

ISSN 2221-2698

online scientific journal  
**Arctic and North**

**A & N**

Northern (Arctic) Federal University  
named after M.V. Lomonosov

**No. 52**  
**2023**

Arkhangelsk

DOI: [10.37482/issn2221-2698.2023.52](https://doi.org/10.37482/issn2221-2698.2023.52)

ISSN 2221-2698

Arctic and North. 2023. No. 52

© Northern (Arctic) Federal University named after M.V. Lomonosov, 2023

© Editorial board of the online scientific journal "Arctic and North", 2023

"Arctic and North" (also known as "Arktika i Sever") is registered at Roskomnadzor (Federal Service for Supervision in the Sphere of Telecom, Information Technologies and Mass Communications) as an online media published in Russian and English: Registration certificate ЭЛ No. ФC77- 78458, issued on the 8th of June 2020; at the system of eLIBRARY, license contract no. 96-04/2011R (2011); Scientific Electronic Library "CyberLeninka" (2016); and in the catalogs of international databases: EBSCO Publishing, USA (2012), Directory of Open Access Journals — DOAJ (2013), Global Serials Directory Ulrichsweb, USA (2013), NSD, Norway (2015), InfoBase Index, India (2015), ERIH PLUS, Norway (2016), MIAR, Spain (2016), OAJI (2017), **RSCI** based on Web of Science (2018). The journal is included in the List of authoritative scientific publications ("**The White List**"), in the List of **Q2** RSCI Journals, and in the List of **Q2** RSCI Journals on the Subject of OECD 507. Social and Economic Geography. The journal is issued not less than 4 times a year.

The Founder is Northern (Arctic) Federal University named after M.V. Lomonosov, Arkhangelsk, Russia. Editor-in-Chief is Elena V. Kudryashova, Dr. Sci. (Phil.), Professor, Rector of Northern (Arctic) Federal University named after M.V. Lomonosov. All journal issues are available free of charge (CC BY-SA) in Russian and English at the webpage of the journal. Rules and regulations of submission, peer reviews, publication and the Declaration of Ethics are available at <http://www.arcticandnorth.ru/en/requirements/>

The Journal publishes the scientific articles focused on the Arctic and the North relevant for the following professional degrees: 5.2 (08.00.00) Economics; 5.4 (22.00.00) Social science; 5.5 (23.00.00) Political science.

No publication fees are charged. Honorariums are not paid. All manuscripts are reviewed using double blind peer review system. The fact of submitting manuscripts is considered as the assignment of copyright to publish an article in the Arctic and North journal and to place it in databases, which contributes to the promotion of the publication activity of the authors and meets their interests.

## CONTENTS

### SOCIAL AND ECONOMIC DEVELOPMENT

<b>AGAMAGOMEDOVA S.A.</b> Customs Control in the Arctic Zone of the Russian Federation	4
<b>BEZHAN A.V.</b> Improving the Efficiency of Heat Supply Systems in the Arctic Zone of the Russian Federation Through the Use of Wind Power Plants (The Case of the Murmansk Oblast)	14
<b>VASILYEV A.M., LISUNOVA E.A.</b> Is It Possible to Change Arctic Fish Pricing?	27
<b>KOZMENKO S.Yu., KOZMENKO A.S.</b> Economic Conjuncture of Arctic Natural Gas in the New Geopolitical Conditions	38
<b>KRASNOPOLSKIY B.Kh.</b> Transformation of the Development Processes of Transboundary Territories of the Far Eastern Arctic and Mechanisms of Their Regulation: The Role of Critical Infrastructure	54
<b>KOZHINA E.V., SERGEEVA K.I.</b> Availability of Budget Investments for Regions under the Program-Targeted Approach to Budget Formation (On the Example of Municipalities of the Arkhangelsk Oblast)	76
<b>BAZHUTOVA E.A., SKUFINA T.P.</b> Integrated Processing of Mineral Raw Materials: Factors of Readiness and Resistance of Economic Entities	87

### POLITICAL PROCESSES AND INSTITUTIONS

<b>ZHURAVEL V.P., TIMOSHENKO D.S.</b> On the Outcomes and Lessons of Russia's Chairmanship of the Arctic Council (2021–2023)	103
<b>KONYSHEV V.N.</b> Science Diplomacy in the Arctic and Antarctic	116

### NORTHERN AND ARCTIC SOCIETIES

<b>MATVIENKO I.I.</b> Current Problems of Indigenous Minorities of the Russian Arctic in the Context of Climate Change	130
<b>PITUKHINA M.A., BELYKH A.D.</b> Artificial Intelligence Technologies in the Russian Arctic: The Case of the Murmansk Oblast	141
<b>KNYAZEVA G.A., POROTNIKOVA N.A., ANTIPOV V.V., MAKUKHA V.V.</b> Arctic Tourism as a Driver of Sustainable Development of the Territory: Research of the Interest of Local Stakeholders in the Komi Republic	152
<b>SULEYMANOV A.A., LITKIN V.M., VINOKUROVA L.I., GRIGORYEV S.A., FEDOROV S.I., GOLOMAREVA V.Yu., BASHARIN N.I., APROSIMOV D.A.</b> Rural Communities of Yakutia in Conditions of Permafrost Degradation: Key Risks, Social Consequences, and Adaptation Mechanisms	168
<b>KHAYMINA L.E., ZELENINA L.I., KHAYMIN E.S., FEDKUSHOVA S.I.</b> Artificial Intelligence in the Healthcare System of the Arctic Regions of the Russian Federation	196

### REVIEWS AND REPORTS

<b>POLIKARPOV A.M., DRUZHININA M.V., POLIKARPOVA E.V.</b> All-Russian Scientific and Educational Project "Preserve the Nenets Language and Culture Together": Experience of Interaction and Prospects for Implementation	206
<b>STEPUS I.S., AVERYANOV A.O., RODION I.V.</b> Review of Scientific Publications on the Study of Population Migration in the Russian Arctic	228
Editorial board of the "Arctic and North" journal	241
Output data	243

## SOCIAL AND ECONOMIC DEVELOPMENT

Arctic and North. 2023. No. 52. Pp. 4–13.

Original article

UDC 339.5(985)

doi: 10.37482/issn2221-2698.2023.52.5

### Customs Control in the Arctic Zone of the Russian Federation

**Saniyat A. Agamagomedova**<sup>1✉</sup>, Cand. Sci. (Law), Associate Professor

<sup>1</sup> Institute of State and Law of the Russian Academy of Sciences, ul. Znamenka, 10, Moscow, Russia

<sup>1</sup> [saniyat\\_aga@mail.ru](mailto:saniyat_aga@mail.ru) ✉, ORCID: <https://orcid.org/0000-0002-8265-2971>

**Abstract.** The purpose of the study is to identify the features of customs control in the Arctic zone of the Russian Federation, which is positioned as a type of customs control. Based on the use of methods of comparative and system analysis, systematization and classification, formal legal method, the author outlines the specifics of this control. Five features of such control, related to its legal regulation and correlation with other types of state control, the status of supervised persons, temporal characteristics, and the application of the customs procedure of a free customs zone, are identified. On the basis of the analysis of the legal regime of the Arctic zone, enshrined in the current legislation, the conclusion is made about the attribution of this regime to administrative regimes of territory management. Attention is drawn to the combination of spatial and status approaches in public administration in the regulation of entrepreneurial and other activities in the Arctic zone of the Russian Federation, as well as to the complex regime support of the management of this territory (the principle of “regime in regime”). It is concluded that there has been a certain transformation in the regulation of the territory in the conditions of increased sanctions pressure, which is reflected in the priorities of import substitution through the development of domestic technologies and cooperation with Asian countries. From the perspective of the prospects of the development of the Arctic zone as a national priority for the socio-economic development of the country, it is proposed to systematically regulate the administrative procedures for customs control, ensuring the full functioning of the Northern Sea Route.

**Keywords:** *Arctic zone, customs control, entrepreneurial activity, free customs zone, privileged status, Arctic zone resident, Northern Sea Route*

### Introduction

The modern legal regulation of entrepreneurial activity clearly reflects two approaches: status and spatial. The status approach is represented in the generation and development of certain privileged statuses of subjects in terms of entrepreneurial and other economic activities, which are provided with various kinds of preferences and simplifications. Representatives of small and medium-sized businesses are a good example of this status in the modern period. The second approach is associated with the designation and establishment of spatial or territorial limits with special jurisdiction, which allows reducing the managerial impact on business entities. Within the framework of this approach, scientists operate with the category of the administrative regime of territories, which is understood as a special procedure for the activities of subjects of law in a special territory, created for the purpose of accelerated socio-economic development of this territory, ensuring comfortable conditions for the life of the population, protection of the foundations of

---

\* © Agamagomedova S.A., 2023

For citation: Agamagomedova S.A. Customs Control in the Arctic Zone of the Russian Federation. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 5–16. DOI: 10.37482/issn2221-2698.2023.52.5



the constitutional order, rights and legitimate interests of citizens. At the same time, scientists refer to special territories those ones, where a legal regime for carrying out entrepreneurial or other activities is different from the usual procedure for territorial management [1, Glushko E.K., p. 9].

One of the varieties of such special territories is, in our opinion, the territory of the Arctic zone of the Russian Federation. Such a zone is considered by scientists as a special object of state management [2, Chistobaev A.I., Malinin P.Yu.]. The peculiarity of such a territory consists, among other things, in the specifics of customs control as one of the types of state control within its boundaries. Let us try to reveal this specificity, which is of particular importance from the point of view of the current situation in the world. Scientists are actively researching the trends of national policy transformation in the Arctic zone of the Russian Federation, taking into account external challenges and threats faced by Russia. In their opinion, the sanctions adopted by the EU and the US against Russia are accompanied by ever-increasing state support for Arctic projects, the development of import substitution policy and further liberalization of access to the Arctic shelf [3, Shapovalova D., Galimullin E., Grushevenko E., p. 20]. The management policy of Russia in the Arctic over the past few decades has changed depending on the current geopolitical situation, which has led to an increase in scientific interest in transformations in the national management of natural resources of the Russian Arctic, the development of relatively new models of public administration in the region to level Western sanctions [3, Shapovalova D., Galimullin E., Grushevenko E.].

Under these conditions, the stimulation of entrepreneurial and other economic activities by public authorities within the Arctic zone, including by reducing the control and supervisory impact on business, is of particular importance. All this has determined the relevance of the proposed research topic.

### ***The legal regime of the Arctic zone, measures of state support and the procedure for carrying out entrepreneurial activities***

According to Part 2 of Article 2 of Federal Law No. 193-FZ of July 13, 2020 “On state support for entrepreneurial activities in the Arctic Zone of the Russian Federation” (hereinafter referred to as Law 193-FZ), the Arctic Zone of the Russian Federation (hereinafter referred to as the Arctic Zone) includes the land territories and adjacent internal sea waters and the territorial sea of the Russian Federation, areas of the continental shelf of the Russian Federation, as well as lands and islands that may be discovered in the future, which are not territories of foreign states located in the Arctic Ocean north of the coast of the Russian Federation to the North Pole in within the limits between the meridian thirty-two degrees four minutes thirty-five seconds east longitude from Greenwich, passing along the eastern side of Vaida Bay through the triangulation mark at Cape Kekurskiy, and the meridian one hundred sixty-eight degrees forty-nine minutes thirty seconds longitude west from Greenwich, passing through the middle of the strait, separating the Ratmanov and Kruzenshtern Islands of the Diomed Islands group in the Bering Strait, on which, in

accordance with the Law 193-FZ and other federal laws, measures of state support for entrepreneurial activity are established <sup>1</sup>.

Law 193-FZ defines the legal regime of the Arctic zone, measures of state support and the procedure for entrepreneurial activity in this zone. Its goals are: economic development of the Arctic zone; stimulation and intensification of investment and entrepreneurial activity within its limits; creation of an economic basis for advanced social development and improvement of the quality of life in the Arctic zone. Less than two years after the adoption of Law 193-FZ, representatives of public authorities presented a number of significant indicators as the results of the development of this territory, including the growth of new projects in the Arctic zone, which exceeds the Far East indicators by 20–25%. More than 460 projects are being implemented in the region with state support, and the volume of investments under agreements exceeds 1.3 trillion rubles <sup>2</sup>.

Russia has adopted a number of strategic planning documents to protect the national interests of the Russian Federation in the Arctic <sup>3</sup>. In fact, in relation to the Arctic zone, it is a practice of granting certain regions within the borders of the state with “customs extraterritoriality”, which aims to revive the economic situation, enhance foreign trade, invest national and foreign capital [4, Kozyrin A.N., p. 50]. At the same time, improving the quality of life of the population of the Arctic zone of the Russian Federation is a priority issue of domestic national policy, including: the development of social, transport and digital infrastructure, ensuring favorable environment, increasing wages and solvency of northerners, improving the availability and quality of medical services, life expectancy, etc. The issue of national security, integrity of land and sea borders, protection of the population, shipping routes is the main issue for the implementation of the Fundamentals of the State Policy of Russia [5, Vopilovskiy S.S., p. 34]. In fact, issues of security, territorial and technological sovereignty, as well as economic, social, ethnic, military and cultural development intersect in the Arctic zone. In 2022, Russia continued to implement the program of its two-year chairmanship of the Arctic Council, the cross-cutting theme of which is “Responsible governance for a sustainable Arctic”. 43 events were held in such key areas of cooperation as supporting the population of the Arctic, including the indigenous peoples of the North, protecting the environment and adapting to the effects of climate change, promoting the socio-economic develop-

<sup>1</sup> Federal'nyy zakon ot 13.07.2020 № 193-FZ (red. ot 02.07.2021) "O gosudarstvennoy podderzhke predprinimatel'skoy deyatel'nosti v Arkticheskoy zone Rossiyskoy Federatsii" [Federal Law No. 193-FZ dated July 13, 2020 (as amended on July 2, 2021) “On state support for entrepreneurial activities in the Arctic zone of the Russian Federation”]. Rossiyskaya gazeta, N 155, 16.07.2020.

<sup>2</sup> Soveshchanie po voprosam razvitiya Arkticheskoy zony 13 aprelya 2022 goda [Meeting on the development of the Arctic zone on April 13, 2022]. URL: <http://www.kremlin.ru/events/president/news/68188> (accessed 28 February 2023).

<sup>3</sup> Ukaz Prezidenta RF ot 05.03.2020 № 164 "Ob Osnovakh gosudarstvennoy politiki Rossiyskoy Federatsii v Arktike na period do 2035 goda" [Decree of the President of the Russian Federation dated March 05, 2020 No. 164 “On the Fundamentals of State Policy of the Russian Federation in the Arctic for the period up to 2035”]. Collection of Legislation of the Russian Federation, 09.03.2020, no. 10, art. 1317; Ukaz Prezidenta RF ot 26.10.2020 № 645 (red. ot 12.11.2021) "O Strategii razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda" [Decree of the President of the Russian Federation dated October 26, 2020 No. 645 (as amended on November 12, 2021) “Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035”]. Collection of Legislation of the Russian Federation, 02.11.2020, no. 44, art. 6970.

ment of the region, as well as strengthening multilateral interaction and scientific cooperation in the Arctic <sup>4</sup>.

### *Features of customs control in the Arctic zone of the Russian Federation*

According to Part 1 of Article 18 of Law 193-FZ, control of persons, vehicles, cargo, goods and animals at checkpoints across the state border of the Russian Federation located in the Arctic zone is carried out by border and customs authorities, federal executive authorities carrying out federal state sanitary and epidemiological supervision.

The peculiarities of customs control, carried out within the Arctic zone, allow to attribute it to a certain type (variety, direction) of customs control, distinguished by the specificity of administrative and procedural property [6, Agamagomedova S.A.]. In this case, the criterion for differentiating customs control is not only the space where administrative control procedures are implemented, but also the special legal status of persons controlled by customs authorities, registered within its boundaries and having a number of preferential characteristics (residents of the Arctic zone).

The **first feature of customs control** in the Arctic zone is its legal regulation, which is carried out through both traditional sources of customs regulation and specialized legal acts of the national level, primarily the Federal Law "On state support for entrepreneurship in the Arctic Zone of the Russian Federation". This is confirmed, in particular, by Part 2.1, Article 214 of Federal Law No. 289-FZ of August 3, 2018 "On customs regulation in the Russian Federation and on amendments to certain legislative acts of the Russian Federation", introduced by Federal Law No. 194-FZ of July 13, 2020 <sup>5</sup>. The legislator recognizes the presence of peculiarities of customs control in the Arctic zone of the Russian Federation and establishes the complexity of its legal regulation, which includes acts of customs legislation on the principle of functionality (Customs Code of the EAEU, Federal Law No. 289-FZ), and Law 193-FZ on spatial principle. In essence, we are dealing with the regulation of customs control with territorial specifics, conditioned by the public objectives of managerial influence in specific spatial limits.

According to Part 1 of Article 21 of Law 193-FZ, customs control in the Arctic zone is carried out by customs authorities in accordance with the acts constituting the EAEU law and (or) the legislation of the Russian Federation on customs regulation, taking into account the specifics established by this Federal Law.

---

<sup>4</sup> Rossiya vo glave Arkticheskogo soveta provela v 2022 godu svyshe 40 meropriyatij po klyuchevym napravleniyam arkticheskoy povestki. URL: [https://arctic-council-rus-sia.ru/news/oficial/rossiya\\_vo\\_glave\\_arkticheskogo\\_soveta\\_provela\\_v\\_2022\\_godu\\_svyshe\\_40\\_meropriyatij\\_po\\_klyuchevym\\_napra/](https://arctic-council-rus-sia.ru/news/oficial/rossiya_vo_glave_arkticheskogo_soveta_provela_v_2022_godu_svyshe_40_meropriyatij_po_klyuchevym_napra/) (accessed 28 February 2023).

<sup>5</sup> Federal'nyy zakon ot 03.08.2018 № 289-FZ (red. ot 14.07.2022) "O tamozhennom regulirovanii v Rossiyskoy Federatsii i o vnesenii izmeneniy v ot del'nye zakonodatel'nye akty Rossiyskoy Federatsii" [Federal Law of 08/03/2018 No. 289-FZ (as amended on 07/14/2022) "On customs regulation in the Russian Federation and on amendments to certain legislative acts of the Russian Federation"]. Collection of Legislation of the Russian Federation, 06.08.2018, no. 32 (part I), art. 5082.

At the same time, in recent years, the departmental regulatory framework for the considered direction of customs control has been actively formed<sup>6</sup>. Such departmental support of customs control in the Arctic zone at the level of the Ministry of Finance of Russia and the Federal Customs Service of Russia exacerbates the administrative and legal independence (isolation) of this type of control, due to state priorities in this territory.

We believe that in the conditions of using customs control as a public law regulator, mainly (but not entirely) in the field of entrepreneurial activity, one should agree with the statement of V.A. Vaypan about two levels of normative regulation of entrepreneurial activity in the conditions of Eurasian economic integration (supranational and internal) and the problem of legal or law “levelling” [7, Vaypan V.A.]. With regard to the Arctic zone, we can talk about the goal of “levelling” from the viewpoint of the extremely diverse regions of Russia in terms of natural, climatic and other conditions.

The tax part of the “preferential status” of an entrepreneur registered in the Arctic zone is reflected in a number of articles of national tax legislation, for example, Part 1.8 of Article 284 of the Tax Code of the Russian Federation establishes a zero rate for tax to the federal budget by residents of the Arctic zone, and Article 284.4 of this Code provides a preferential procedure for taxpayers<sup>7</sup>. Along with residents of the Arctic zone, the legislator includes residents of the territory of advanced socio-economic development and residents of the port of Vladivostok among the latter.

Thus, the regulation of customs and tax control in the Arctic zone is an integral part of customs and tax legislation, business legislation, as well as the legal framework that regulates a variety of social relations within the land and sea borders of the Arctic. In this regard, we support the position of scientists who deny the distinguishing the so-called “Arctic law” as a branch of law, a system of law or other traditional legal formation [8, Zvorykina Yu.V., Teteryatnikov K.S., p. 30]. We believe that in this regard it is appropriate to talk about a special polysystemic legal formation, including national legal and international legal means of regulating natural resource and environ-

---

<sup>6</sup> Prikaz FTS Rossii ot 15.10.2020 № 915 "Ob utverzhdenii Poryadka prinyatiya resheniya o sozdanii zony tamozhenogo kontrolya na uchastke rezidenta Arkticheskoy zony Rossiyskoy Federatsii dlya tseley primeneniya tamozhenoy protsedury svobodnoy tamozhennoy zony" [Order of the Federal Customs Service of Russia dated October 15, 2020 No. 915 "On approval of the Procedure for making a decision on the creation of a customs control zone on the territory of a resident of the Arctic zone of the Russian Federation for the purposes of applying the customs procedure of a free customs zone"]. Official Internet portal of legal information. URL: <http://pravo.gov.ru>, 23.11.2020; Prikaz Minfina Rossii ot 12.02.2021 № 19n "Ob utverzhdenii Poryadka i tekhnologiy soversheniya tamozhennykh operatsiy v otnoshenii tovarov (v tom chisle transportnykh sredstv), vvozimykh na uchastki Arkticheskoy zony Rossiyskoy Federatsii, na kotorykh primenyaetsya tamozhennaya protsedura svobodnoy tamozhennoy zony, v tom chisle svyazannykh s osushchestvleniem ikh identifikatsii, i vyvozimykh s takikh uchastkov" [Order of the Ministry of Finance of Russia dated February 12, 2021 No. 19n "On approval of the Procedure and technologies for performing customs operations in relation to goods (including vehicles) imported into areas of the Arctic zone of the Russian Federation where the customs procedure of a free customs zone is applied, including related with the implementation of their identification, and exported from such areas"]. Official Internet portal of legal information. URL: <http://pravo.gov.ru> (accessed 09 September 2022).

