was a settlement nearby, but its remains were completely washed away by the river waters.

The age of the graves cannot be determined by their appearance, as they look similar to the tombstones at the Old Russkoe Ustye. The features of the preservation of wooden objects and buildings in the Arctic do not allow visually determining the age of structures even approximately. In addition, drift-wood is used for construction, which can contain wood of any age. Special atten-

tion was paid to the examination of structures of gravestones, because some local historians justify their antiquity by the presence of ship parts. Alas, the details of ancient ships were not found in the visible remains of the structures of gravestones. The age of the existing burials can be established only by their archaeological research.

Thus, the basis for applying the method of historical-archaeological complexes and obtaining new information about the past of the Russkoe Ustye has been obtained. The study of monuments of historical time by archaeological methods allows supplementing significantly the data of written sources, which, as a rule, do not preserve information about everyday life. Archaeological research of the Old Russkoe Ustye, and possibly the burials at Gulyanka, can play a significant role in the question of the origin and time of the beginning of the formation of the Russkoust'intsy as an ethnographic group. The materials obtained during archaeological excavations make it possible to trace in the dynamics the transformation of the culture of the Russkoust'intsy people in the process of its adaptation to the Arctic conditions and the degree of influence of a foreign ethnic environment.

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