<sup>7</sup> Nalogovyy kodeks Rossiyskoy Federatsii (chast' vtoraya) ot 05.08.2000 № 117-FZ (red. ot 14.07.2022) [Tax Code of the Russian Federation (Part Two) dated 08/05/2000 No. 117-FZ (as amended on 07/14/2022)]. *Parlamentskaya gazeta*, No. 151-152, 10.08.2000.

mental, humanitarian and socio-economic, political and legal issues of Arctic development [9, Arctic Law, p. 6].

The **second feature** of this type of customs control is its implementation in close interrelation with other types of state control, primarily sanitary and phytosanitary control. Representatives of the FCS of Russia pay attention to this feature as a factor in accelerating the total time for passing state control<sup>8</sup>. It should be noted that the specifics of these types of state control do not concern the objects of control themselves (they are the same as in other regions), but their departmental support. Thus, for example, on August 11, 2021, Government Decree No. 121 dated February 6, 2021 "On amendments to certain acts of the government of the Russian Federation" came into force, which amends the Rules of state quarantine phytosanitary control (supervision) at checkpoints through the border of the Russian Federation<sup>9</sup>.

According to the provisions of the latter, the authority to carry out phytosanitary supervision at checkpoints across the state border of the Russian Federation located in the Arctic zone are transferred to customs authorities, whose officials conduct phytosanitary supervision at various checkpoints in the Republic of Karelia, in the Arkhangelsk and Murmansk oblasts.

In addition, the above-mentioned tax privileges for residents of the Arctic zone indicate a targeted preferential customs and tax impact within the considered regulation zone.

The **third feature** of customs control in the Arctic zone is its temporal specificity: it is carried out around the clock at checkpoints (Part 3 of Article 18 of Law No. 193-FZ).

The **fourth feature** of this type of customs control is the special status of a person under the control of customs authorities — a resident of the Arctic zone. The latter is understood as an individual entrepreneur or a legal entity being a commercial organization, the state registration of which is carried out in the Arctic zone (with the exception of state and municipal unitary enterprises), which, in accordance with Law 193-FZ, have concluded an agreement on investment activities in the Arctic zone and are included in register of residents of the Arctic zone (Paragraph 2, Part 1 of Article 1 of Law 193-FZ). The presence of such, to a certain extent, privileged status allows us to speak about the combination of both territorial and status instruments of stimulating socio-economic, investment and other development in the Arctic zone. At present, 564 residents are

---

<sup>8</sup> Zamrukovoditelya FTS Rossii Vladimir Ivin vystupil na sessii «SMP: bystree, nadezhnee, effektivnee». Novosti Vostochnogo ekonomicheskogo foruma [Deputy Head of the Federal Customs Service of Russia Vladimir Ivin spoke at the session "NSR: faster, more reliable, more efficient". News from the Eastern Economic Forum]. URL: [https://zen.yandex.ru/media/customs\\_rf/prodoljaem-delitsia-novostiami-s-polei-vef2022-zamrukovoditelja-fts-rossii-63183c27d7dd5e66c2527e35](https://zen.yandex.ru/media/customs_rf/prodoljaem-delitsia-novostiami-s-polei-vef2022-zamrukovoditelja-fts-rossii-63183c27d7dd5e66c2527e35) (accessed 09 September 2022).

<sup>9</sup> Postanovlenie Pravitel'stva RF ot 13.08.2016 № 792 (red. ot 06.02.2021) "O poryadke osushchestvleniya gosudarstvennogo karantinnogo fitosanitarnogo kontrolya (nadzora) v punktakh propuska cherez gosudarstvennuyu granitsu Rossiyskoy Federatsii" (vmeste s "Pravilami osushchestvleniya gosudarstvennogo karantinnogo fitosanitarnogo kontrolya (nadzora) v punktakh propuska cherez gosudarstvennuyu granitsu Rossiyskoy Federatsii") [Decree of the Government of the Russian Federation dated August 13, 2016 No. 792 (as amended on February 6, 2021) "On the procedure for implementing state quarantine phytosanitary control (supervision) at checkpoints across the state border of the Russian Federation" (together with the "Rules for implementing state quarantine phytosanitary control (supervision) at checkpoints across the state border of the Russian Federation")]. Collection of Legislation of the Russian Federation, 29.08.2016, No. 35, art. 5321.

included in the register of residents of the Arctic zone of the Russian Federation<sup>10</sup>, the largest of which are NOVATEK, Gazpromneft, Rosneft, Severnaya Zvezda and many others.

The application of the customs procedure of the free customs zone is, in our opinion, the **fifth feature** of the considered type of customs control in the Arctic zone. Within the framework of customs control, a checkpoint regime is provided in port and logistics areas, other territories of the zone under consideration.

The procedure for ensuring a control and pass regime in port areas or logistic areas of the Arctic zone of the Russian Federation determines the rules for ensuring a control and pass regime in a separate area (areas) of seaports open for international traffic and the entry of foreign ships, including the water area of the seaport, and (or) in separate airport areas, open for receiving and departing aircraft carrying out international air transportations, located in the Arctic zone of the Russian Federation, as well as on area adjacent to road or railway checkpoint (logistics site), where the procedure of a free customs zone, provided for a port or logistics special economic zone, is applied: import (export) of goods; entry (exit) of vehicles; entry (exit) of people<sup>11</sup>.

The application of this customs procedure determines the use of such varieties of customs control zones as the area of the Arctic zone and (or) the section of the Arctic zone resident, where the customs procedure of the free customs zone is applied. At the same time, these areas are subject to special requirements for arrangement and equipment for customs control<sup>12</sup>.

These requirements are related, in particular, to the nature of the boundaries of the port and logistics areas of the Arctic zone, as well as the section of the resident of the Arctic zone and the designation of their borders; determination of the composition of buildings, premises, structures necessary for customs operations and control (customs infrastructure facilities) on the territories of the port and logistics areas of the Arctic zone, as well as the sites of residents of the Arctic zone, and their locations in the territories of the corresponding sections of the Arctic zone; providing and equipping customs infrastructure facilities with material and technical means.

Taking into account the fact that in the current legislation, the customs procedure is understood as a set of rules defining for the purposes of customs regulation the conditions and procedure for the use of goods in the customs territory of the Union or outside it (Subparagraph 34,

---

<sup>10</sup> Register of residents of the Arctic zone of the Russian Federation. URL: <https://investarctic.com/registry.php> (accessed 28 February 2023).

<sup>11</sup> Prikaz Minfina Rossii ot 12.02.2021 № 18n "Ob utverzhdenii poryadka obespecheniya kontrol'no-propusknogo rezhima na portovykh uchastkakh ili logisticheskikh uchastkakh Arkticheskoy zony Rossiyskoy Federatsii, vklyuchaya poryadok dostupa lits na takie uchastki" [Order of the Ministry of Finance of Russia dated February 12, 2021 No. 18n "On approval of the procedure for ensuring access control regime at port areas or logistics areas of the Arctic zone of the Russian Federation, including the procedure for access of persons to such areas"]. Official Internet portal of legal information. URL: <http://pravo.gov.ru> (accessed 09 September 2022).

<sup>12</sup> Prikaz Minfina Rossii ot 30.12.2020 N 336n "Ob ustanovlenii trebovaniy k obustroystvu i oborudovaniyu uchastkov Arkticheskoy zony Rossiyskoy Federatsii, na kotorykh primenyaetsya tamozhennaya protsedura svobodnoy tamozhennoy zony" [Order of the Ministry of Finance of Russia dated December 30, 2020 N 336n "On establishing requirements for the development and equipment of areas of the Arctic zone of the Russian Federation where the customs procedure of a free customs zone is applied"]. URL: <http://pravo.gov.ru> (accessed 09 September 2022).



Paragraph 1, Article 2 of the Customs Code of the Eurasian Economic Union<sup>13</sup>), which, in fact, corresponds to the understanding of the administrative and legal regime (in the legislation of the previous period, this concept was called the customs regime), one can talk about the presence of a special customs regime in the Arctic zone of the Russian Federation.

In this unique regime of the territory, we can also observe other overlaying regimes (“regime in regime”): for example, a checkpoint regime at port or logistics areas of the Arctic zone of the Russian Federation<sup>14</sup>; special economic regime, operational regime in the Arctic zone; regime of special protection of natural areas<sup>15</sup> and others. Moreover, according to the Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2035, a special economic regime is designed to facilitate the transition to a circular economy<sup>16</sup>. It offers fundamentally new approaches to production, consumption and economic activities based on the principles of renewable solutions and business models, is based on the cyclical processing of natural resources and their return to circulation, is designed to solve fundamental problems in the field of waste management and provide an environmental agenda.

Ensuring the administrative and legal regime of the Arctic zone of the Russian Federation, established by the legislation, naturally acts in modern conditions as an important guarantee of long-term socio-economic development of Russia, preservation of its territorial sovereignty and security.

### **Conclusion**

The features of customs control in the Arctic zone reflect the selectivity of managerial organizational and legal influence there. The peculiarity of the administrative procedures of control and supervisory activities in the considered zone is designed to promote the development of entrepreneurial and investment activities in this region. On the basis of the analysis, it can be concluded that, firstly, customs control in the zone under consideration is an integral part of the control and supervisory activities of state bodies in the Arctic zone as a whole, and, secondly, this control is a reflection of combination of spatial and status approaches in the regulation of entrepreneurial and other economic activities in modern conditions.

<sup>13</sup> Customs Code of the Eurasian Economic Union (as amended on May 29, 2019). Appendix No. 1 to the Treaty on the Customs Code of the Eurasian Economic Union. URL: <http://www.eaeunion.org/> (accessed 09 September 2022).

<sup>14</sup> Prikaz Minfina Rossii ot 12.02.2021 N 18n "Ob utverzhdenii poryadka obespecheniya kontrol'no-propusknogo rezhima na portovykh uchastkakh ili logisticheskikh uchastkakh Arkticheskoy zony Rossiyskoy Federatsii, vklyuchaya poryadok dostupa lits na takie uchastki" [Order of the Ministry of Finance of Russia dated February 12, 2021 N 18n "On approval of the procedure for ensuring access control regime at port areas or logistics areas of the Arctic zone of the Russian Federation, including the procedure for access of persons to such areas"]. URL: <http://pravo.gov.ru> (accessed 09 September 2022).

<sup>15</sup> Ukaz Prezidenta RF ot 26.10.2020 № 645 (red. ot 12.11.2021) "O Strategii razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda" [Decree of the President of the Russian Federation dated October 26, 2020 No. 645 (as amended on November 12, 2021) "On the Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period until 2035"]. Collection of legislation of the Russian Federation, 02.11.2020, No. 44, art. 6970.

<sup>16</sup> Ibid.



The Arctic zone is an area of intersection of a wide variety of interests: transport, geopolitical, military, socio-economic, environmental, tourist, national and others. Scientists draw attention to the need to take into account the interests of the indigenous peoples of the Far North in the economic development of the Arctic [2, Chistobaev A.I., Malinin P.Yu., p. 124], explore various aspects of the ethno-social situation in the region in the context of state national policy, conclude that there are no socio-economic, demographic and cultural prerequisites for the growth of ethnic tension in the region under study, but, at the same time, emphasize the need for a certain rethinking of the idea of ethnic and cultural diversity in the conditions of the Arctic zone [10, Zaykov K.S., Maksimov A.M., Tamitskiy A.M., Troshina T.I.].

The development of the Arctic zone is a national priority for the socio-economic development of the country, while the main focus of the documents is on the development of resources, ensuring security and stability, Northern Sea Route (NSR) and sustainability. The NSR is seen by scientists as the most important tool for further development of the Arctic zone [8, Zvorykina Yu.V., Teteryatnikov K.S.].

The national maritime policy in the Arctic regional direction is conditioned, among other things, by the transformation of the Arctic into a region of global competition not only from the economic, but also from the military point of view. Taking into account these factors, the priorities of the national maritime policy in the Arctic regional direction are to ensure the specified operational regime in the Arctic zone of the Russian Federation by strengthening the combat potential of the forces (troops) of the Northern and Pacific Fleets, as well as the federal security service in accordance with the existing and predicted nature of military dangers and threats to the Russian Federation in the Arctic<sup>17</sup>. It should be noted that scientists traditionally pay attention to the connection between state security issues and environmental changes, but the latter (in particular, climate change) are not considered as a threat, but rather as a second-level risk that contributes to the existing instability [11, Zellen B.S.].

Scientists note that national priorities in the resource policy and development policy of the NSR were established long before the imposition of sanctions and remain relevant today. At the same time, the sanctions caused some changes in resource management, namely the establishment of import substitution priorities through the development of domestic technologies and cooperation with Asian countries [3, Shapovalova D., Galimullin E., Grushevenko E.], which ultimately requires a certain transformation in terms of customs regulation. The implementation of projects in the Arctic zone of the Russian Federation with the participation of foreign partners has a positive multiplier effect on the development of the NSR, the main economic highway of the Russian Arctic [5, Vopilovsky S.S., p. 33]. We believe that from the perspective of customs regulation in the

---

<sup>17</sup> Ukaz Prezidenta RF ot 31.07.2022 № 512 "Ob utverzhdenii Morskoy doktriny Rossiyskoy Federatsii" [Decree of the President of the Russian Federation dated July 31, 2022 No. 512 "On approval of the Maritime Doctrine of the Russian Federation"]. Collection of legislation of the Russian Federation, 01.08.2022, No. 31, art. 5699.

future, it will be necessary to systematically regulate the administrative procedures of customs control, ensuring the full functioning of the Northern Sea Route.

## References

1. Glushko E. K. *Administrativnye rezhimy territoriy: monografiya* [Administrative Regimes of Territories]. Moscow, TEIS Publ., 2017, 128 p. (In Russ.)
2. Chistobaev A.I., Malinin P.Yu. Arkticheskaya zona Rossiyskoy Federatsii kak osoby ob"ekt gosudarstvennogo upravleniya [Arctic Zone of the Russian Federation as Special Object of Public Administration]. *Regional'nye issledovaniya* [Regional Research], 2016, no. 2 (52), pp. 122–128.
3. Shapovalova D., Galimullin E., Grushevenko E. Russian Arctic Offshore Petroleum Governance: The Effects of Western Sanctions and Outlook for Northern Development. *Energy Policy*, 2020, vol. 146, 111753. DOI: 10.1016/j.enpol.2020.111753
4. Kozyrin A.N. *Gosudarstvenno-pravovoy mekhanizm tamozhennoy politiki zarubezhnykh stran* [State-Legal Mechanism of Customs Policy of Foreign Countries]. Moscow, MGIMO Publ., 1994, 145 p. (In Russ.)
5. Vopilovskiy S.S. Foreign Economic Partners of Russia in the Arctic Zone. *Arktika i Sever* [Arctic and North], 2022, no. 46, pp. 33–50. DOI: 10.37482/issn2221-2698.2022.46.33
6. Agamagomedova S.A. Vidy tamozhennogo kontrolya: ponyatie i kriterii klassifikatsii [Types of Customs Control: Notion and Classification Criteria]. *Tamozhennoe delo* [Customs Business], 2016, no. 3, pp. 3–7.
7. Vaypan V.A. *Teoriya spravedlivosti: Pravo i ekonomika: monografiya* [Theory of Justice: Law and Economics]. Moscow, Yustitsinform Publ., 2017, 280 p. (In Russ.)
8. Zvorykina Yu.V., Teteryatnikov K.S. Severnyy morskoy put' kak instrument osvoeniya Arktiki [The Northern Sea Route as a Tool of Arctic Development]. *Rossiyskiy ekonomicheskiy zhurnal* [Russian Economic Journal], 2019, no. 4, pp. 21–44. DOI: 10.33983/0130-9757-2019-4-21-44
9. Khabrieva T.Ya., ed. *Arkticheskoe pravo: kontseptsiya razvitiya: monografiya* [Arctic Law: Conception of the Development]. Moscow, Yurisprudentsiya Publ., 2014, 152 p. (In Russ.)
10. Zaykov K.S., Maksimov A.M., Tamitskiy A.M., Troshina T.I. Ethnosocial Situation in Arctic Regions of Russia and the State National Policy. *Polis. Political Studies*, 2018, no. 2, pp. 57–67. DOI: 10.17976/jpps/2018.02.05
11. Zellen B.S. Russia's Arctic Strategy: Ambitions and Restraints. In: *The Fast-Changing Arctic: Rethinking Arctic Security for a Warmer World*. University of Calgary Press, 2013. DOI: 10.2307/j.ctv6gqr43.16

*The article was submitted 12.02.2023; approved after reviewing 27.02.2023;  
accepted for publication 02.03.2023*

*The author declares no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 14–26.

Original article

UDC [621.548+697.34](470.21)(045)

doi: 10.37482/issn2221-2698.2023.52.17

## Improving the Efficiency of Heat Supply Systems in the Arctic Zone of the Russian Federation Through the Use of Wind Power Plants (The Case of the Murmansk Oblast)

**Aleksey V. Bezhan**<sup>1</sup>✉, Researcher

<sup>1</sup> Northern Energetics Research Centre — Branch of the Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”, ul. Fersmana, 14, Apatity, Russia

<sup>1</sup> a.bezhan@ksc.ru ✉, ORCID: <https://orcid.org/0000-0002-4602-5161>

**Abstract.** The successful development of the Arctic zone of the Russian Federation is directly related to the reliable and efficient operation of local heat supply systems, including those with minimal anthropogenic impact on the environment. Today, the Arctic zone of the Russian Federation uses mainly imported fossil fuels for heat generation, most of which (with the exception of coal and wood in some places) are delivered from other regions of Russia, which is associated with great financial difficulties and complicated logistics of fuel delivery to consumers. On the example of Teriberka settlement, located in the Murmansk region on the coast of the Barents Sea, it is shown that one of the solutions to these problems can be the use of wind turbines for heat supply needs together with the local boiler house, operating on organic fuel. The main effect from the use of wind power plants is expressed in the reduction of the boiler house participation in covering the heating load schedule of Teriberka settlement by 75–80% and, accordingly, by the same amount in saving fossil fuel consumed at the boiler house, as well as in reducing the negative impact on the natural environment.

**Keywords:** *Arctic zone of the Russian Federation, renewable energy source, wind energy, heat supply, boiler house, low-carbon development, Arctic region*

### Introduction

The Arctic region is an important geopolitical and strategic area that attracts the interests not only of the Arctic states, but also of many other countries. First of all, this is due to the possibility of developing natural resources, which are abundant in the Arctic. According to a study [1], published in the journal “Science”, the Arctic region contains 83 billion barrels of oil, which is equivalent to 13% of the world’s undiscovered reserves. In turn, there are about 1550 trillion m<sup>3</sup> of natural gas reserves in the region. Most of the undiscovered oil reserves are off the coast of Alaska, and almost all natural gas reserves are located off the coast of Russia [2]. Along with this, the Arctic region plays an important role in the implementation of large-scale transportation [3; 4].

The Arctic zone occupies about 1/3 of the territory of Russia. The land part of the Arctic zone of the Russian Federation (AZRF) includes all Russian lands and islands located in the Arctic Ocean, as well as several subjects of the Russian Federation (fully or partially), including the Murmansk Oblast. Most of the territory of the Murmansk Oblast is located north of the Arctic

---

\* © Bezhan A.V., 2023

For citation: Bezhan A.V. Improving the Efficiency of Heat Supply Systems in the Arctic Zone of the Russian Federation Through the Use of Wind Power Plants (The Case of the Murmansk Oblast). *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 17–31. DOI: 10.37482/issn2221-2698.2023.52.17

Circle, so the climate here is severe subarctic, the main feature of which is long winters and short cold summers. The duration of the heating period in the region is about 8–9 months, and it can reach 12 months in some areas, which is the reason for the increased demand for thermal energy. In this regard, reliable and uninterrupted operation of heat supply systems is a mandatory requirement for the long-term existence and sustainable development of the region.

The Murmansk Oblast does not have its own sources of fossil fuels (coal, gas, oil), therefore, for the production of heat energy, fuel imported from other regions of Russia, significantly distant from the Murmansk Oblast, is mainly used. Let us refer to Fig. 1, which shows the structure of fuel and energy resources consumption for the purposes of heat generation by thermal power plants and boiler houses of the Murmansk Oblast. It can be seen that fuel oil and coal are predominantly used for heat energy generation, less frequently wood and electricity are used for direct water heating. The dependence of the Murmansk Oblast on fuel oil and coal supplies creates a risk for reliable and uninterrupted operation of heat supply systems.

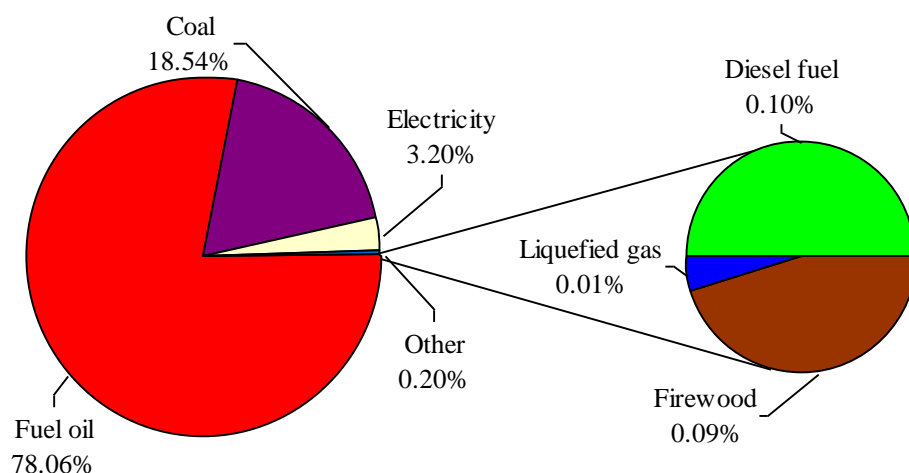


Fig. 1. Structure of fuel and energy resources consumption for heat generation in the Murmansk Oblast.

The remoteness of the Murmansk Oblast from the places of fossil fuel production and the system of market pricing for fuel cause increased costs for fuel purchase and its delivery. This leads to the fact that the cost of heat energy is higher than the tariff at which organizations are obliged to supply it to consumers. As a result, the activities of most heat supply organizations in the Murmansk Oblast are unprofitable, and therefore, the state has to subsidize the purchase of fuel and its delivery to the territory of the Oblast in order to compensate for the lost income. One of the ways out in this situation can be the maximum use of local renewable energy sources (RES) together with traditional heat sources for heat supply needs. RES can reduce the participation of traditional heat sources in heat supply, and thereby save imported fossil fuel.

Of all the RES available in the Murmansk Oblast, wind energy has the greatest prospects for widespread development, where a separate direction of its use can be the use of wind power plants (WPP) together with boiler houses. The feasibility of using WPP for heat supply needs in specific areas and conditions should be confirmed by modern technical and economic calculations and analysis of the efficiency indicators. Many studies have been devoted to the study of these

issues, but all of them are mainly related to the analysis of hybrid energy systems, consisting, as a rule, of photovoltaic elements and WPP operating for power supply needs [5; 6]. At the same time, some studies still address the issues of heat supply from WPP, but heat and electric loads are considered together [7; 8]. Thus, the analysis of these and other similar studies has shown a lack of information on the efficiency of using WPP for heat supply, which could indicate that such use of wind turbines may be appropriate for some areas. In this regard, it seems important to assess the possible participation of WPP in the heat supply to consumers and the effect that can be obtained from the use of WPP together with boiler houses for heat supply needs.

### ***Wind potential in the Murmansk Oblast and factors enabling its use for heat supply needs***

A series of studies [9; 10] have been carried out earlier for preliminary assessment of the prospects of using WPP for heat supply needs in the Murmansk Oblast, the results of which indicate a high wind energy potential, characterized by an average annual wind speed at a height of 10 meters from the ground surface of 5–6 m/s on the White Sea coast and 7–9 m/s on the Barents Sea coast. At the same time, an important feature of the annual wind cycle was established — the highest wind speeds in the cold season (Fig. 2), when there is a winter maximum consumption of thermal energy. Thus, the high wind potential, combined with a long heating period, which is 8–9 months a year or more in the Murmansk Oblast, is a favorable prerequisite for the efficient use of wind energy for heat supply needs.

It should be noted that the power generated by WPP is highly dependent on wind speed, which has such a disadvantage as variability over time. Therefore, in order to provide consumers with electricity of the required quality, wind turbines are supplemented with special converting devices, as well as with complex mechanical and electronic control systems that ensure the generation of electricity from high-quality wind turbines in a continuous mode [11; 12]. In the case of using wind energy for heat supply needs, high requirements to the quality of energy produced by WPP are not necessary. This circumstance can be explained by the fact that short-term second and minute fluctuations of the power produced by wind turbines are smoothed out by the coolant itself, as well as by the inertia of heat supply systems. Longer fluctuations (over several hours) are leveled off due to the heat storage capacity of heated buildings. During a long absence of wind, heat accumulators or duplicating traditional fossil fuel heat sources can be used. Thus, low requirements to the quality parameters of the energy generated by wind turbines make it possible to use WPP built in a simple design, making them cheaper and more reliable in operation.

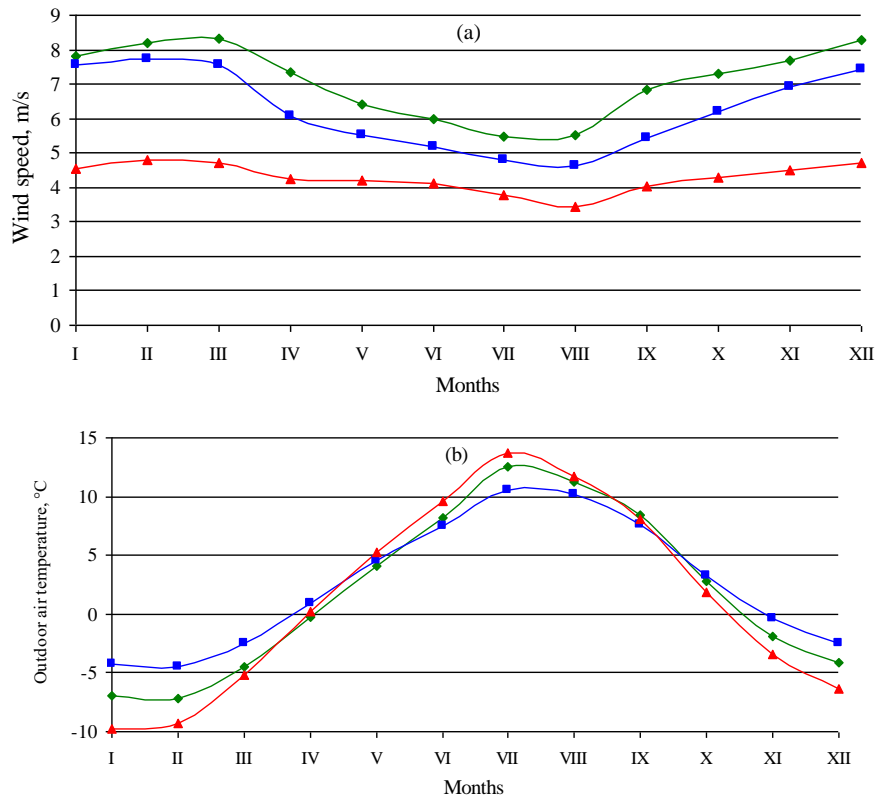


Fig. 2. The annual course of long-term average monthly wind speeds (a) and the change in long-term average monthly values of outdoor air temperature (b) in the twenty-year period 2001–2020: green, blue, and red curves are weather stations Teriberka, Vayda-Guba, and Murmansk, respectively.

### Research methods and materials

Modern centralized heat supply systems are a complex set of various elements, the main of them are sources (thermal power plants or boiler houses) and consumers (complex of heated buildings) of heat energy, interconnected by heat networks. The scheme of a heat supply system, which includes a boiler room, looks as shown in fig. 3a. The main purpose of such a heat supply system is the transfer of thermal energy from the boiler house to heated buildings in order to cover their thermal (heating) load. In this case, the heating load of a particular district or an entire settlement, covered by a boiler house during the day, can be determined by the following formula:

$$Q_0 = Q_{kom} = (Q_{kom}^{max} \cdot k_v \cdot (T_e - T_h)) / (k_{v,p} \cdot (T_e - T_{h,p})), \quad (1)$$

where  $Q_{kom}$  — power output of the boiler house during the day, Gcal/h (MW);  $Q_{kom}^{max}$  — estimated connected load of the boiler house, Gcal/h (MW);  $T_e = 18^\circ\text{C}$  (internal air temperature for residential, administrative and public buildings<sup>1</sup> [13]);  $v$  and  $T_h$  — average daily values of wind speed and outdoor air temperature, for which it is required to determine the heating load, m/s and  $^\circ\text{C}$ ;  $k_v$  — coefficient of heat loss increase from wind speed, units. (Fig. 4);  $T_{h,p}$  — estimated outdoor air temperature of the coldest five-day period of eight winters during the fifty-

<sup>1</sup> SNiP 41-01-2003 Otoplenie, ventilyatsiya i konditsionirovanie [SNiP 41-01-2003 Heating, ventilation and air conditioning]. Moscow, State Unitary Enterprise Gosstroy of Russia, 2004, 64 p.

year period<sup>2</sup>;  $v_p$  — estimated wind speed, defined as the maximum of the average wind speeds by rhumb lines for January<sup>3</sup>;  $k_{v_p}$  — coefficient of heat loss increase from the calculated wind speed (Fig. 4).

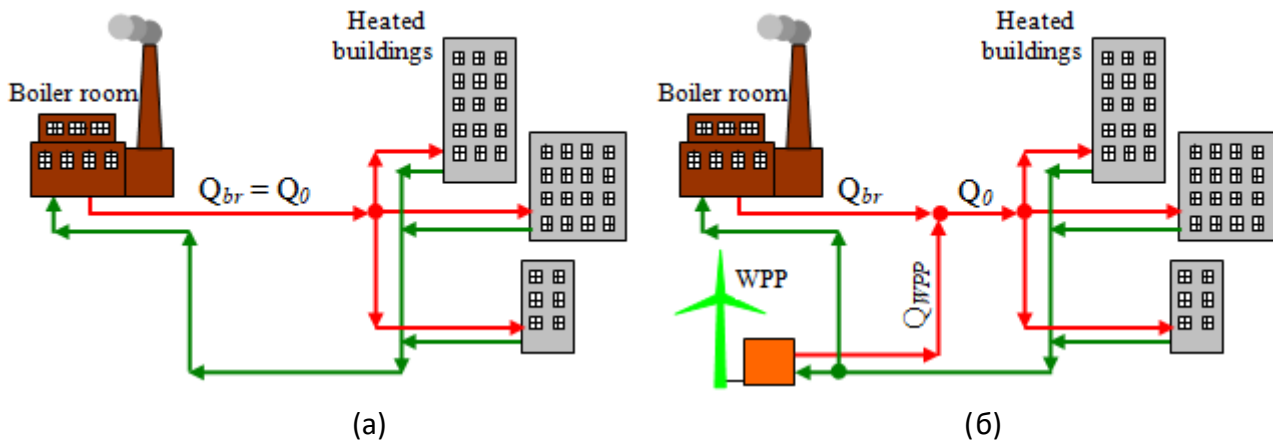


Fig. 3. Scheme of the heat supply system based on the boiler house (a) and the “boiler house + WPP” complex (b).

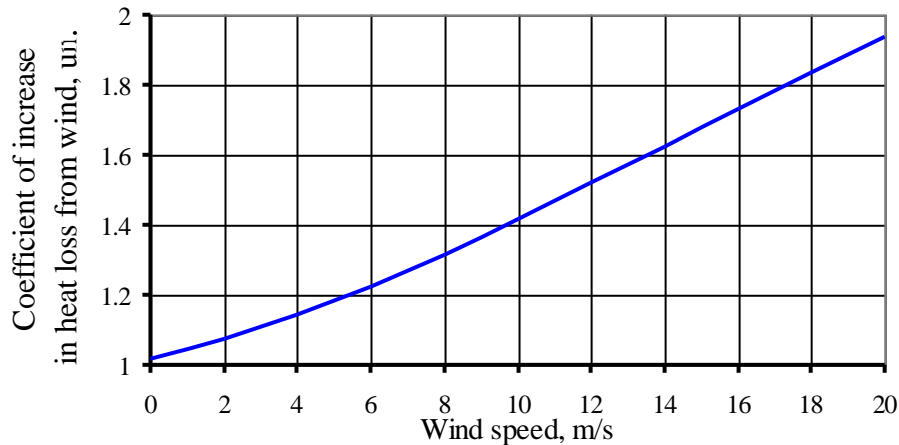


Fig. 4. Relative increase in building heat loss from wind speed [4].

The variation of the heating load during the whole heating period can be represented in the form of a graph of the annual duration of heating loads. Knowing how the average daily outdoor temperature and wind speed change during the entire heating period, using formula (1), it is possible to calculate and build the annual heating load schedule covered by the boiler house. In this case, the data of the archive of long-term meteorological observations of the outdoor air temperature and wind speed, which are contained in the specialized databases “RIHMI-WDC”, “Weather of Russia”, “Weather Schedule” and others, can be used as initial information.

<sup>2</sup> Svod pravil SP 131.13330.2020 «SNiP 23-01-99\* Stroitel'naya klimatologiya» (utv. prikazom Ministerstva stroitel'stva i zhilishchno-kommunal'nogo khozyaystva RF ot 24 dekabrya 2020 g. № 859/pr) [Set of rules SP 131.13330.2020 “SNiP 23-01-99\* Construction climatology” (approved by order of the Ministry of Construction and Housing and Communal Services of the Russian Federation dated December 24, 2020 No. 859/pr)]. URL: <https://docs.cntd.ru/document/573659358?ysclid=lcyv8xyi4b206024744> (accessed 20 January 2023).

<sup>3</sup> Ibid.



Let us introduce the parameter  $\varphi$ , which will indicate the share of participation of boiler house in covering the heating load schedule. If heat supply is carried out from one boiler house (Fig. 3a), then  $\varphi = 1$ .

To increase the efficiency of the heat supply system, it is possible to use a combined heat and power plant as an additional source of heat energy together with a boiler house. In this case, the scheme of the heat supply system, originally presented in Fig. 3a, will now look like the one shown in Fig. 3b. In this option of heat supply, part of the heating load schedule will be covered by the WPP as a priority, and the rest — by the boiler house. Then the formula that determines the value of the heating load can be written as following:

$$Q_0 = Q_{kom} + Q_{B\partial Y} - Q_{B\partial Y}^{u\beta\delta} = (Q_{kom}^{max} \cdot k_v \cdot (T_e - T_n)) / (k_{v_p} \cdot (T_e - T_{n,p})), \quad (2)$$

where  $Q_{B\partial Y}$  — power produced by the wind turbine, Gcal/h (MW);  $Q_{B\partial Y}^{u\beta\delta}$  — wind turbine excess capacity, Gcal/h (MW).

To calculate the power output of a wind turbine, it is necessary to know the average wind speed for a 10-minute time interval at the height of the tower in the selected area of the wind turbine location and the operating characteristic of the WPP. The values of the average wind speed for a 10-minute time interval are obtained using measurements of meteorological instruments installed at a certain height (in our case, at the height of the wind turbine tower) on the meteorological mast.

Formula (2) characterizes the process in which the share of boiler house participation in covering the heating load schedule  $\varphi$  is less than 1. At the same time, the smaller  $\varphi$  is, the greater the effect of the use of wind turbines for heat supply needs is achieved. If we denote that  $Q_{B\partial Y} / Q_0$  is the share of participation of the wind turbine in covering the heating load for a 10-minute time interval, then  $\varphi = 1 - Q_{B\partial Y} / Q_0$  is the share of participation of the boiler house in covering the heating load in the joint operation of the boiler house and the wind turbine also for a 10-minute time interval.

To calculate  $\varphi$  for a longer time period, for a month or a year, the following formula can be used:

$$\varphi_m = 1 - \left[ \left( \sum_{j=1}^m \sum_{i=1}^n Q_{B\partial Yji} \right) / \left( \sum_{j=1}^m Q_{0j} \right) \right], \quad (3)$$

where  $j=1, 2, \dots, m$  — the number of the day, units;  $m$  — the number of days for which it is necessary to determine  $\varphi$ , units;  $i=1, 2, \dots, n$  — the number of the 10-minute time interval, units;  $n$  — the number of 10-minute time intervals in  $m$ , units. For example, at  $m=31$ , i.e. for a month with 31 days,  $n=4464$ , and for a year with 365 days,  $n=52560$ .

In more detail, the operation of a wind turbine together with a boiler house can be explained as follows:

1. If  $Q_{BЭY} \geq Q_0$ , then the wind turbine is able to fully cover the heating load schedule and the participation of the boiler house is not required ( $Q_{ком} = 0$ ,  $\varphi = 0$ ). At the same time, during periods with strong wind ( $Q_{BЭY} > Q_0$ ), the wind turbine can create excess power  $Q_{BЭY}^{изб}$ , which can be stored in a heat accumulator in the form of hot water or dissipated into the environment. But this is the subject of a separate study and will not be considered in this article.

2. If  $Q_{BЭY} < Q_0$ , then the power of the wind turbine is not enough to cover the heating load schedule and the boiler house supplements the work of the wind turbine ( $0 < \varphi < 1$ , where  $\varphi = 1 - Q_{BЭY} / Q_0$ ).

3. If  $Q_{BЭY} = 0$ , then this corresponds to periods of cold low-wind weather, when the entire heating load falls on the boiler house ( $\varphi = 1$ ).

### **Research results**

One of the consumers experiencing difficulties with heat supply is the village of Teriberka (Teriberka settlement). It is a settlement in the Murmansk Oblast on the coast of the Barents Sea. The village is centrally supplied with heat from an oil-fueled boiler house with a maximum connected load of 1.8 Gcal/h (2.1 MW). The heat supply scheme is two-pipe with heat supply for heating. Hot water supply is provided by water heaters in apartments.

On the example of this settlement, a series of calculations was carried out to assess the possible using of wind turbines together with the local boiler house in the heat supply of the village and the effect that can be obtained from the use of WPP. During the calculations, it was assumed that heat losses in pipelines of the heating network and heating systems of buildings, as well as energy losses during its transmission from wind turbines, will not be taken into account. The calculations were carried out in two stages.

At the first stage, according to the data of meteorological observations of the outdoor air temperature and wind speed, carried out in Teriberka in the period from 2019 to 2021 (Fig. 5), using the formula (1), the values of the heating load covered by the boiler house were calculated. The parameters included in formula (1) were taken as follows:  $Q_{ком}^{max} = 2.1$  MW;  $T_{г} = 18^\circ\text{C}$ ;  $T_{н.р} = -21^\circ\text{C}$ ;  $k_{v_p} = 1.46$ , which corresponds to  $v_p = 10.9$  m/s (Fig. 4). The results of such calculations are shown in Fig. 6 in the form of annual heating load curves. The figure shows that the heat demand varies significantly during the heating period. This is mainly due to changes in heat loss to the environment, resulting from fluctuations in outdoor temperature and wind speed.

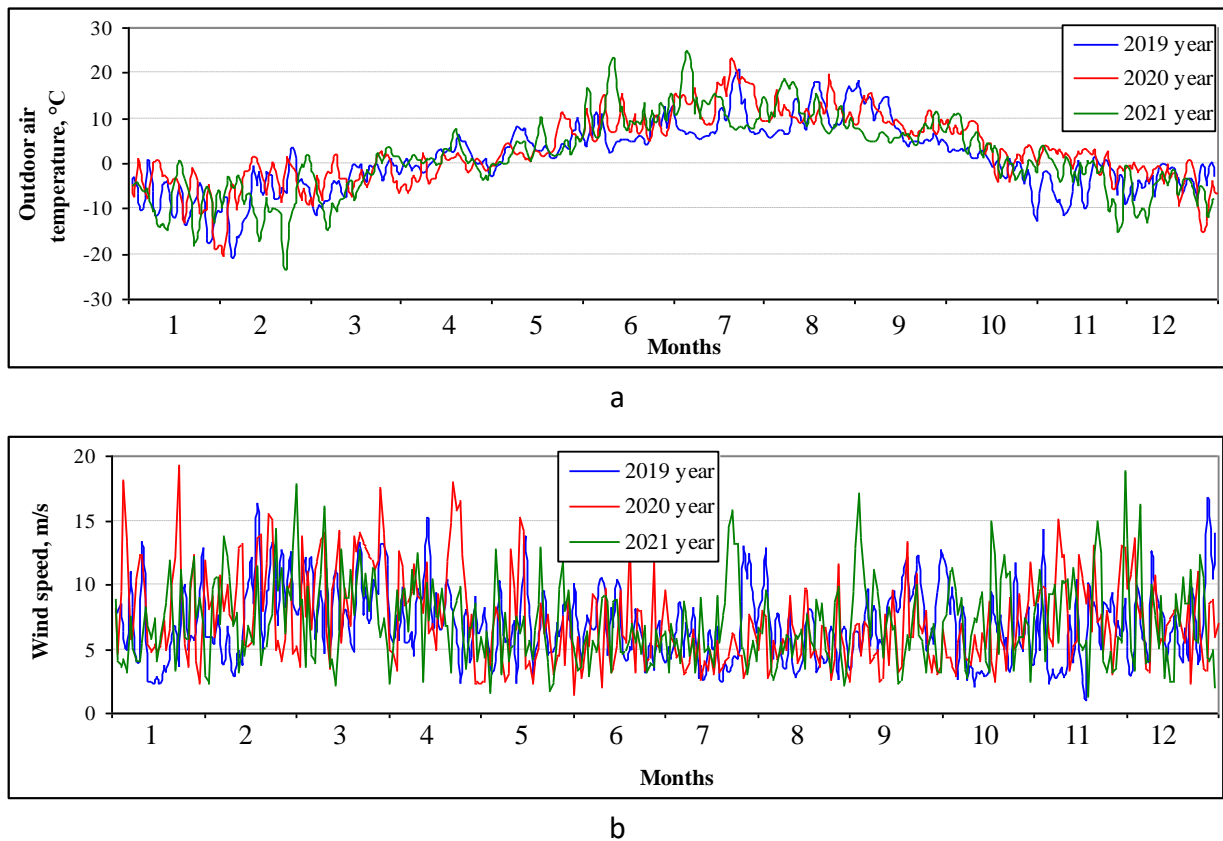


Fig. 5. Graphs of changes in the average daily values of outdoor air temperature (a) and wind speed (b) in Teriberka for the period from 2019 to 2021.

To improve the efficiency of the heat supply system in Teriberka, it is proposed to use two Vestas V52/850 wind turbines with a total capacity of 1.7 MW (81% of the connected load of the boiler house) and a tower height of 65 m together with the boiler house. To calculate the power output of the wind turbines, the average 10-minute wind speed values for a three-year period (from 2019 to 2021), measured at a height of 65 metres near Teriberka, were used. The operating characteristic of the wind turbine is shown in fig. 7. Based on these data, annual graphs of the change in the power output of wind turbines were built, and together with them, using formula (2), the possible participation of wind turbines in covering the heating load schedules of Teriberka, originally shown in fig. 6. These constructions are presented in fig. 8. It shows that when the boiler house and the wind turbine work together, the main part of the heating load is covered by the wind turbine (Fig. 8, blue area), and the rest — by the boiler house (Fig. 8, red area), supplementing the work of the wind turbine during periods with little or no wind. When the value of wind turbine power exceeds the hourly demand of all heated buildings in thermal energy, excess WPP power is generated (Fig. 8, grey area).

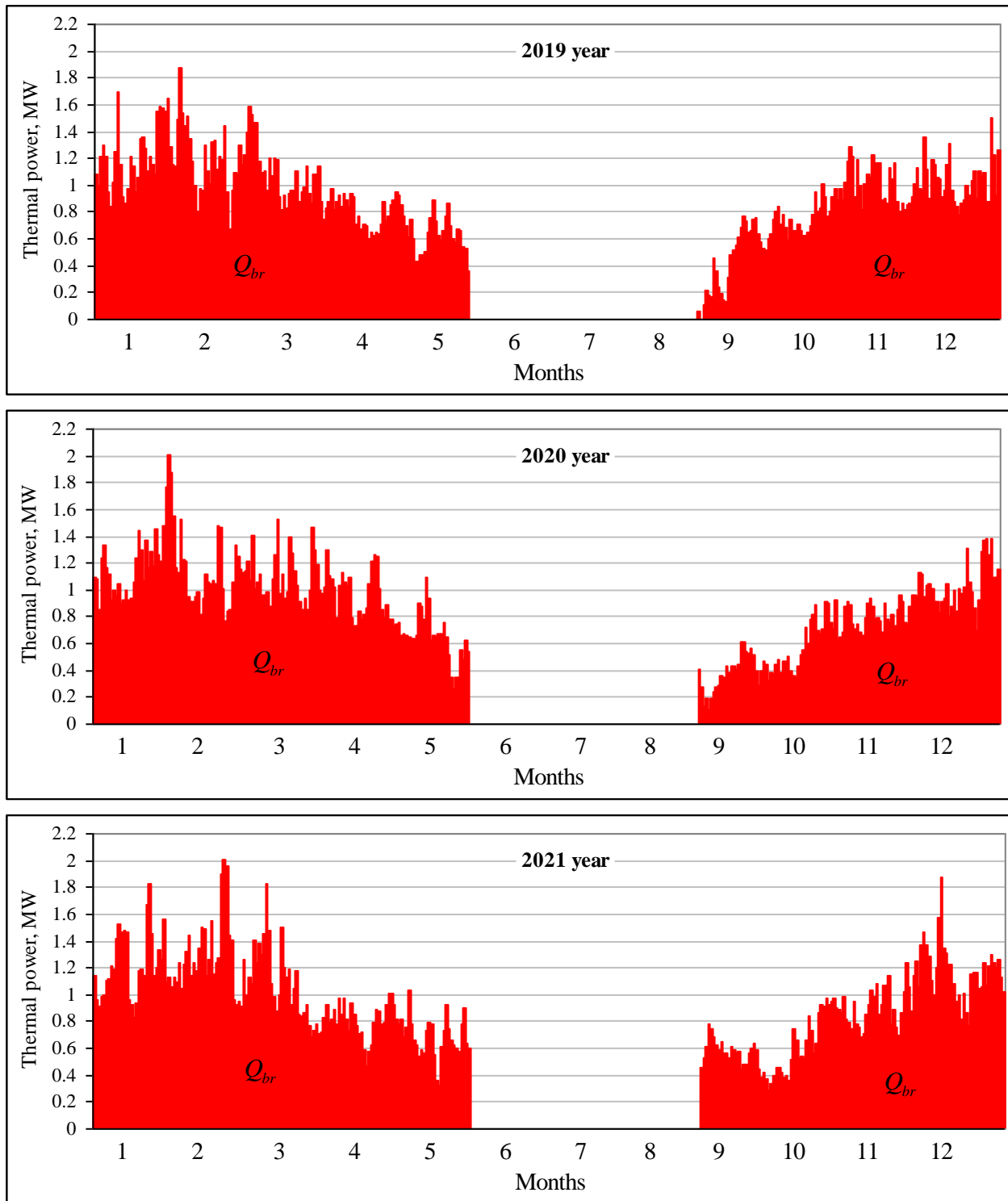


Fig. 6. Annual schedules of the heating load in Teriberka, covered by the boiler house.

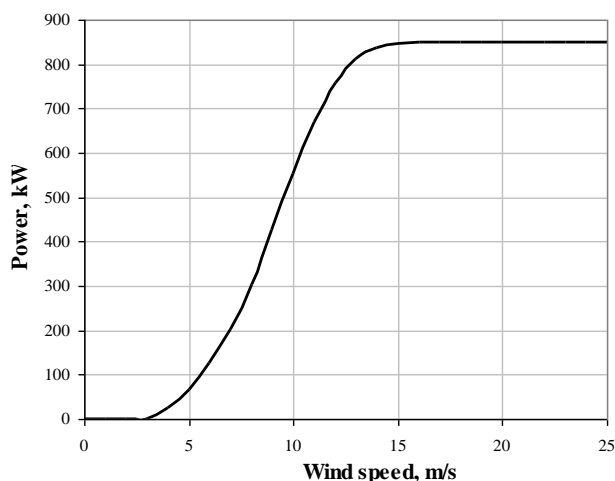


Fig. 7. Operating characteristic of Vestas V52/850 wind turbine.

At the second stage, according to the data, the effect that can be obtained from the use of wind turbines for the needs of heat supply in Teriberka was determined. As mentioned earlier, the main effect of the use of WPP can be shown as a decrease in the share of the boiler house in covering the heating load schedule. For this purpose, the values of the boiler house share in the heating load coverage were calculated using formula (3) for the joint operation of the boiler house and wind turbines for each month and for the whole year. The results of such calculations are presented in the form of a diagram in fig. 9, which shows that wind turbines are able to reduce the participation of the boiler house in covering the heating load schedule of the village of Teriberka by 60–90% in certain months, and by about 75–80% in general for the year, as well as to ensure fuel (fuel oil) economy by the same amount consumed in the boiler house. In physical terms, this is equivalent to a decrease in thermal energy generation of the boiler house by 3.88 thousand Gcal (4507.5 MWh) in 2019, by 4.0 thousand Gcal (4647.9 MWh) in 2020 and by 4.01 thousand Gcal (4667.7 MWh) in 2021. Taking into account that the weighted average standard of specific fuel consumption for the production of thermal energy and the weighted average efficiency of the boiler units of the fuel oil boiler house in Teriberka are 210.19 kg of reference fuel/Gcal and 67.97%, respectively, then with such indicators of the boiler house, the volume of saved fuel (fuel oil) will amount to 0.57 thousand tons of fuel per year on average.

When burning fuel oil in the amount of 1 ton, 2.27 tons of carbon dioxide are emitted<sup>4</sup>. Consequently, with an annual saving of fuel oil in the amount of 0.57 thousand tons of fuel equivalent, carbon dioxide emissions will decrease by 1.29 thousand tons per year, which will contribute to improving the environmental situation in Teriberka and preserving the health of the local population. Reduction in carbon dioxide emissions will generate additional revenue in the

<sup>4</sup> Prikaz Ministerstva prirodnykh resursov i ekologii Rossiyskoy Federatsii ot 30.06.2015 goda № 300 «Ob utverzhdenii metodicheskikh ukazaniy i rukovodstva po kolichestvennomu opredeleniyu ob"ema vybrosov parnikovyykh gazov organizatsiyami, osushchestvlyayushchimi khozyaystvennyuyu i inuyu deyatel'nost' v Rossiyskoy Federatsii» [Order of the Ministry of Natural Resources and Ecology of the Russian Federation dated June 30, 2015 No. 300 “On approval of methodological instructions and guidelines for the quantitative determination of the volume of greenhouse gas emissions by organizations carrying out economic and other activities in the Russian Federation”]. URL: <https://docs.cntd.ru/document/420287801> (accessed 21 January 2023).

future. This will be possible due to the implementation of the Strategy for the socio-economic development of the Russian Federation with low greenhouse gas emissions up to 2050, which will allow the sale of greenhouse gas emission quotas to companies that have not implemented emission reduction projects at their facilities. This circumstance increases the effect of using wind power plants for heat supply.

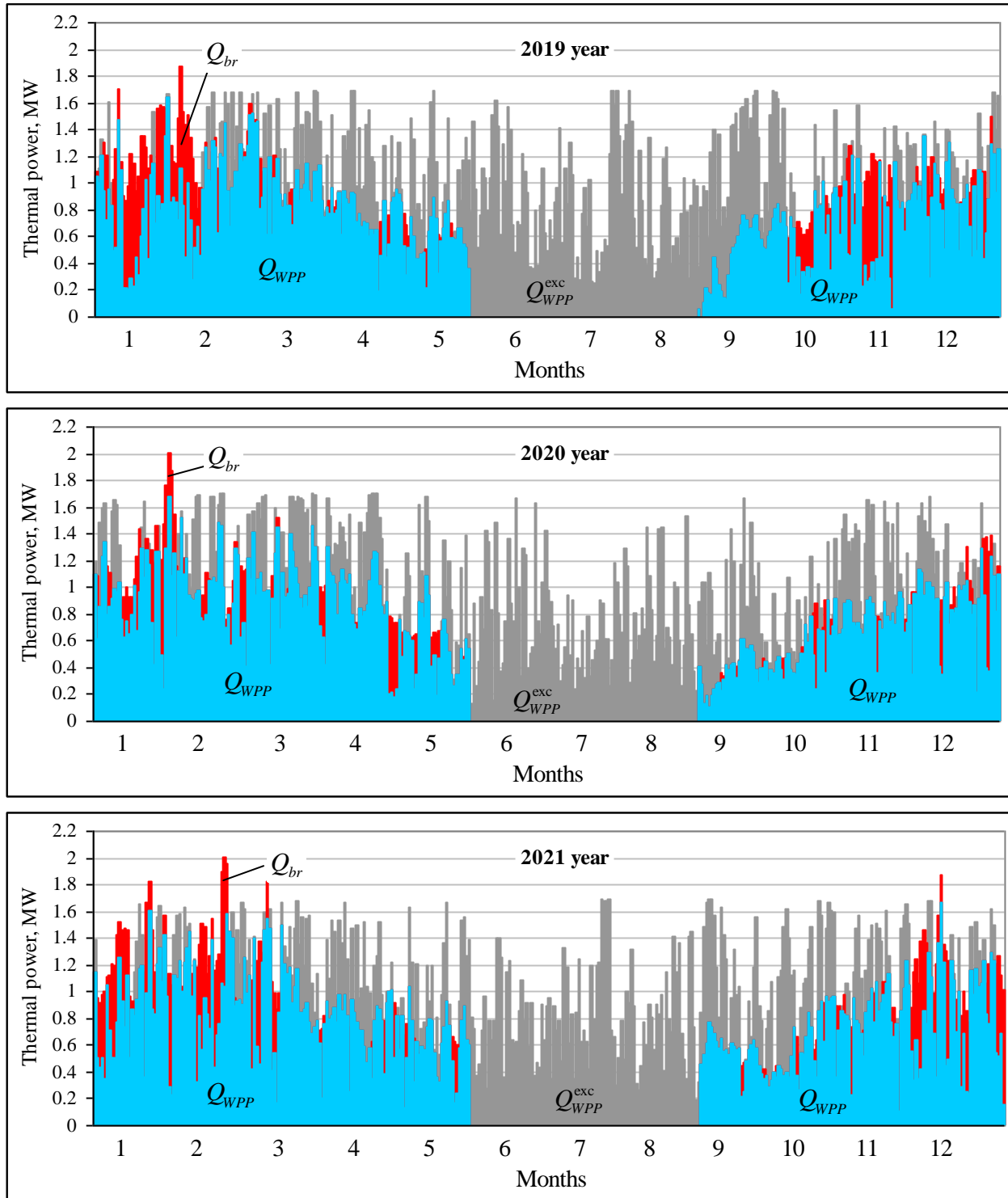


Fig. 8. Combined operation of the boiler house and wind turbines to cover the heating load schedules of Teriberka: areas of blue and red colors are the power output of the wind turbine and boiler house, respectively; the grey area is the excess capacity of the wind turbine.

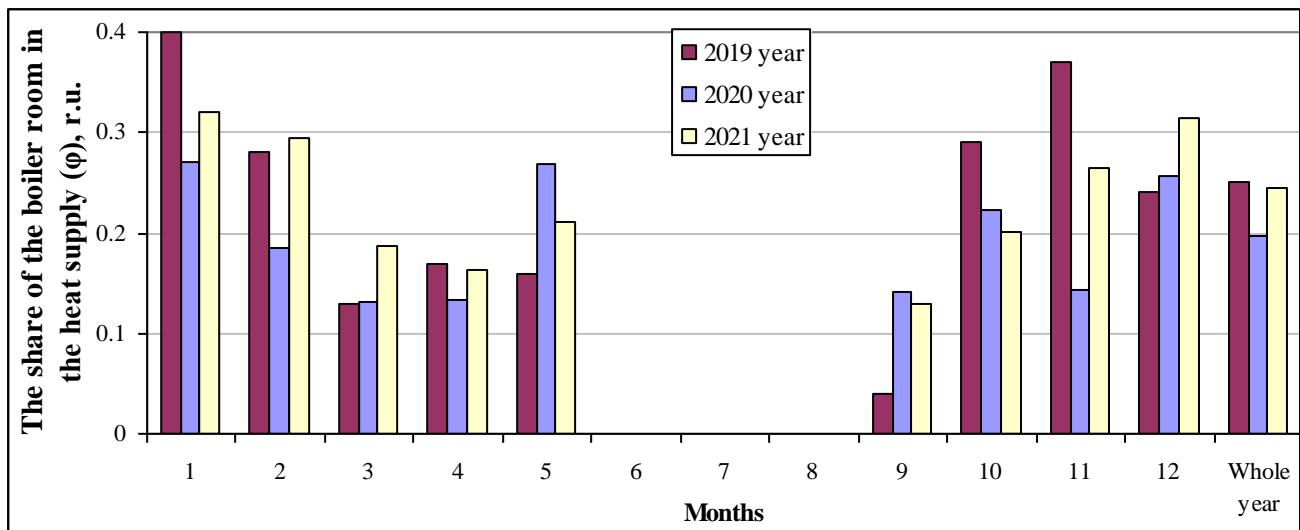


Fig. 9. Share of boiler house participation in covering the heating load in Teriberka in combined operation of the boiler house and wind turbines for heat supply needs.

### Conclusion

In areas of the Arctic zone of the Russian Federation with a high wind potential to improve the efficiency of local heat supply systems, it is possible to use wind power plants together with traditional heat sources operating on fossil fuels for heat supply needs. In this case, the main effect of using wind turbines is to reduce the participation of traditional heat sources in the heat supply of consumers and, as a consequence, to save fossil fuels, as well as to reduce the negative impact on the environment.

On the example of Teriberka settlement, located in Murmansk Oblast in the area with average annual wind speed at the height of 10 meters from the ground surface of 7 m/s and heating season of 9 months, the work of two wind turbines with total capacity of 1.7 MW together with the local boiler house to cover the heating load schedule of this settlement is shown. The efficiency of wind turbines was assessed, which showed that use of WPPs can reduce the participation of the boiler house in covering the heating load of the village of Teriberka and thereby ensure savings in fossil fuel consumed by the boiler house by 75–80%, as well as reduce the harmful emissions of the boiler house by the same amount. In future, this will generate additional income from the sale of greenhouse gas emission quotas to companies that have not implemented emission reduction projects at their facilities.

In general, the use of wind energy in heat generation technologies for heat supply to consumers located in the regions of the Arctic zone of the Russian Federation is of great socio-economic importance for the further development and successful exploration of these areas. First of all, it is associated with the possibility of increasing the efficiency and reliability of local heat supply systems, which becomes possible due to the substitution of heat energy obtained from the combustion of fossil fuels with the energy produced by wind turbines, and, as a consequence, due to the reduced dependence on fossil fuel supplies. In turn, this will minimize the problems of fossil



fuel delivery to the Russian Arctic regions and reduce state subsidies for its purchase, which is especially important due to the current difficult economic conditions in the country.

## References

1. Gautier D.L., Bird K.J., Charpentier R.R., Grantz A., Houseknecht D.W., Klett T.R. et al. Assessment of Undiscovered Oil and Gas in the Arctic. *Science*, 2009, vol. 324 (5931), pp. 1175–1179. DOI: 10.1126/science.1169467
2. Melamed I.I., Avdeev M.A., Pavlenko V.I., Kutsenko S.Ju. Arkticheskaya zona Rossii v sotsial'no-ekonomicheskom razvitii strany [The Arctic Zone of Russia in the Context of the Socio-Economic Development of the Country]. *Vlast'* [The Authority], 2015, vol. 23, no. 1, pp. 5–11.
3. Osipova E.E., Smirnov S.V., Khairova T.A. Preconditions for the Development of Russian Arctic Export, Coastal (Cabotage) Transportation and Project Cargo for the Arctic Demand. *Arktika i Sever* [Arctic and North], 2019, no. 37, pp. 5–21. DOI: 10.17238/issn2221-2698.2019.37.5
4. Serova N.A., Serova V.A. Critical Tendencies of the Transport Infrastructure Development in the Russian Arctic. *Arktika i Sever* [Arctic and North], 2019, no. 36, pp. 42–56. DOI: 10.17238/issn2221-2698.2019.36.42
5. Celik A. Optimisation and Techno-Economic Analysis of Autonomous Photovoltaic–Wind Hybrid Energy Systems in Comparison to Single Photovoltaic and Wind Systems. *Energy Conversion and Management*, 2002, vol. 43, iss. 18, pp. 2453–2468. DOI: 10.1016/s0196-8904(01)00198-4
6. Mamaghani A.H., Avella S., Najafi B., Shirazi A., Rinaldi F. Techno-Economic Feasibility of Photovoltaic, Wind, Diesel and Hybrid Electrification Systems for Off-Grid Rural Electrification in Colombia. *Renewable Energy*, 2016, vol. 97, pp. 293–305. DOI: 10.1016/j.renene.2016.05.086
7. Sagani A., Vrettakos G., Dedoussis V. Viability Assessment of a Combined Hybrid Electricity and Heat System for Remote Household Applications. *Solar Energy*, 2017, vol. 151, pp. 33–47. DOI: 10.1016/j.solener.2017.05.011
8. Ozgener O. Use of Solar Assisted Geothermal Heat Pump and Small Wind Turbine Systems for Heating Agricultural and Residential Buildings. *Energy*, 2010, vol. 35, iss. 1, pp. 262–268. DOI: 10.1016/j.energy.2009.09.018
9. Minin V.A., Dmitriev G.S., Ivanova E.A., Moroshkina T.N., Nikiforova G.V., Bezhan A.V. *Energiya vetra — perspektivnyy vozobnovlyаемyy energoresurs Murmanskoy oblasti* [Wind Energy as a Promising Renewable Energy Resource of the Murmansk Region]. Apatity, KSC RAS Publ., 2006, 73 p. (In Russ.)
10. Minin V.A., Bezhan A.V. *Perspektivy ispol'zovaniya energii vetra dlya teplosnabzheniya potrebiteley evropeyskogo Severa* [Prospects for the Use of Wind Energy for Heat Supply to Consumers in the European North]. Apatity, KSC RAN Publ., 2009, 56 p. (In Russ.)
11. Gupta A., Dr. Shandilya A. Challenges of Integration of Wind Power on Power System Grid: A Review. *International Journal of Emerging Technology and Advanced Engineering*, 2014, vol. 4, iss. 4, pp. 880–884.
12. De Alegria I.M., Andreu J., Martin J.L., Ibañez P., Villate J.L., Camblong H. Connection Requirements for Wind Farms: A Survey on Technical Requirements and Regulation. *Renewable and Sustainable Energy Reviews*, 2007, vol. 11 (8), pp. 1858–1872. DOI: 10.1016/j.rser.2006.01.008
13. *Metodika opredeleniya potrebnosti v toplive, elektricheskoy energii i vode pri proizvodstve i peredache teplovoy energii i teplonositeley v sistemakh kommunal'nogo teplosnabzheniya* [Methodology for Determining the Need for Fuel, Electric Energy and Water in the Production and Transmission of Thermal Energy and Heat Carriers in Municipal Heat Supply Systems]. Moscow, FSUE “Center For Design Products” Publ., 2004, 76 p. (In Russ.)

*The article was submitted 25.01.2023; approved after reviewing 01.02.2023; accepted for publication 06.02.2023*

*The author declares no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 27–37.

Original article

UDC [338.5+338.439.52](98)(045)

doi: 10.37482/issn2221-2698.2023.52.32

## Is It Possible to Change Arctic Fish Pricing?

**Anatoliy M. Vasilyev**<sup>1✉</sup>, Dr. Sci. (Econ.), Professor, Chief Researcher

**Evgeniya A. Lisunova**<sup>2</sup>, Researcher

<sup>1,2</sup>Luzin Institute for Economic Studies — Subdivision of the Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”, ul. Fersmana, 24a, Apatity, Russia

<sup>1</sup>vasiliev@pgi.ru ✉, ORCID: <https://orcid.org/0000-0001-8626-9980>

<sup>2</sup>eliskavav@yandex.ru, ORCID: <https://orcid.org/0000-0001-5908-8471>

**Abstract.** The purpose of the article is to show the necessity of reducing wholesale domestic prices for Arctic fish and to propose economic methods for solving this problem. The relevance is associated with an unreasonable increase in wholesale prices, which are the basis of retail prices, resulting in a decrease in the consumption of local fish. The increase in wholesale prices of fisheries in 2014-2015 and in the subsequent period is analyzed. The fundamentals of the world doctrines of cost and value are given, and the absence of factors to justify the increase in wholesale prices on the basis of the labor theory of value is shown. The data on the unreasonably close relationship between wholesale prices for fish in the domestic market of Russia and the exchange prices at which fish products exported to the European Union countries are presented. The possibility of reducing wholesale domestic prices by increasing the supply of fish to the domestic market of Russia in order to achieve the threshold values of the figures indicated in the Doctrine of Food Security is shown. In order to replace exchange foreign prices used in the domestic market of Russia, the need to develop a methodology for determining wholesale prices for the main types of Arctic fish, primarily currency-intensive ones, is substantiated.

**Keywords:** *Arctic, fish industry, consumption, food security, price*

### Introduction

“The main problems of the fishing industry, including the Arctic region, concerning the rational use of aquatic biological resources (ABR) in connection with economic and food security, were considered at the meeting of the Presidium of the State Council of the Russian Federation on October 19, 2015” [1, Vasilyev A. M.]. Despite extensive criticism by the President of the Russian Federation of high prices for fish products, which had already existed during the period of the State Council meeting, the meeting participants did not propose any measures to limit their growth. The FAS report “On measures to limit the growth of prices for fish products”<sup>1</sup>, presented to the President in July 2016, did not give positive results either — prices continued to increase and made most types of products unaffordable for the general public. The criticism and proposals of the majority of speakers at the State Council related to retail prices and were limited to administrative restrictive measures that the Government of the Russian Federation did not consider necessary to implement.

\* © Vasilyev A.M., Lisunova E.A., 2023

For citation: Vasilyev A.M., Lisunova E.A. Is It Possible to Change Arctic Fish Pricing? *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 32–43. DOI: 10.37482/issn2221-2698.2023.52.32

<sup>1</sup> Доклад «О мерах, направленных на ограничение роста цен на рыбную продукцию» [Report “On measures aimed at limiting the rise in prices for fish products”]. URL: [fas.gov.ru/attachment/152302/download...](https://fas.gov.ru/attachment/152302/download...) (accessed 12 February 2023).

In 2014–2015, the Russian ruble depreciated against the US dollar. In December 2015, it began to cost 69.68 rubles, which is 2.12 times more expensive than the level of the ruble at the end of 2013. If we look at the graph of changes in selling prices for chilled cod, obtained from the Murman Association of Coastal Fisheries and Farmers, we will see that they also increased more than 2 times during this period (Fig. 1). In subsequent years, fluctuating (seasonal) changes in the price of coastal cod occurred at this new high level, with an overall upward trend similar to prices for frozen cod sold mainly abroad.

Coastal fishing in the Barents Sea is carried out in the Russian economic zone; the fish is fully sold on the territory of the country. The coastal fishery has no relation to the US currency, and therefore, the owners of enterprises had no reason for prices to rise following the dollar exchange rate.

The increase in wholesale prices for the main types of Arctic frozen fish products in 2014–2015, against the background of ruble devaluation, was observed in even larger values (Table 1). Thus, the selling price for frozen cod more than doubled in 1.5–2 years. The increase in prices for other types of fish, including the so-called “social” ones, despite the criticism of the President of Russia V.V. Putin at a meeting of the Presidium of the State Council in October 2015, ranged from 76.2% (mackerel) to 125.9% (capelin).

The growth rate of wholesale prices of producers (fishermen) for 2 years, given in Table 1, was not much less than their increase for 2000–2014, that is, for 14 years of a relatively stable ruble exchange rate. As a result, the share of fishermen in the retail price has increased dramatically. While in 2014, it was 30%, then in 2015 it increased to 85%<sup>2,3</sup>. The economic and financial indicators of fisheries improved: economic turnover increased by 2.06 times; balanced result — by 3.59 times. Economic turnover growth rate in 2014–2015 was significantly higher than the growth rate of costs, and as a result, the profitability of sales of fish products was higher than in 2013 by 40.3% (67.3 — 37.0)<sup>4</sup>.

---

<sup>2</sup> O razvitii rybokhozyaystvennogo kompleksa Rossiyskoy Federatsii: rabochaya gruppa prezidiuma Gosudarstvennogo soveta [On the development of the fishery complex of the Russian Federation: working group of the Presidium of the State Council]. URL: [http://vniro.ru/files/Gossovvet\\_doklad.pdf](http://vniro.ru/files/Gossovvet_doklad.pdf) (accessed 08 February 2023).

<sup>3</sup> Nauchnye i prikladnye osnovy ustoychivogo razvitiya i modernizatsii morekhozyaystvennoy deyatel'nosti v zapadnoy chasti arkticheskoy zony Rossiyskoy Federatsii: otchet o NIR (promezhut.): 0226-2019-0022 [Scientific and applied foundations of sustainable development and modernization of marine economic activities in the western part of the Arctic zone of the Russian Federation: research report (interim): 0226-2019-0022]. Luzin Institute for Economic Studies — Subdivision of the Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”; sci. lead. Vasilyev A.M.; resp. perf.: Vasilyev A.M., Vopilovskiy S.S., Fadeev A.M. [et al.]. Apatity, 2020, 128 p.

<sup>4</sup> Rybokhozyaystvennyy kompleks Murmanskoy oblasti / Federal'naya sluzhba gosudarstvennoy statistiki, Territorial'nyy organ Federal'noy sluzhby gosudarstvennoy statistiki po Murmanskoy oblasti [Fishery complex of the Murmansk Oblast / Federal State Statistics Service, Territorial body of the Federal State Statistics Service for the Murmansk Oblast]. Murmanskstat, 2016, 43 p.

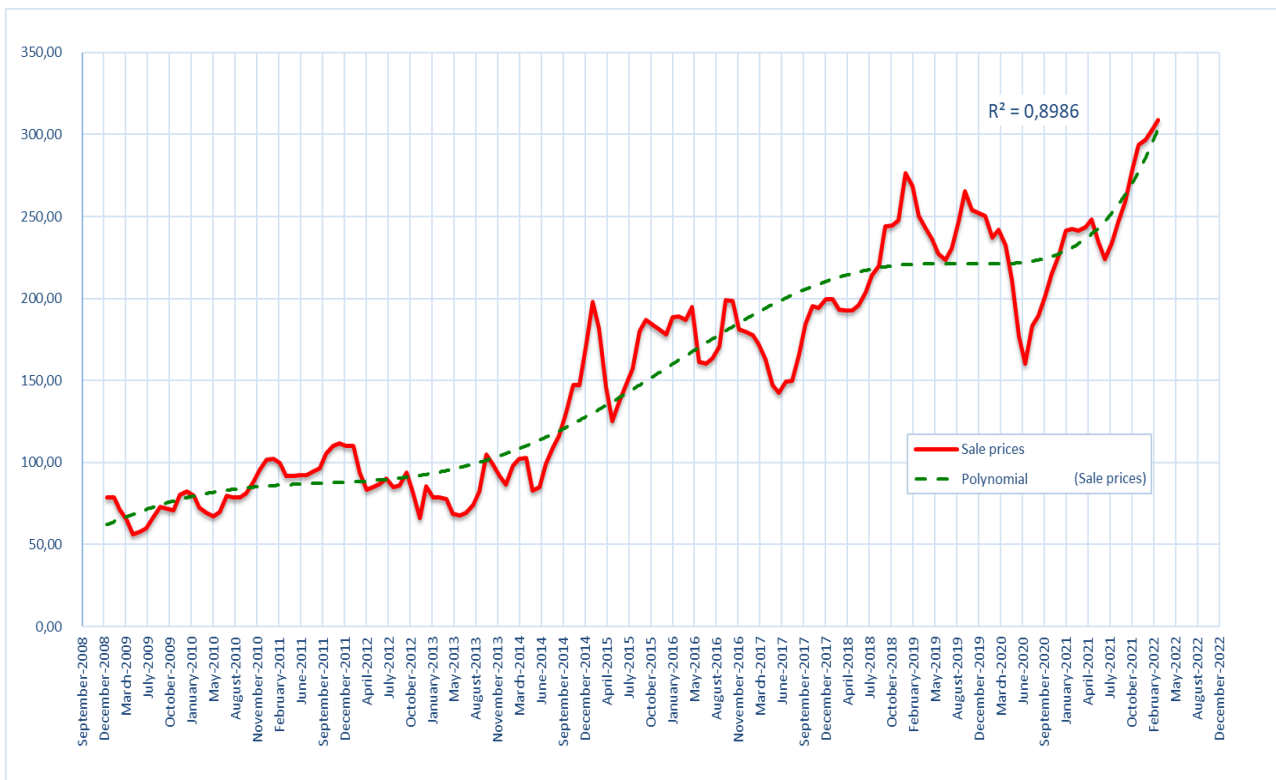


Fig. 1. Changes in the selling price of 1 ton of cod (chilled, gutted, headless) in 2009–2022, thousand rubles <sup>5</sup>

Table 1

*Change in selling prices for frozen fish products in 2014–2015 in the northern basin <sup>6</sup>*

Fish species	2013	2014	2015	Ratio of prices in 2014 to their level in 2013, %	Ratio of prices in 2015 to their level in 2013, %
Cod	76	147	176	193.4	231.6
Haddock	112	133	138	118.7	123.2
Halibut	201	315	385	156.7	191.5
Capelin	27	42	61	155.6	225.9
Herring	43	66	97	153.5	225.6
Mackerel	63	78	111	123.8	176.2
Blue whiting	18	19	39	105.5	216.7

### **Main part**

There are two main theories of pricing in the world: the labor theory and the theory of marginal utility. According to the labor theory, the cost of goods is determined by an objective value — the amount of socially necessary labor. It characterizes the behavior of producers. The theory of marginal utility considers the sphere of behavior of consumers of useful goods. The value of a good is measured by marginal utility — the utility of an additional unit of the good.

The founders of the first theory are the English economists A. Smith, W. Petty, D. Ricardo and K. Marx. Austrian economists K. Menger, O. Böhm-Bawerk and others made a great contribution to the development of the second theory.

<sup>5</sup> Source: compiled by the authors based on data from the Murman Association of Coastal Fisheries and Farms.

<sup>6</sup> Compiled by the authors. Source: «Rybnyy Kur'er-Profi: ezhenedel'nyy byulleten' o mezhdunarodnom rybnom biznese» [“Fish Courier-Pro: weekly newsletter about the international fish business”], 2013, No. 48 (467), No. 51 (470); 2014, No. 49 (519); 2015, No. 49 (570).

Petty W. became the founder of the labor theory of value. His main scientific work is considered to be the monograph "Economic and statistical works" [2, Petty W.], A. Smith separated "use value" from "exchange value", proposing a macroeconomic analysis of the distribution of value [3]. The main scientific work of D. Ricardo is "Principles of political economy and taxation", in which he developed the theory of value created by A. Smith. He considered the main task of political economy to be the definition of the laws governing the distribution of the product between classes [4], the theory of value was further developed in the works of K. Marx [5, p. 153].

Menger K. is the founder of the Austrian school in the economic theory of marginal utility. He rejected the labor theory of value and believed that value is subjective and does not exist outside of human consciousness, and labor spent on the production of a good is neither a source nor a measure of its value. Menger believed that value is not an objective property of a thing. Value is an individual's judgment of a good. Therefore, the same good can have different values for different people. The necessary conditions for a good to possess value are the following:

- its utility for a given individual;
- rarity.

The subjective value of a good is determined by the utility of the last unit of the consumed good. In the theory of K. Menger, value is given through the idea of diminishing marginal utility of a good [6].

Eugen von Böhm-Bawerk substantiated his own view of the theory of marginal utility in the monograph "Fundamentals of the theory of the value of economic goods". His main contribution to the world science is the idea that the constantly existing difference between the value of a product and the total cost of production (i.e. profit) determined by its value depends on the duration of the production period [7]. In the book "Critique of the theory of K. Marx", he developed the theory of "marginal utility". Böhm-Bawerk's criticism of Marx's theory became the basis for defending the market economy from accusations of exploiting the working class [8].

As a source of easily digestible and complete animal protein, the biological value of which is equal to the protein in meat, fish has some valuable properties that, from the consumers' point of view of useful goods, is a more valuable product compared to meat [9, Selin V.M., p. 141]. Supporters of high prices for fish products note this in the scientific literature and at scientific conferences. These factors are taken into account to a certain extent in the formation of exchange and other market prices.

It is not possible to justify the price increases for fish products in 2014–2015, shown in Table 1, on the basis of the labour theory of value, which is used in Russia in determining prices, because the costs per 1 ruble of fish products, compared to 2013, decreased by 14.5 kopecks (71.3 ÷ 56.8), that is, by 20.3%. The increase in the cost of production was higher than the increase in costs and prices could be reduced. However, the owners and employees of fishing enterprises managed to convince public opinion, and possibly the Government of the Russian Federation, that production costs, primarily for fuel, are growing at a fast pace and an increase in prices for fish

products is necessary. For example, the article “Fish prices break records. Who is guilty?” on the business news site Konkurent.ru, in particular, says: “Due to the high price and the decline in the welfare of Russians, demand in Russia is shrinking, and industry enterprises can survive only through sales in markets where demand is stable. That is, exclusively in the foreign market. The other side of the problem is cost pressure. Companies are faced with a significant increase in the cost of fishing. Fuel is growing, taxes and fees for bioresources are growing. All this leads to the fact that enterprises are forced to raise prices as much as possible in order to survive. Because of this, sales in Russia are falling and all companies are orientated towards export. The rest of the fish, not sold for export to rich countries, is bought in small batches by Russian traders to meet the needs of that Russian stratum that can afford to buy any fish at any price”<sup>7</sup>. What is true in this article? Is it incompetence or unreasonable support of fishermen? Tax system in the period 2015–2022 was stable. The rates of fees for bioresources increased only from 2023.

In our opinion, the most justified reason for price increases by commercial fishermen is their reference to the growth of Oslo exchange prices, which they use as export and domestic wholesale prices. The Northern Basin fishermen believe that they have the right to sell fish products at export prices, calculated taking into account the incomes of the population of Norway and the European Union, on the domestic market of Russia. This conclusion, in particular, confirms the statement of the executive director of the Fish Union S. Gudkov, made to the correspondent of the Izvestia newspaper in 2014: “The price of cod is tied to foreign currency, the guideline for fishermen is the price for which this fish can be sold to anyone on the world market for dollars. A certain price for cod is kept, the ruble is devalued. In order not to suffer losses due to the difference between the domestic market and the foreign market, fishermen raise prices for Russia”<sup>8</sup>. A similar opinion, judging by the scientific publications and statements of managers of various ranks, is shared by the majority of specialists related to the development of fisheries. The weekly bulletin on the international fishing business Fish Courier-Profi publishes hundreds of articles and reports discussing the topic of high prices for fish products. However, the issue of the legitimacy of the use by Russian fishermen of high exchange prices determined on European and American exchanges is not considered<sup>9</sup>. In the above interview with S. Gudkov, there is also no conclusion about the legitimacy of using foreign exchange prices in the domestic market of Russia. In this regard, it should be noted that the prices for fish products in Russia, determined by foreign retailers and suppliers, were condemned by the President of Russia V.V. Putin at the meeting of the Presidium of the Russian Federation on October 19, 2015. Later, the President criticized the use of export prices on the Russian market at a meeting with leaders of large Russian businesses. The FAS and the Federal Tax

<sup>7</sup> Tseny na rybu b'yut rekordy. Kto vinovat? [Fish prices are breaking records. Who is guilty?]. URL: <https://konkurent.ru/article/46677?ysclid=led0s6lox8535641383> (accessed 18 February 2023).

<sup>8</sup> Lyalyakina A. Rost dollara dovel tseny na tresku do istoricheskogo maksimuma [A rising dollar has driven cod prices to an all-time high]. URL: <https://iz.ru/news/578765?ysclid=led1bsfixz95000251> (accessed 18 February 2023).

<sup>9</sup> «Rybnyy Kur'er-Profi: ezhenedel'nyy byulleten' o mezhdunarodnom rybnom biznese» [“Fish Courier-Pro: weekly newsletter about the international fish business”], no. 473-931.



Service were instructed to analyze the formation of the wholesale price for fish products, the margins of intermediaries and retailers. In July 2016, the report “On measures aimed at limiting the growth in prices for fish products” was presented to the President. However, there was no analysis of the formation of the wholesale price for fish.

Figure 2 shows that changes in wholesale (selling) first-hand prices for cod and haddock used by fishing enterprises in the domestic market are identical to some extent to export prices determined at the Oslo (Norway) exchange. Wholesale price level on average for 2013–2021 is only 4.2% lower than the exchange prices for headless gutted cod, and 7.0% — for haddock. In some years, wholesale prices are higher than exchange prices, which, in our opinion, is not acceptable in this case. Domestic wholesale prices serve the needs of the national economy and should be formed taking into account the internal market conditions of the country, which are much lower in Russia than in the countries of the EEC and Norway, importing in the last 10 years from 88% to 91% of the total volume of export products of the Murmansk Oblast<sup>10</sup>. However, *some fish producers in the Northern Basin say that they have the right to sell fish products in Russia even more expensive than for export, as they incur additional costs*. Precedents of higher wholesale prices than export prices can be seen in Fig. 2. It should also be noted that officials of the Ministry of Agriculture at various levels also believe that fishermen have nothing to do with high prices for fish, while in fact their share in the retail price is more than 50%. Thus, the head of Rosrybolovstvo (Federal Agency for Fishery), I. Shestakov, says that “...the fish price is charged by resellers, not fishermen”<sup>11</sup>.

---

<sup>10</sup> Rybokhozyaystvennaya deyatel'nost' v Murmanskoy oblasti / Federal'naya sluzhba gosudarstvennoy statistiki, Territorial'nyy organ Federal'noy sluzhby gosudarstvennoy statistiki po Murmanskoy oblasti [Fishery activities in the Murmansk Oblast / Federal State Statistics Service, Territorial body of the Federal State Statistics Service for the Murmansk Oblast]. Murmanskstat, 2022, 48 p.

<sup>11</sup> Glava Rosrybolovstva: nakrutki na tsenu ryby delayut perekupshchiki, a ne rybaki [Head of Rosrybolovstvo: resellers, not fishermen, make markups on the price of fish]. URL: <https://fish.gov.ru/obzor-smi/2021/10/04/glava-rosrybolovstva-nakrutki-na-czenu-ryby-delayut-perekupshhiki-a-ne-rybaki/> (accessed 18 February 2023).



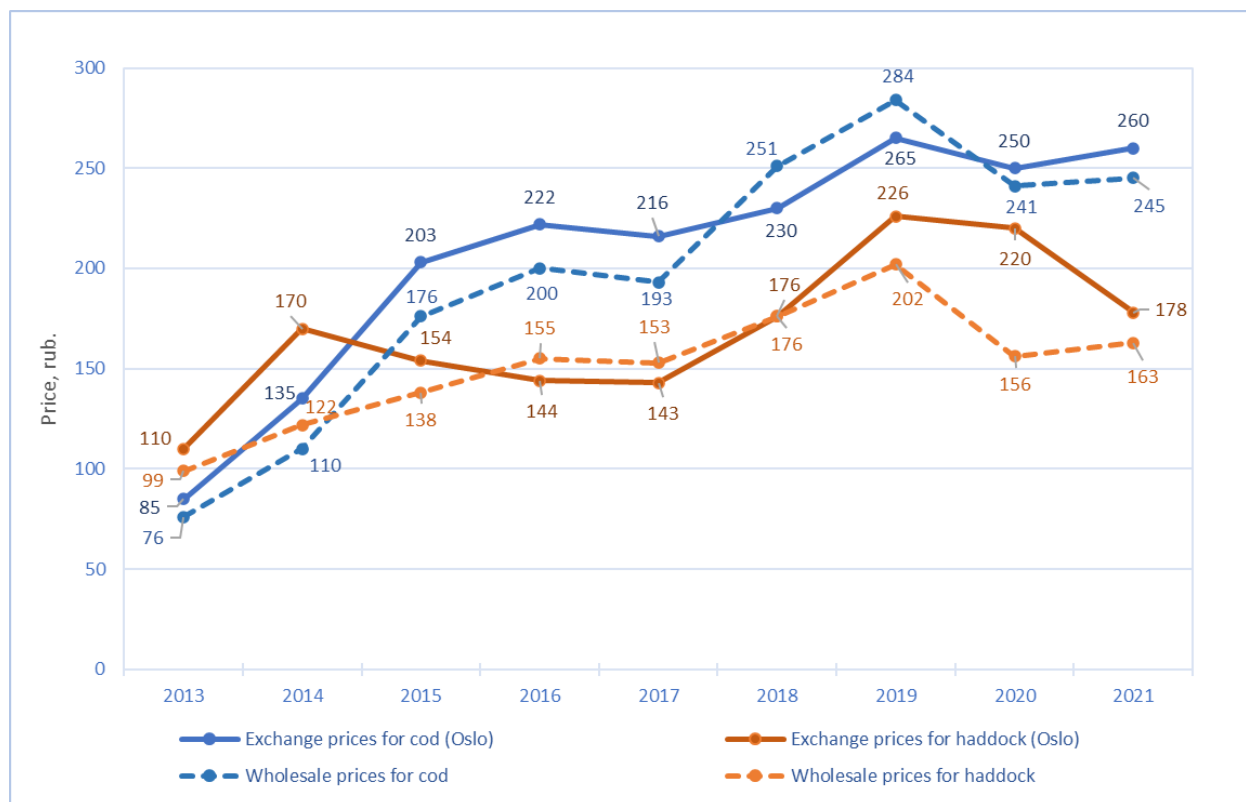


Fig. 2. Exchange and wholesale prices for frozen cod and haddock<sup>12</sup>.

In the current situation, it should be taken into account that the incomes of the population in these countries, which, along with other factors, determine the price and demand for fish products, differ significantly from Russian conditions<sup>13</sup>. It should also be noted that wholesale prices for the so-called “social” fish species — blue whiting, herring, capelin and mackerel — contrary to the assertions of fishermen about responsible fishing, exceeded in 2021 their level of 2013 by 2.33; 2.64; 2.42 and 2.36 times, respectively. Russian prices for the listed fish species are higher than the prices determined at the stock exchange in Oslo, due to the high efficiency of the Norwegian purse-seine fishery, which Russian fishermen do not use. In addition, the listed fish species, except for mackerel, are largely used for the production of fishmeal and fat. The ban on the import

<sup>12</sup> Sources: Rybnyy Kur'er-Profi: ezhenedel'nyy byulleten' o mezhdunarodnom rybnom biznese za 2013-2021 gg. [Fish Courier-Pro: International Fishing Business Weekly Newsletter 2013-2021]; Dannye o tsenakh na moreprodukty na mirovykh optovykh rybkakh: 25-ya nedelya 2017 [Data on prices for seafood on world wholesale markets: week 25, 2017]. URL: <http://fishkamchatka.ru/articles/world/20160/> (accessed 18 February 2023); Tseny moreproduktov na mirovykh optovykh rybkakh: 9 nedelya 2018 [Seafood prices on global wholesale markets: week 9, 2018]. URL: <https://ribnox.ru/ceny-moreproduktov-na-mirovykh-optovy/> (accessed 18 February 2023); Dannye o tsenakh na moreprodukty na mirovykh optovykh rybkakh: 8-ya nedelya 2019 [Data on seafood prices on global wholesale markets: week 8, 2019]. URL: <https://www.fishnet.ru/news/rynok/dannye-o-cenah-na-moreprodukty-na-mirovykh-optovykh-rybkah-8-ya-nedelya-2019/?ysclid=lee0ksymzo570385889> (accessed 18 February 2023); Obzor rossiyskogo i mirovogo rybnogo i moreproduktov po sostoyaniyu na 02.07.2021 [Review of the Russian and world fish and seafood markets as of 02.07.2021] URL: [http://www.kaicc.ru/sites/default/files/ryba\\_rf\\_02.07.2021.pdf](http://www.kaicc.ru/sites/default/files/ryba_rf_02.07.2021.pdf) (accessed 18 February 2023); Rybnye ryady. Obzor situatsii na rynke ryby [Fish rows. Review of the situation on the fish market]. URL: [nfr.ru/media/files/monitoring/2021...13.12.2021.pdf](http://nfr.ru/media/files/monitoring/2021...13.12.2021.pdf) (accessed 18 February 2023).

<sup>13</sup> «Rybnyy Kur'er-Profi: ezhenedel'nyy byulleten' o mezhdunarodnom rybnom biznese» [“Fish Courier-Pro: weekly newsletter about the international fish business”], no. 473-931.

of capelin and herring from Norway prevents Russia from using cheap fish raw materials for the production of food products at relatively low prices.

The average purchasing power per capita in Europe in 2019 was 14.739 euros, which is 2.6 times higher than the Russian level of 5.660 euros<sup>14</sup>. This fact should be taken into account by the government and prevent the unjustified enrichment of fishermen, which has already been observed for 9 years. When something similar happened recently with vegetable oil and some other food products, then the government of the Russian Federation took appropriate measures, and the price situation was more or less normalized. Currently, FAS has achieved a reduction in retail margins for certain types of products, but fish was not among them.

### ***Solution of the problem***

Currently, the Government of the Russian Federation is preparing a document, according to which it is supposed to establish fixed prices for the so-called “social” fish — for the Arctic region, apparently, for herring, mackerel, capelin, blue whiting and some other fish species that are not of particular importance for export<sup>15</sup>. In our opinion, this is a temporary and not the best solution to the problem of reducing wholesale prices. Fishery is an economic sector, regulating of which by market and economic measures can bring the necessary results, including the reduction of wholesale producer prices to an acceptable level.

In accordance with the Constitution of the Russian Federation, marine stocks of fish and seafood within the territorial and 200-mile waters are the property of the state and are under the jurisdiction of the federal and regional authorities. By regulating the access of fishermen to fishery resources, it is possible to solve most economic problems, including the formation of rules for the exploitation of aquatic biological resources in the interests of the state and society.

Under the current conditions, the simplest and most effective solution to reduce wholesale and retail prices, in our opinion, is to create conditions for the implementation of the standards of the Food Security Doctrine, approved by the Decree of the President of the Russian Federation on January 21, 2020. The Doctrine provides for “... the formation of foreign economic policy in compliance with food security criteria”. In order to ensure this condition, the supply of domestic fishermen’s catches to the Russian market should provide 85% of the population’s consumption of fish in the amount of 22 kg per capita per year in uncut form. Consequently, Russian fishermen should annually supply to the domestic shore, excluding the population of new regions, 2744 thousand tons (18.7 kg \* 146.745 thousand people) of fish and seafood; including the population of new regions — approximately 2839 thousand tons (18.7 kg \* 151.800 thousand people). With the current total catch volume (approximately 5.0 million tons per year), 54.9% and 56.8% of this

---

<sup>14</sup> Gorshkov A. GfK pokupatel'skaya sposobnost' v Evrope i Rossii [GfK purchasing power in Europe and Russia]. URL: <https://proza.ru/2021/05/04/1270> (accessed 20 February 2023).

<sup>15</sup> Rybu ravnyayut na sakhar. Rosrybolovstvo gotovit soglasenie o fiksatsii roznychnykh tsen [Fish is compared to sugar. Rosrybolovstvo is preparing an agreement to fix retail prices]. URL: <https://fishretail.ru/news/ribu-ravnyayut-na-sahar-rosribolovstvo-gotovit-432988> (accessed 20 February 2023).

value, respectively, should be delivered to the Russian coast, while 2011 thousand tons were delivered in 2020 (39.1%). For the Northern Basin, with joint liability, 349.0 thousand tons (55% of the average annual catch for 2018–2020) should be supplied, and only 29% of the total catch is supplied to the Russian coast [10, Vasilyev A.M., Lisunova E.A., p. 63].

Fishermen consider that the reason for the non-fulfillment of indicators of the Food Security Doctrine is the impossibility to sell the above-mentioned volumes of fish on the Russian market, which is true at current prices. It is necessary to reduce wholesale prices, which is not included in the plans of fishing companies. This confirms the conclusion: the implementation of the normative indicators of the Food Security Doctrine should lead to a decrease in prices for fish products. At the same time, the federal fishery management replaces the indicator of fish supplies to the Russian market with a self-sufficiency indicator, which in 2021 amounted to 153.2% (the ratio of the total catch to the recommended consumption rate)<sup>16</sup>.

It should be noted that the supply of fish to the Russian coast in the volumes prescribed by the Doctrine was not carried out during the period of the Doctrine in 2010–2019 [10, Vasilyev A.M., Lisunova E.A., p. 54]. In accordance with Chapter VII of the Doctrine “Mechanisms and organizational basis for ensuring food security”, it is proposed to designate the supply of fish to the Russian market in the rules of fishing as a prerequisite for obtaining quotas of biological resources for fishing in full. In order to stimulate the process of price reduction under the influence of the increased supply of fish products, in our opinion, it is advisable to cancel the payment for bioresources supplied to the Russian coast.

As shown above, in Russia, wholesale prices for trading on the domestic market are based on prices developed on the stock exchange in Oslo, which led to their overestimation in comparison with the purchasing power of Russians. The purchasing power rating of Norway is higher than in Russia in various indicators from 2.11 to 2.67 times<sup>17,18,19</sup>. Under such conditions, it is reasonable to develop Russian wholesale prices for fish products, including Arctic fish and seafood, as is done in our country for grain.

In our opinion, there are many similarities in the processes of production, processing and sale of fish, and the cultivation, processing and sale of grain: variety of types of products, annual and seasonal risks, sales on domestic and foreign markets, presence of intermediaries in trade chains, desire of owners to sell more grain and fish abroad, danger of exposure of the domestic and rising prices. At the same time, for grain trade in the country, there are both domestic prices, which do not allow a significant increase in the price of bread, and export prices; there are no

<sup>16</sup> Results of the activities of the Federal Fisheries Agency in 2021. URL: [https://fish.gov.ru/wp-content/uploads/2022/05/itogi\\_raboty\\_rosrybolovstvo\\_za\\_2021\\_god.pdf](https://fish.gov.ru/wp-content/uploads/2022/05/itogi_raboty_rosrybolovstvo_za_2021_god.pdf) (accessed 14 January 2023).

<sup>17</sup> Ranking of countries by GDP per capita (PPP). URL: <https://nonews.co/directory/lists/countries/gdp-per-capita-ppp> (accessed 20 February 2023).

<sup>18</sup> Rating of countries by purchasing power. URL: <https://take-profit.org/statistics/purchasing-power/> (accessed 20 February 2023).

<sup>19</sup> Rating of countries by purchasing power per capita. URL: <https://moshekam.livejournal.com/1910820.html> (accessed 20 February 2023).

prices for fish products. The cost of 1 ton of grain in the domestic market and in exports differs significantly. So, in 2022, the average prices for wheat in Russia in February were 15.501 rubles/t, and the average export prices in January were 1.55 times higher than domestic prices (24.069 rubles/t)<sup>20</sup>.

To calculate wholesale prices for grain, the Ministry of Fisheries has developed and uses a corresponding methodology<sup>21</sup>. The government of the Russian Federation is obliged to monitor the level of exports and the availability of grain in the country. Recently, the President of the Russian Federation Vladimir Putin warned the Government not to overdo exports. The same control procedure is provided for fish products, but is not being implemented.

Wholesale prices for fish products in our country are set by fish producers. As shown above, in the Arctic region, prices for frozen products are used as prices for frozen products set on the stock exchange in Oslo or close to them, which do not take into account the purchasing power of Russians. In this regard, it is advisable to develop a “Methodology for determining wholesale prices for fish products in order to implement the Food Security Doctrine”.

The main difficulty in its development, in our opinion, is related to determining the level of wholesale prices that ensure the normal functioning and creditworthiness of fisheries participants in the renewal of fixed production assets, as well as the economic availability of products to the population and coastal processing enterprises. To ensure this, a negotiated method of determining wholesale prices for the main fish species with the participation of fishermen, coastal processors and a third party can be used.

It should be noted that in many countries, fish products are sold at different prices. For example, in Norway, for frozen ship-produced products, first hand prices are exchange prices. To determine the price for cod caught by the coastal fleet, contract prices were used until recently, but now they are dynamic, consisting of the sum of 80% of fresh cod prices, 70% of frozen cod prices and 60% of the export index, divided by 3. In addition, small volumes of fish and seafood are sold fresh to the public at special prices.

The implementation of the Food Security Doctrine and the availability of reasonable wholesale prices for fish will serve as the basis for the formation of retail market prices for fish products that are affordable for the population.

---

<sup>20</sup> Tseny na pshenitsu v Rossii i za rubezhom — obzor klyuchevykh tendentsiy [Wheat prices in Russia and abroad - overview of key trends]. URL: <https://agrovesti.net/lib/industries/cereals/tseny-na-pshenitsu-v-rossii-i-za-rubezhom-obzor-klyuchevykh-tendentsij-obnovlenie-na-aprel-2022-g.html> (accessed 20 February 2023).

<sup>21</sup> Prikaz Ministerstva sel'skogo khozyaystva Rossiyskoy Federatsii ot 29.10.2021 № 733 «Ob utverzhdenii Metodiki rascheta predel'nykh urovney minimal'nykh i maksimal'nykh tsen na sel'skokhozyaystvennuyu produkciyu v tselyakh provedeniya gosudarstvennykh zakupochnykh i tovarnykh interventsiy» [Order of the Ministry of Agriculture of the Russian Federation dated October 29, 2021 No. 733 “On approval of the Methodology for calculating the maximum levels of minimum and maximum prices for agricultural products for the purpose of conducting government procurement and commodity interventions”]. URL: <http://publication.pravo.gov.ru/Document/View/0001202112230010?ysclid=led8776esn303198965> (accessed 20 February 2023).

## References

1. Vasiliev A.M. Tseny na rybu stali vyshe pokupatel'noy sposobnosti [The Price on Fish Became Higher than the Purchasing Capacity]. *Rybnoe khozyaystvo* [Fisheries], 2017, no. 4, pp. 3–7.
2. Petty W. *Ekonomicheskie i statisticheskie raboty* [Economic and Statistical Works]. Moscow, Gosudarstvennoe sotsial'no-ekonomicheskoe izdatel'stvo (Sotsekgiz) Publ., 1940, 324 p. (In Russ.)
3. Smith A. *Issledovanie o prirode i prichinakh bogatstva narodov* [An Inquiry into the Nature and Causes of the Wealth of Nations]. Moscow, Eksmo Publ., 2016, 1056 p. (In Russ.)
4. Ricardo D. *Nachala politicheskoy ekonomii i nalogovogo oblozheniya* [The Beginnings of Political Economy and Taxation]. Moscow, Eksmo Publ., 2007, 953 p. (In Russ.)
5. Marx K. *Kapital. Kritika politicheskoy ekonomii* [Capital: A Critique of Political Economy]. Moscow, Gospolitizdat Publ., vol. 3, 1951, 927 p. (In Russ.)
6. Menger C. *Izbrannye raboty* [Selected Writings]. Moscow, Izdatel'skiy dom «Territoriya budushchego» Publ., 2005, 496 p. (In Russ.)
7. Böhm-Bawerk O. *Osnovy teorii tsennosti khozyaystvennykh blag* [Basic Principles of Economic Value]. Moscow, 2000, 23 p. (In Russ.)
8. Böhm-Bawerk O. *Kritika teorii Marksa: nauchnoe izdanie* [Criticism of Marx's Theory]. Chelyabinsk, Sotsium Publ., 2002, 282 p. (In Russ.)
9. Selin V.M. Metodologicheskie aspekty analiza i otsenki srednedushhevogo potrebleniya ryby i more-produktov naseleniem RF [Methodological Aspects of Analyzing and Assessing the Per Capita Consumption of Fish and Seafood in the Russian Federation]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii i prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2015, no. 6 (42), pp. 139–152. DOI: 10.15838/esc/2015.6.42.8
10. Vasiliev A.M., Lisunova E.A. Doktrina prodovol'stvennoy bezopasnosti v sisteme obespecheniya naseleniya rybnoy produktsiyey [The Doctrine of Food Security in the System of Providing the Population with Fish Products]. *EKO [ECO]*, 2022, no. 6, pp. 51–66. DOI: 10.30680/ECO0131-7652-2022-6-51-66

*The article was submitted 21.02.2023; approved after reviewing 29.03.2023;  
accepted for publication 31.03.2023*

*Authors' contributions:  
Vasilyev A.M. — research concept; writing the original text; final conclusions.  
Lisunova E.A. — writing the original text; text revision*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 38–53.

Original article

UDC [338.1:327](045)+622.32

doi: 10.37482/issn2221-2698.2023.52.44

## Economic Conjunction of Arctic Natural Gas in the New Geopolitical Conditions

**Sergey Yu. Kozmenko**<sup>1✉</sup>, Dr. Sci. (Econ.), Professor, Chief Researcher

**Arina S. Kozmenko**<sup>2</sup>, Cand. Sci. (Econ.), Researcher

<sup>1,2</sup> Luzin Institute for Economic Studies, Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”, ul. Fersmana, 24a, Apatity, Russia

<sup>1</sup> fregat306@mail.ru ✉, ORCID: <https://orcid.org/0000-0002-3728-8357>

<sup>2</sup> kozmenko\_arriva@mail.ru, ORCID: <https://orcid.org/0000-0002-3623-308X>

**Abstract.** The special military operation (SMO) organically fits into the logic of the century-long confrontation between Russia and Britain, and later — the USA, known since the late 18th century as the “Great Game”. One of the goals of the SMO on a national scale is not only to restore Russia’s dominance in the Black Sea and the Sea of Azov, but also to counteract the achievement of such a goal by NATO countries. Russia uses various sources of funding the SMO, including oil and gas revenues of the Federal budget. Natural gas, unlike oil, is not under sanctions. There is nothing to compensate for the loss of revenues from the reduction of gas exports to Europe: practically all Russian pipelines (except for the Power of Siberia-1 with a capacity of only 38 billion m<sup>3</sup>) are oriented to the West; liquefied natural gas from the Yamal LNG and Sakhalin-2 projects is contracted for many years ahead. The EU countries have nothing to compensate for the lost volumes, except coal, but only Russian coal. Europe needs gas, Russia needs currency for the SMO, so it is necessary to find a solution to the problem.

**Keywords:** *Great Game, anti-Russian sanctions, Arctic natural gas, major gas projects, oil and gas revenues, gas export mobility*

### Introduction

The geopolitical organization of the world space is based on the insurmountable contradiction between maritime (lords of the sea) and continental (lords of the land) civilizations [1]. The confrontation between them runs along the line of contact “ocean vs continent”, around which countries and regions are localized, gravitating towards one of the civilizations, depending on the emerging situation on the geopolitical atlas of the modern world. Both civilizations, when implementing a global liberal project, strive for world dominance both in geopolitics, economics and other areas of global and regional development. This ultimately leads major maritime and continental powers to confrontation to achieve world domination in full or in part (for example, on the principle of dominance on the sea or in the air), which is implemented accordingly on the basis of “Sea power” [2; 3] (Theory of Sea Power) and the “concept of absolute dominance of the sea” [4] — “power at sea decides the fate of history” and “who owns the sea, owns everything” — sea powers and the concept of “Heartland” — “who owns the core land (that is, Central Eurasia), owns the world island (mainland Eurasia), and who owns the world island, owns everything” [5].

---

\* © Kozmenko S.Yu., Kozmenko A.S., 2023

For citation: Kozmenko S.Yu., Kozmenko A.S. Economic Conjunction of Arctic Natural Gas in the New Geopolitical Conditions. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 44–61. DOI: 10.37482/issn2221-2698.2023.52.44



From the standpoint of a systems approach as a basic methodology of spatial research, it should be emphasized that maritime and continental civilizations constitute a single whole, trying to weaken each other, but not to destroy completely: disappearance of one of the components from the geopolitical atlas of the modern world will lead to a worldwide collapse, a catastrophe on a global scale, as a result of which the phenomenon of “ocean vs continent” will disappear.

The confrontation “ocean vs continent”, known as the epic “Great Game”, began to take shape in a geopolitical structure at the turn of the 18th–19th centuries, when elements of maritime civilization began to emerge in the Russian Empire of that time. The “Great Game” began in the Mediterranean Sea in the struggle for possession of the island of Malta in September 1800 between the Anglo-Saxons (British Empire) and Russia. The Game continues. Today the Anglo-Saxons (USA, NATO) continue to oppose Russia.

The practice of interaction on the fields of the “Great Game” is characterized by a maxim that has been known for more than a hundred years [6, pp. 41–118]: “Only friendship with the Anglo-Saxons can be worse than enmity with them”.

However, since the times of Peter the Great, “friendship with the West” has been a key element of Russian foreign policy. As a result, the country turned from a leader into an imitator of the Western worldview with an expressed desire to be included in the orbit of the “collective West”. The country rushed to the West, ignoring the laws and rules of the “Great Game” — this became the basis of the geopolitical drama of Russia in the modern times of the late 20th–early 21st centuries [7].

In the gas sector, it was manifested in the construction of redundant pipeline communications, which led to the excess of the pipeline gas supply over demand, which over the past ten years (2011–2022) has practically “frozen” with a downward trend at the level of 580–550 billion m<sup>3</sup> [8, p. 29–36]. The maximum value of European imports in these years (not counting Turkey) was 270 billion m<sup>3</sup> (of which 132 billion m<sup>3</sup> were Russian) of pipeline gas and about 70 million tons of LNG, including 12.6 Russian. In such conditions, Nord Stream 2 was clearly unnecessary.

This has led to a significant convergence of gas prices in Europe with gas quotations at Henry Hub in the USA and has already started to negatively affect the competitiveness of American corporations compared to European ones.

This is the essence of the conflict between the United States, Europe and Russia in the gas sector — just business and nothing personal. “The US has decided that over the past twenty–thirty years we have been cooperating too well with Germany. Or rather, it cooperates too well with us. A powerful alliance has emerged, based on our energy resources and German technologies. It began to threaten the monopoly position of many American corporations”<sup>1</sup>.

---

<sup>1</sup> Interview with the Minister of Foreign Affairs of the Russian Federation S.V. Lavrov for the informational and educational lesson “Talking about the important”, dedicated to the topic “Russia and the world”, Moscow, February 12, 2023. URL: [https://www.mid.ru/ru/foreign\\_policy/news/1853575/](https://www.mid.ru/ru/foreign_policy/news/1853575/) (accessed 14 February 2023).



As a result of the development of strategic nuclear forces, having passed through the stages of the Korean (1950–1953) and Vietnamese (1965–1974) wars, overcoming the Cuban missile crisis (1962), where the parties demonstrated an approximate equality of forces and means of destroying each other, a long-awaited pause came in the “Great Game”, which lasted until the beginning of the SMO. During this peacetime period, both sides practically lost the skill of interaction and coordination in front-line military operations.

By the mid-1970s, oil and gas were finally established as the basis of USSR exports. During this period, the economic situation of these energy resources on world markets grew so much that oil and gas revenues became part of the state budget of the USSR.

The formation of the structure of oil and gas exports began with the commissioning (1964) of the Druzhba oil pipeline with a total capacity of 66.5 million tons of crude oil per year. The basic, mainly social, even humanitarian goal of this project was to supply crude oil to the western Soviet Union republics — Lithuania, Latvia (via the latter — Estonia), Belarus and Ukraine (via the latter — Moldova). Druzhba came to other Eastern European countries — members of the Warsaw Pact: Poland, East Germany (GDR), Czechoslovakia, Hungary, and Yugoslavia (Croatia and Slovenia).

It should be emphasized that never in the entire history of economic cooperation along the “Russia–Europe” line, even during the Cold War era, energy and other resources, for example, uranium, titanium and aluminum, fertilizers and grain, were considered by our country as a geopolitical tool, as a means of pressure on the EU in one sphere or another.

Until recently, Europe was the main trading partner of both the Soviet Union and modern Russia; trade with EU countries was the main source of replenishing gold and foreign exchange reserves. At the same time, the currency was spent not only on goods on the domestic consumer market, but also, most importantly, on the acquisition of complex technologies that would allow the development of advanced areas of domestic energy and industry, including the military-industrial complex.

During the period of maximum rise of economic conjuncture of the national economy (approximately 1964–1982), over the course of 20 years, our country acquired and developed competencies in basic sectors of the economy (many of them were lost, for example, in the field of shipbuilding). This made it possible to save the economy and the country from final ruin during the period of perestroika and market reforms.

But, most importantly, in the 1990s, it was possible to create and maintain sea-based strategic nuclear forces (SNF) and subsequently update these forces at the level of modern standards, which allows taking a worthy position in the new geopolitical conditions and meeting the current challenge. This is Sevmash Production Association.

### ***Economic turnover of Arctic natural gas in Europe under new geopolitical conditions***

Oil and gas revenues (OGR) are still of significant importance in the formation of the revenue part of the Federal Budget (FB), the maximum OGR over the last five years was 42% in 2022, of which about 85% are oil and about 15 % — gas revenues, including mineral extraction tax and export customs duties.

The author's articles are devoted to fluctuations in the economic conjunction of oil in new geopolitical conditions at the end of globalization in the energy markets of Europe and the Asia-Pacific region [9, pp. 38–54], [10, pp. 136–141].

The basis of the gas transportation system (GTS) of Ukraine is the Soyuz gas pipeline, built on the basis of the Orenburg gas condensate field in 1975–1979 by the Soviet Union and other CMEA countries (Council for Mutual Economic Assistance). The length of the 26 billion m<sup>3</sup> capacity Soyuz pipeline along the Orenburg – western border of the USSR route is 2750 km, including 300, 882 and 1568 km through the territory of Kazakhstan, Russia and Ukraine, respectively. The Soyuz's entry point into the territory of Ukraine is the Sokhranovka gas measuring station (GMS) on the territory of the LPR. Therefore, pumping through this GMS was stopped by the Ukrainian side in May 2022.

The exit points of the Soyuz, as well as the entire GTS of Ukraine, towards Western Europe are the Beregovo GMS (Hungary), the Tekovo GMS (Romania) and the Uzhgorod GMS (Slovakia). From Slovakia, gas flows to the Czech Republic, and from there — to Western European countries: Germany, France, Switzerland (via the OPAL gas pipeline), Austria, Slovenia and Italy (via the TAG gas pipeline).

This configuration of the Union was politically motivated, as the pipeline was built as part of the first major gas-for-pipes deal between the Soviet Union and West Germany. Despite the fact that the northern route (Belarus — Poland — East Germany) was significantly shorter (later, the Yamal–Europe gas pipeline was laid this way), the current southern route was chosen at the insistence of Germany.

The commissioning of the Soyuz in 1980 was confirmation of Russia's real breakthrough to the West, which acquired not only a significant economic, but also a geopolitical context.

In addition, over the past forty-odd years, natural gas, along with oil and petroleum products, has become so organically integrated into the population and consumption structure of the “collective West” that, as the events of 2022–2023 show, disruptions in the logistical supply chains can and have led to social collisions on a national scale.

In the early 1980s, the GTS of Ukraine was intensively expanded due to the Ukrainian branches of the gas pipelines “Urengoy — Pomary — Uzhgorod” (1983) and “Progress” — “Yamburg — Western border of the USSR” (1988), with a length of 1160 km each and a capacity of 28.0 and 26.0 billion m<sup>3</sup> per year, respectively. The remaining export gas pipelines, including entrances to the territory of Ukraine through the GMS of Belarus, are less powerful and are capable of transporting gas in a volume of about 60 billion m<sup>3</sup>. Thus, the throughput capacity of the Ukrainian gas

transportation system on the border with Russia is 288 billion m<sup>3</sup> per year (through 12 GMSs), on the border with the EU — 142.5 billion m<sup>3</sup> (11 GMSs). The historical maximum of gas transportation to Europe was reached in 1998 — 141.0 billion m<sup>3</sup>.

The real capacity of the Ukrainian GTS today is not clear. The system requires a thorough overhaul.

Constant gas wars with Ukraine have led to the fact that 45.6% of the total capacity of the Ukrainian GTS under the current contract (2020–2024) to pump gas on a take-or-pay basis in 2020 (65 billion m<sup>3</sup>) and only 28% (40 billion m<sup>3</sup>) in 2021–2024 were in demand.

The logic is as follows: in 2021 and until May 2022, gas was pumped through Ukraine through the Sudzha GMS (Progress pipeline) and the Sokhranovka GMS (Soyuz pipeline) with a capacity of about 26 and 14 billion m<sup>3</sup> (not all lines of the Soyuz are in use), which in total amounts to the same 40 billion m<sup>3</sup> or 109.6 million m<sup>3</sup> daily. The exit points of both gas pipelines from the territory of Ukraine are the same (Uzhgorod, Beregovo and Tekovo GMSs). In May 2022, during the SMO, the Sokhranovka GMS (located on the territory of the LPR) was out of the control of the Ukrainian side. Only the Sudzha GMS remained (this entry point of Progress into the territory is located in the Sumskaya region), the capacity of which is no more than 72 million m<sup>3</sup> daily versus 109.6 million m<sup>3</sup> under the contract.

In the first half of February 2023, the pumping volume was recorded at 31–36 million m<sup>3</sup>, which corresponds to an annual load of 11.3–13.1 billion m<sup>3</sup> of natural gas<sup>2</sup>. This pipeline ensures gas transportation along two branches: GMS Sudzha — GMS Kishinev through Kremenchug, Nikolaev and Odessa, ensuring gas supplies to Moldova and GMS Sudzha — GIS Uzhgorod, GMS Beregovo and GMS Tekovo — transportation of gas to Slovakia, Hungary and Romania, respectively.

From October 1, 2021, PJSC Gazprom began supplying natural gas to Hungary bypassing Ukraine via the Balkan Stream gas pipeline (a continuation of the European branch of the Turkish Stream), while the virtual reverse natural gas flow from Hungary to Ukraine is naturally closed, as well as Beregovo GMS on the Ukrainian–Hungarian border<sup>3</sup>.

Ukrainian gas transit to Romania for further pumping to southern European countries was also stopped with the commissioning of the Turkish Stream in January 2020; gas transit through Romania actually stopped. Countries in southern Europe, including Romania and Moldova, consider the “Turkish route” to be more cost-effective and free of geopolitical risks.

Thus, Russia supports the transportation of gas via the Sudzha — Uzhgorod — Slovakia gas pipeline, most likely in order to fulfill its obligations to preserve the Ukrainian route. This is how Russia sells spot gas supplies to Europe with a deadline for tomorrow.

<sup>2</sup> Postavki cherez Ukrainu vyrosli na 15% [Deliveries through Ukraine increased by 15%]. RIA NOVOSTI, 15.02.23. URL: <https://www.ria.ru> (accessed 17 February 2023).

<sup>3</sup> «Gazprom» nachal postavki gaza v Vengriyu v obkhod Ukrainy, i ona tut zhe prekratila tranzit [Gazprom began supplying gas to Hungary, bypassing Ukraine, and it immediately stopped transit]. BFM.RU, 01.10.21. URL: <https://www.bfm.ru/news/482656> (accessed 18 February 2023).

The logic of such a Russian–Ukrainian agreement is as follows. For pumping 40 billion m<sup>3</sup> of gas on a take-or-pay basis through the Sudzha gas pipeline with a length of 1160 km, Ukraine receives a transit fee based on the average European rate of USD 2.8 per 1 thousand m<sup>3</sup> per 100 km. In any case, regardless of the volume of actual pumping, Russia has to pay for these 40 billion m<sup>3</sup> or USD 1.3 billion. This will allow Ukraine to maintain the GTS — this is USD 1 billion plus USD 300 million in profit.

The break-even point is reached at an annual pumping volume of 30 billion m<sup>3</sup>. If after 2024 the volume of pumping decreases, then the Ukrainian gas transportation system will apparently fall into disrepair.

It should be emphasized that even such seemingly small volumes are significant for both Gazprom and the Russian federal budget. In 2022, PJSC Gazprom pumped an average of 41–42 million m<sup>3</sup> of gas per day through the Sudzha gas pipeline <sup>4</sup>, or about 15.1 billion m<sup>3</sup> per year.

The rest of the European gas transport communications are currently not operational. These are, first of all, both lines of the Nord Stream 1 gas pipeline and one line of the Nord Stream 2 gas pipeline, blown up on September 26, 2022. The second line of the Nord Stream 2 gas pipeline cannot be used for geopolitical reasons. For the same reasons, on March 30, 2022, the Polish side stopped pumping Russian gas through the Yamal–Europe gas pipeline, passing from Russia to Germany in transit through the territory of Belarus and Poland.

The design capacity of each string of the Nord Stream 1 and 2 projects is 27.5 billion m<sup>3</sup>, and the Yamal–Europe gas pipeline — about 33 billion m<sup>3</sup>.

In fact, at present, the only gas pipeline is Turkish Stream, which consists of Turkish and European branches, with a capacity of 15.75 billion m<sup>3</sup> each. Natural gas supplies to southern and south-eastern European countries in 2022 amounted to about 15.0 billion m<sup>3</sup>.

Attempts to attack the Turkish Stream gas pipeline were made in October 2022 and are planned now, in February 2023, against the backdrop of the earthquake in Turkey, and are part of the modern version of the “Great Game”.

This, according to the American magazine *National Interest*, “guarantees transatlantic energy solidarity, breaking the big gas ring that emerged after the construction of Nord Stream 2 and Turkish Stream, which will finally deprive Russia of its position as a gas monopoly in the European part of the continent” <sup>5</sup>.

In 2021, exports from Russia to Turkey amounted to 26.7 billion m<sup>3</sup>, including 15.98 billion m<sup>3</sup> via Blue Stream (under the contract until 2026 at an oil-linked price of USD 800 per 1 thousand m<sup>3</sup>) and 10.72 billion m<sup>3</sup> at spot prices of USD 1400 per 1 thousand m<sup>3</sup>. Total gas consumption in Turkey in 2022 amounted to about 61 billion m<sup>3</sup>, and there is an upward trend.

<sup>4</sup> «Gazprom» uvelichil na 9,5% prokachku gaza cherez Ukrainu [Gazprom increased gas pumping through Ukraine by 9.5%]. *Kommersant*, 18.02.23. URL: <https://www.kommersant.ru> (accessed 18 February 2023).

<sup>5</sup> SShA probuyut vyvesti «Turetskiy potok» iz stroya, prikryvayas' zemletryaseniem [The United States is trying to disable the Turkish Stream under the guise of an earthquake]. *REGNUM*, 14.02.23. URL: <https://www.regnum.ru/news/3780223.html>

At the maximum, gas exports from Russia to Turkey in 2023 could increase to 30 billion m<sup>3</sup>; Ukrainian transit would amount to at least 35–40 billion m<sup>3</sup>, and supplies along the European branch of the Turkish Stream will be 10–15 billion m<sup>3</sup>. The total is about 80 billion m<sup>3</sup>. In 2022, gas exports from Russia to the EU countries amounted to 68 billion m<sup>3</sup> (due to the work of Nord Stream 1 and the Yamal–Europe gas pipeline in the first half of the year), in 2023 the situation is more complicated: out of 80 billion m<sup>3</sup> (this is Russia's maximum capability in current conditions) and excluding Turkey's 30 billion m<sup>3</sup>, 50 billion m<sup>3</sup> remains for the EU. In a stable 2021, Russia exported 132 billion m<sup>3</sup> of gas to Europe. That is, the shortfall in gas import volumes in 2022 for the EU amounted to 64, and in 2023 — to about 82 billion m<sup>3</sup> [8, p. 37]. A logical question is whether Europe will be able to somehow compensate for such shortfalls in pipeline gas imports, and whether Russia will be able to compensate for the falling revenues of the federal budget from such a decrease in exports?

In total, Russian pipeline exports in 2023 are projected at 125 billion m<sup>3</sup>: 80 billion (Europe and Turkey) and 30 billion (CIS countries, including Kazakhstan and Belarus), plus 15 billion (maximum, China via the Power of Siberia 1). This is 76 billion m<sup>3</sup> or almost 38% less than in the relatively stable 2021 (201 billion m<sup>3</sup>).

In 2021, the gas component of OGR amounted to 1703.2 billion rubles, including mineral extraction tax — 577.8 and export customs duty — 1125.4 billion rubles. In 2023, out of 125 billion m<sup>3</sup> of projected exports, spot gas will amount to only 50 billion m<sup>3</sup> (Ukrainian transit and Turkish gas from Turkish Stream), the rest is contract gas. That is, to maintain balance, the price of gas on the spot (these 50 billion m<sup>3</sup>) should increase by 2.5 times as compared to 2021.

Let us emphasize that such an imbalance has arisen due to the shutdown of the Nord Stream 1 and Yamal Europe gas pipelines, with 55+33=88 billion m<sup>3</sup> of transport capacity taken out of economic turnover. It should be especially noted that these gas pipelines supply gas to two EU countries — Germany and Poland. At the same time, in 2022 (relative to 2021), the total consumption of natural gas in 27 EU countries and the UK decreased from 590 to 545 billion m<sup>3</sup>, while domestic production increased slightly from 212 to 227 billion m<sup>3</sup>. Pipeline gas consumption decreased by almost 84 billion m<sup>3</sup>, but LNG consumption in terms of free gas increased by almost 61 billion m<sup>3</sup>.

An increase in LNG supplies to EU countries (Russia alone increased LNG exports to the EU in 2022 by 15%, from 17.4 to 20.0 billion m<sup>3</sup> compared to 2021) is unlikely to affect Poland and Germany significantly. Poland has only one regasification terminal in Świnoujście with a capacity of 5 billion m<sup>3</sup> per year, while Germany has no such terminals at all. This means that the deficit of pipeline gas imports in 2023 will mainly manifest itself in these countries in the winter of 2023–2024. Gas consumption in Germany is about 91 billion m<sup>3</sup> per year, and in Poland — 21.5 billion m<sup>3</sup>. If divided proportionally, Germany will have a deficit of 66 billion m<sup>3</sup>, and Poland — 16 billion m<sup>3</sup>, i.e. approximately 73% of the consumption level.

An increase in gas supplies to Europe is also possible through LNG. But Russia's capabilities are very limited. Yamal-LNG is the only LNG plant operating in the Arctic and European part of Russia.

To support the Yamal LNG project, the Arctic gas fleet consisting of 15 ships was built at the Daewoo Shipbuilding & Marine Engineering Company (DSME), Seoul, South Korea (Table 1).

Table 1

*Arctic fleet of gas tankers*

Name	Operation, year	Operator	Flag
Christophe de Margerie	January 2017	Sovcomflot (Russia)	Cyprus
Eduard Toll	December 2017	Teekay (Canada)*	Bahamas
Rudolf Samoylovich	December 2017	Teekay (Canada)	Bahamas
Nikolay Evgenov	June 2019	Teekay (Canada)	Bahamas
Vladimir Voronin	August 2019	Teekay (Canada)	Bahamas
Georgiy Ushakov	October 2019	Teekay (Canada)	Bahamas
Yakov Gakkel	November 2019	Teekay (Canada)	Bahamas
Boris Vilkitskiy	November 2017	Dynagas Ltd (Greece)**	Cyprus
Fedor Litke	November 2017	Dynagas Ltd (Greece)	Cyprus
Georgiy Brusilov	November 2018	Dynagas Ltd (Greece)	Cyprus
Nikolay Zubov	December 2018	Dynagas Ltd (Greece)	Cyprus
Boris Davydov	January 2019	Dynagas Ltd (Greece)	Cyprus
Vladimir Rusanov	March 2018	MOL (Japan)***	Hong Kong
Vladimir Vize	October 2018	MOL (Japan)	Hong Kong
Nikolay Urvantsev	July 2019	MOL (Japan)	Hong Kong

\* Teekay with its Chinese subsidiary China LNG Shipping (Holdings) Limited (China LNG)

\*\*Dynagas Ltd with leading Chinese shipping companies Sinotrans and China LNG Shipping

\*\*\* MOL (Mitsui O.S.K. Lines Ltd) with the participation of China Shipping Development

The Arctic gas fleet includes reinforced ice-class Arc 7 Yamalmax gas tankers; these vessels are optimized for passage through the approach channel to the port of Sabetta on the Yamal Peninsula. The channel is 295 meters wide and 15.1 meters deep. The project was developed by the Finnish company Aker Arctic at the request of Sovcomflot. Design cargo capacity is 172.600 m<sup>3</sup> of LNG. The average cost of one gas tanker is about USD 340 million, and the entire tender is USD 5.5 billion.

A design feature of these gas carriers is the ability to navigate "stern first" in difficult ice conditions (with ice thickness up to 1.5 m) at a speed of about 5.5 knots, and traditionally ("bow first") in open water at a speed of 19.5 knots.

Yamalmax is a double acting ship, which is achieved by three Azipod thrusters with a power of 15 MW each. Such thrusters are categorized as strategic imports subject to sanctions restrictions. The main issue during the construction of Arc 7 tankers is the installation and supply of the Azipod thrusters, which have no analogues in Russia yet. This has already manifested itself at the beginning of the construction of the next series of Yamalmax vessels at the Zvezda Shipbuilding Complex (SBC) for the Arctic LNG-2 project.

The Yamal LNG project involves the Russian company Novatek (50.1%), the French Total and the China National Petroleum Corporation (CNPC) — 20% each, as well as the Chinese Silk Road Fund Co Ltd. — 9.9%. The total capacity of three large-tonnage and one medium-tonnage ("Arctic Cascade") lines is about 18.6 million tons.



It is important to note the significant fluctuations in the economic situation of pipeline gas relative to LNG, depending on the transport range of supply. All other things being equal, pipeline delivery is preferable (more cost-effective) to sea supply at a distance of up to 2500 km, and sea supply — at a longer distance, over 4500 km. The price advantage of LNG is especially evident when supplying Arctic natural gas to Europe [11, pp. 554–560].

The Yamal-LNG project was almost entirely contracted for terms ranging from 25 to 40 years back in 2014, including more than 50% of total capacity by project participants Novatek Gas & Power (2.86 million tons), Total Gas & Power (4 million tons) and CNPC (3.0 million tons). In addition, the Russian Gazprom Marketing & Trading Singapore (GM&T) signed a contract for the supply of up to 2.9 million tons of LNG per year for resale to the Indian GAIL, and the Gas Natural Fenosa Company (Spain) signed a contract for 2.5 million tons. Engie (France) has long-term contracts for Arctic gas for 1 million tons, British Shell — 0.9 million tons, and the largest energy trader Gunvor (Cyprus) — 0.5 million tons. The remaining LNG is traded on the spot market, in particular, TTF (Netherlands).

The Yamal LNG project is focused mainly on the West and has provided LNG supplies to Europe at the level of 12.5 and 14.4 million tons in 2021 and 2022, respectively.

Pricing with project participants and other traders is flexible and takes into account regional peculiarities of pricing natural gas, including LNG: for Europe, the Groningen principle of determining gas prices is used based on the oil basket (fuel oil and gas oil), the contract with CNPC is linked to the “Japan crude cocktail”.

In 2022, all Russian LNG projects operated at almost full capacity: Yamal LNG — 18.6; Sakhalin-2 — 11.6; Cryogas-Vysotsk — 0.7 and Portovaya LNGC (operating since September 2022) — 1.5 million tons; in total, taking into account losses of about 32.5 million tons, which in terms of free gas is about 46 billion m<sup>3</sup>, this is 16% more than in 2021.

Russian LNG exports in 2022 were distributed as follows. Deliveries to Europe increased from 17.4 in 2021 to 20.0 billion m<sup>3</sup> in 2022 due to the launch of the Portovaya LNGC project in September 2022.

In the same years, Russian LNG exports to the Indo-Pacific region increased from 22.2 to 26.0 billion m<sup>3</sup> due to a significant, 6.3-fold increase in Russian LNG imports to India from 0.6 to 3.8 billion m<sup>3</sup>.

In general, in 2022, oil and gas revenues of the Federal budget of the Russian Federation increased due to the growth of oil and gas prices by 2500.0 billion rubles and reached a level of 11556.5 billion rubles versus 9056.5 billion in 2021.

### ***Russia's oil and gas revenues within the current planning horizons (up to 2025)***

Under the conditions of the SMO, the strategic task of the national economy is the formation of the revenue side of the federal budget. The main financial instrument for solving this problem is oil and gas revenues (OGR), which consist of three main types of payments: mineral



extraction tax (MET), tax on additional income from hydrocarbon production (EPT) and export customs duty (ECD).

Regarding the combination of MET and ECD on crude oil, a tax maneuver has been in effect since August 2018, with the aim of gradually reducing of ECD to 0 by 2024 and a proportional increase of MET to this decrease.

ECD is adjusted annually by introducing a corresponding coefficient into the formula for ECD calculating, the value of which for the period from 2019 to 2024 is defined as <sup>6</sup> 0.833 from January 1, 2019 to December 31, 2019, 0.667 from January 1, 2020 to December 31, 2020, 0.5 from January 1, 2021 to December 31, 2021, 0.333 from January 1, 2022 to December 31, 2022, 0.167 from January 1, 2023 to December 31, 2023, 0 from January 1, 2024.

The specific value of ECD for crude oil and petroleum products is calculated by the Ministry of economic development on a monthly basis and is posted on the Ministry's website no later than 4 days before the start of the next month. Monthly information from the Ministry of economic development also contains current values of ad valorem customs duties on natural gas and LNG.

For example, in February 2023, crude oil 2 709 was subject to ECD rate of USD 12.8 per 1000 kg in accordance with the Information of the Ministry of economic development dated January 17, 2023, and in March 2023, the ECD rate was USD 14.2 per 1000 kg in accordance with the Information of the Ministry of economic development dated February 15, 2023. The ECD rate for natural gas is ad valorem and amounts to 30% <sup>7</sup> of the customs value of exported gas. ECD for LNG is equal to 0.

The value of MET on crude oil is determined by multiplying the base rate of 919 rubles per ton by a coefficient determined on the average price of a barrel of Urals oil (USD) and the current USD exchange rate. The value of this coefficient is published in information letters of the Federal Tax Service. For example, in May 2022, the MET rate for crude oil was about 12800 rubles.

The procedure for calculating MET for natural gas is the same. The base rate from January 2023 is 35 rubles per 1000 m<sup>3</sup>. This rate is multiplied by an adjustment factor, the value of which is published in information letters of the Federal Tax Service. The average value of MET and ECD in the stable year 2021 was 823 and 5600 rubles per 1000 m<sup>3</sup>.

To increase the level of OGR, the mineral extraction tax for PJSC Gazprom is increased by 50 billion rubles monthly in 2023–2025, totaling 1800 billion rubles of additional OGR. The relevant law was adopted in November 2022. In addition, the introduction of a tax rate of 35 rubles per 1000 m<sup>3</sup> from January 1, 2023 (not from July 1, 2023, as previously planned) will bring an additional 200 billion rubles.

The ratio of the OGR components in 2021 is presented in table 2.

<sup>6</sup> Decree of the Government of the Russian Federation dated December 14, 2018. No. 1523. URL: <https://www.consultant.ru/> (accessed 21 February 2023).

<sup>7</sup> Decree of the Government of the Russian Federation dated November 27, 2021. No. 2068. URL: <https://www.consultant.ru> (accessed 21 February 2023).

Table 2

*Federal budget revenue structure, 2021, billion rubles*<sup>8</sup>

Indicator	Value	% to*	% to**	% to***	% to****
FB revenues 2021*	25286.4	100.0	no	no	no
Oil and gas revenues** – total	9056.5	35.8	100.0	no	no
Oil revenues***	7394.9	29.3	81.7	100.0	no
– MET – mineral extraction tax	6295.7	24.9	69.5	85.1	no
– ECD – export customs duty, oil and petroleum products	1099.2	4.3	12.1	14.9	no
Gas revenues****	1940.6	7.7	21.4	no	100.0
– MET – mineral extraction tax, gas and condensate	815.2	3.2	9.0	no	42.0
– ECD – export customs duty	1125.4	4.5	12.4	no	58.0
Additional income from hydrocarbon production tax (EPT)	1008.7	4.0	11.1	no	no
Refund of excise tax on crude oil sent for processing	–1287.7	0.0	–14.2	no	no
Non-oil and gas revenues – total	16229.9	64.2	no	no	no

It should be emphasized that, within the framework of the budget rule in force in 2021, 58% of gas revenues were generated by ECD, essentially, exports. In general, the weight of budget payments from pipeline gas exports in 2021 exceeded the same figure for crude oil and petroleum products by 2.4% and amounted to 1125.4 billion rubles.

In countries with a clear focus on raw materials, the formation and accumulation of sovereign funds is considered generally accepted and politically justified — this is how the principle of state regulation in the oil and gas sector is implemented.

In order to solve the tasks of the National Welfare Fund (NWF), formed in Russia on January 1, 2018, a formalized actual budgetary rule has been put into effect since then, which establishes the procedure for filling the NWF. For this purpose, the cut-off price for 1 barrel of Urals oil is set at USD 40.0 in 2017 prices. Annual indexation of 2% of the cut-off price was assumed: in 2018 — 40.8, etc. in 2022 — USD 44.2. “Oil” revenues from oil prices exceeding the cut-off level are sent to the National Welfare Fund. Thus, in 2018, the NWF was replenished to 4036.0 billion rubles, and in the subsequent 2019–2021 — up to 7773.0, 13545.7 and 13565.35 billion rubles, respectively [9, p. 44].

In 2022, OGR exceeded the level of 2021 (Table 2) by 2500 billion rubles and amounted to 11556.5<sup>9</sup> billion with a forecast of 11666.2 (Table 3).

Thus, the basic OGR corresponding to oil prices from USD 40.8 (2018) to USD 43.3 (2022) were formed at the level shown in table. 3. In 2022, basic OGD would have amounted to 6563.6 billion rubles according to the 2017 budget rule (with a cut-off price of USD 44.2). However, in March 2022, due to new geopolitical conditions, the current budget rule was suspended, and the new one came into force in 2023, first in a truncated form, and from 2025 — in full.

Under the new geopolitical conditions, the current budget rule has been reformulated and tied not to the world prices of 1 barrel of Urals oil, but to the basic oil and gas revenues of the Federal budget (FB). Thus, the formula for oil and gas revenues in 2022 looks like this (billion ru-

<sup>8</sup> According to [12, p. 19].

<sup>9</sup> V 2022 g. v RF uvelichilsya eksport gaza i nefi [In 2022, gas and oil exports to the Russian Federation increased]. URL: <https://dprom.online.ru> (accessed 27 February 2023).

bles): 11556.5 = 8000.0 (basic OGR corresponding to the cut-off price of approximately USD 62–63) + 3336.5, of which slightly over 2000.0 billion rubles<sup>10</sup> were aimed at covering the deficit of FB-2022. Thus, in 2022, 1336.5 billion rubles were allocated to the NWF, i.e., at the beginning of 2023, the reserves of the NWF amounted to about 14900 billion rubles.

The 2017 budget rule has been optimized to new geopolitical realities. In the first three years (2023–2025), OGR is determined in the amount of 8000.0 billion rubles, which is achievable while maintaining oil and gas production and export volumes at the 2021 level at prices no lower than USD 62–63 per barrel Urals brand oil. From 2026, an annual indexation of OGR by 4% is provided. OGR received in excess of the indicated amounts are directed to the formation of reserves of the NWF.

New geopolitical conditions and sanctions led to the fact that Russia had to urgently maneuver in search of new buyers, so oil was offered at a significant discount to the exchange price.

Table 3

*Parameters of the Federal budget in 2019–2025, billion rubles<sup>11</sup>*

Parameter	2019	2020	2021	2022*	2022**	2023	2024	2025
INCOME	20188.8	18719.1	25286.4	27693.1	27770.0	26130.3	27239.8	27979.4
OGR	7924.3	5235.2	9056.5	11666.1	11556.2	8939.0	8656.3	8488.5
Basic OGR	4967.4	5557.6	5889.5	6563.6	8000.0	8000.0	8000.0	8000.0
NOGR	12264.5	13483.8	16229.9	16027.0	16213.8	17191.3	18583.5	19490.9
EXPENSES	18214.5	22821.6	24762.1	29006.2	31120.0	29055.6	29432.5	29243.7
BALANCE	1974.3	−4102.5	524.3	−1313.1	−3350.0	−2925.3	−2192.6	−1264.3
NWF	7773.0	13545.7	13565.4	17354.8	15121.6	13135.3	11599.0	10823.2

\*forecast \*\*fact

Against the backdrop of the G7 and the EU countries establishing a price ceiling for Russian oil, future OGRs are no longer determined only by the exchange price; the main criterion for determining the OGR value has become the balance of the Russian Federal budget.

In 2023–2025, the NWF funds will be spent rather than replenished. Replenishment of the National Welfare Fund will begin no earlier than 2026 and in the currencies of friendly countries, for example, in yuan, rupees or rands, and other countries cooperating with Russia.

According to the data<sup>12</sup>, the FB-22 deficit was expected to be at the level of almost the maximum value over the last 20 years and amounted to 3350.0 billion rubles with revenues of 27770.0 billion rubles and expenses of 31110.0 billion rubles against the plan of September 2022 of 29010.0 billion rubles, i.e. increased by 2100.0 billion rubles.

Previously, in September 2022, the FB-22 deficit was planned at the level of 0.9% of GDP or 1313.0 billion rubles (Table 3).

The historical maximum deficit of the Federal budget of the Russian Federation in recent years occurred in the pandemic year of 2020 and amounted to 4102.0 billion rubles (Table 3).

<sup>10</sup> Defitsit byudzheta po itogam 2022 g. stal odnim iz krupneyshikh v istorii Rossii [The budget deficit at the end of 2022 became one of the largest in the history of Russia]. URL: <https://www.forbes.ru/> (accessed 27 February 2023).

<sup>11</sup> According to [13, p. 58]

<sup>12</sup> Unified portal of the budget system of the Russian Federation. URL: <http://budget.gov.ru> (accessed 21 February 2023).

The FB-22 deficit is covered by government borrowings (about 1350 billion rubles) and funds from the NWF, a little more than 2000.0 billion rubles.

This deficit of FB is caused by an increase in expenditures on the SMO, not only in terms of the production of weapons and military equipment and, in general, logistical support of the SMO military grouping, but also by the provision of massive social support to the Russian population during this period, as well as by demilitarization and restoration of vital activity in the liberated territories.

The planned deficit values of FB-23, 24, 25 are at the level of 2925.3, 2192.6 and 1264.3 billion rubles, respectively (Table 3), indicate the end of the acute phase of SMO at the turn of 2025–2026. The deficit in these years is supposed to be covered by the National Welfare Fund.

### **Conclusion**

#### ***Mobility of Arctic pipeline gas and LNG in Asia-Pacific countries***

The drop in pipeline gas export volumes in 2023 is forecast to be about 82 billion m<sup>3</sup>. The change in OGR resulting from a decrease in gas exports was taken into account when forecasting the parameters of FB-23 (Table 3). The share of gas revenues in total OGR is about 21%. Thus, natural gas accounts for about 550 of 2617.2 billion rubles decrease in OGR in 2023. This amount is compensated by an increase in the MET of PJSC Gazprom by 50 billion rubles per month in 2023–2025, which will amount to 600 billion rubles annually.

Domestic consumption of natural gas, taking into account the ongoing gasification program, has fluctuated over the past ten years (2012–2022) from 408 to 484 billion m<sup>3</sup> in 2015 and 2022, respectively. It is possible to use the remaining 82 billion m<sup>3</sup> in the domestic market within the current planning horizons (up to 2025), doubling the gasification rate of 2022 in order to maintain production at the level of 700–720 billion m<sup>3</sup> by 2026.

Pipeline gas exports in Russia were until recently focused exclusively on Europe; European countries, including Turkey, accounted for 82.8% of Russian gas exports in stable 2021, while CIS countries, including Belarus and Kazakhstan, accounted for 13.4%, and the only Asia-Pacific country, China — 3.8% [8, p. 27].

In the eastern direction, the Power of Siberia project is being developed, which consists of three routes: eastern (Power of Siberia-1), western (Power of Siberia-2) and far-eastern (Power of Siberia-3).

The Power of Siberia-1 pipeline is currently in operation, with a design capacity of 38 billion m<sup>3</sup> per year. Essentially, in the new geopolitical conditions, this is the maximum possible supply of pipeline gas to China in the foreseeable future. The gas pipeline was put into operation on December 2, 2019. Given the lack of enthusiasm from the Chinese side in implementing this project, the contract stipulated the following procedure<sup>13</sup>: the volume of natural gas supplies will be in-

<sup>13</sup> «Sila Sibiri» zapushchena: chto vpered i — triumf ili proval ["Power of Siberia" launched: what lies ahead - triumph or failure]. *Biznes i finansy* [Business and Finance], 2019. URL: [http://social.ridus.ru/blog/43578090601/-Sila-Sibiri-zapuschena-chto-vpered-i-triumf-ili-proval?utm\\_referrer=mirtesen.ru](http://social.ridus.ru/blog/43578090601/-Sila-Sibiri-zapuschena-chto-vpered-i-triumf-ili-proval?utm_referrer=mirtesen.ru) (accessed 28 February 2023).

creased gradually as the infrastructure and the Chinese gas transportation system are ready — 5 billion m<sup>3</sup> in 2020; 10 billion m<sup>3</sup> in 2021; 15 billion m<sup>3</sup> in 2022, reaching the design capacity of 38 billion m<sup>3</sup> by 2025. This is the way it is going — in 2021, the supply volume was 7.6, and in 2022 — 15 billion m<sup>3</sup>.

This route is used to supply natural gas to the sparsely populated by Chinese standards (only 70 million people) north-eastern provinces of Jilin and Liaoning. Gas consumption in this region has reached the level of 14–15 billion m<sup>3</sup>, and further development seems to be an urgent, but very distant task.

At the beginning of 2022 (before the start of the SMO), a feasibility study was completed for the western route (through Mongolia) with a capacity of 50 billion m<sup>3</sup> per year. Commissioning of this gas pipeline is expected in 2027–2028<sup>14</sup>. Taking into account financial restrictions (Table 3), it is quite possible to change these deadlines.

Power of Siberia-3 (Far Eastern route) involves the supply of natural gas from the offshore Kirinskoe gas condensate field (Sakhalin — Khabarovsk — Vladivostok — state border of China). The capacity of the route is 5–10 billion m<sup>3</sup>. Since the Kirinskoe gas condensate field is under sanctions, the commissioning of this route has been postponed indefinitely.

For more details on the implementation details of the Power of Siberia project, see [14, p. 21–28].

Thus, the restoration and/or increase in the export of Russian pipeline gas, both to the east and to the west, is realistic only with a radical change in the current new geopolitical conditions.

Exports of natural gas to the Asia-Pacific region account for 36.5% of global exports, and the volume of LNG supplies is five times higher than pipelines. In 2021, the ratio was 372 to 74 billion m<sup>3</sup>. It should be emphasized that if, before recent events, pipeline gas supplies to Europe were of a strategic nature and carried out over long distances, then the Asia-Pacific countries used pipelines to solve tactical problems — providing gas to sparsely populated areas remote from the sea; and wherever there is any possibility, LNG is used. The locality of pipeline gas is confirmed by the example of China.

The less developed northern provinces are supplied with gas from Russia (15 billion m<sup>3</sup>), the western ones — from Kazakhstan, Turkmenistan and Uzbekistan (41.7 billion m<sup>3</sup> in total), the southwestern — from Myanmar (3.9 billion m<sup>3</sup>). This accounts for about 80% of all pipeline exports to Asia-Pacific countries. Neighboring countries also supply each other with short-distance pipelines: Myanmar to China and Thailand, and Indonesia to Malaysia and Singapore.

As for LNG, 74% of all supplies to Asia-Pacific countries come from China, Japan and South Korea. All deliveries are long-distance, passing along the Indo-Pacific route, called according to

---

<sup>14</sup> Yarlyk poluchen. «Sila Sibiri-2» budet vvedena v ekspluatatsiyu cherez neskol'ko let [The shortcut has been received. "Power of Siberia-2" will be put into operation in a few years]. URL: <https://dzen.ru/a/YfEvQtijFQ4iSOB0> (accessed 28 February 2023).

Chinese tradition the Southern Silk Road, through the Strait of Malacca, which is easily blocked at the narrowest point in the Singapore area.

Russia may well build an alternative LNG supply route through the Northern Sea Route via the eastern route. It is necessary to build new LNG plants, but the most important things are to build our own fleet of gas carriers, to obtain the necessary competencies and to acquire the skills of building reinforced ice-class vessels at the shipbuilding complexes of the Far East. This is the only way to restore the previous level of Arctic natural gas exports over time.

### *Acknowledgments and funding*

The work was carried out within the framework of the theme FMEZ-2023-0009 “Strategic planning for the development of the Arctic in new geo-economic and political conditions” under the state assignment of the Federal Research Center “Kola Science Center of the Russian Academy of Sciences”.

### *References*

1. Ivashov L.G. *Geopolitika russkoy tsivilizatsii* [Geopolitics of Russian Civilization]. Moscow, Institut russkoy tsivilizatsii Publ., 2015, 800 p. (In Russ.)
2. Mahan A.T. *Vliyanie morskoy sily na frantsuzskuyu revolyutsiyu i Imperiyu. V 2-kh tomakh* [The Influence upon the French Revolution and Empire]. Moscow, Saint Petersburg, Terra Fantastica Publ., 2002, 575 p., 605 p. (In Russ.)
3. Mahan A.T. *Vliyanie morskoy sily na istoriyu* [The Influence of Sea Power upon History]. Moscow, Saint Petersburg, Terra Fantastica Publ., 2002, 634 p. (In Russ.)
4. Colomb P.H. *Morskaya voyna* [Naval Warfare]. Moscow, Saint Petersburg, AST Publ., Terra Fantastica Publ., 2003, 271 p. (In Russ.)
5. Mackinder H.J. The Geographical Pivot of History. *Geographical Journal*, 1904, vol. 23, no. 4, pp. 421–437.
6. Vandam A. *Nashe polozhenie* [Our Position]. Moscow, AST Publ., Astrel' Publ., 2004, 368 p. (In Russ.)
7. Ivashov L.G. *Geopoliticheskaya drama Rossii* [Russia's Geopolitical Drama: Will Russia Survive in the 21st Century?]. Moscow, Argumenty nedeli Publ., 2021, 528 p. (In Russ.)
8. *BP Statistical Review of World Energy*. London, 2022, 60 p.
9. Kozmenko S.Yu., Kozmenko A.S. The Arctic Geo-Economy: Mobility of Strategic Oil Resources at the End of Globalization. *Arktika i Sever* [Arctic and North], 2022, no. 49, pp. 38–54. DOI: 10.37482/issn2221-2698.2022.49.38
10. Kozmenko A.S. Prostranstvennaya organizatsiya kommunikatsiy pri transportirovke arkticheskoy nefti na vostok [Spatial Organization of Communications During Transportation of Arctic Oil to the East]. *Izvestiya Sankt-Peterburgskogo gosudarstvennogo ekonomicheskogo universiteta* [Journal of the St. Petersburg State University of Economics], 2020, no. 6 (126), pp. 136–141. DOI: 10.24411/2311-3464-2020-10003
11. Kozmenko S.Yu., Masloboev V.A., Matviishin D.A. Obosnovanie ekonomicheskogo preimushchestva morskoy transportirovki arkticheskogo prirodnogo gaza v vide SPG [Justification of Economic Benefits of Arctic LNG Transportation by Sea]. *Zapiski Gornogo instituta* [Journal of Mining Institute], 2018, vol. 233, pp. 554–560. DOI: 10.31897/PMI.2018.5.554
12. *Ispolnenie Federal'nogo byudzheta i byudzhetov byudzhetnoy sistemy Rossiyskoy Federatsii v 2021 g.* [Execution of the Federal Budget and Budgets of the Budgetary System of the Russian Federation in 2021]. Moscow, AO «Finpol» Publ., 2022, 138 p. (In Russ.)
13. *Osnovnye napravleniya byudzhetnoy, nalogovoy i tamozhenno-tarifnoy politiki na 2023 god i na planovyy period 2024 i 2025 godov* [The Main Directions of the Budget, Tax and Customs Tariff Policy

for 2023 and for the Planning Period of 2024 and 2025]. Moscow, AO «Finpol» Publ., 2022, 72 p. (In Russ.)

14. Kozmenko S.Yu. Ekonomicheskaya kon'yunktura Arktiki na kitayskom energeticheskom rynke [The Economic Situation of the Arctic in the Chinese Energy Market]. *Sever i rynek: formirovanie ekonomicheskogo poryadka*, 2021, no. 4 (74), pp. 21–28. DOI: 10.37614/2220-802X.4.2021.74.002

*The article was submitted 02.03.2023; approved after reviewing 17.03.2023; accepted for publication 20.03.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*



Arctic and North. 2023. No. 52. Pp. 54–75.

Original article

UDC: [339.9+332.1](985)(045)

doi: 10.37482/issn2221-2698.2023.52.62

## Transformation of the Development Processes of Transboundary Territories of the Far Eastern Arctic and Mechanisms of Their Regulation: The Role of Critical Infrastructure

**Boris Kh. Krasnopolskiy** <sup>1</sup>✉, Dr. Sci. (Econ.), Professor

<sup>1</sup> Economic Research Institute, Far Eastern Branch of the Russian Academy of Sciences, ul. Tikhookeanskaya, 153, Khabarovsk, Russia

<sup>1</sup> boriskrasno@gmail.com ✉, ORCID: <https://orcid.org/0000-0002-1549-036X>

**Abstract.** In this article, on the basis of conceptual approaches derived from research in the field of theories of spatial economy and infrastructure, the problems of naturally occurring significant changes in the processes of development of natural-economic formations formed in the geostrategic territories of the North-Arctic part of the Far East, representing at the same time the eastern part of the Arctic zone of the Russian Federation (AZRF) are considered. Their transboundary role in the global Arctic basin, as well as at the junction of Russia with the state of Alaska, USA, in the Pacific Arctic, also requires intensification of research in this area, especially at the present stage of the well-known difficulties in international cooperation between our country and the United States. All this requires focusing the attention of specialists on the study of these processes, as well as on the closely related issues of the necessity to adjust the methods and mechanisms of state-regional regulation of the development of these economic entities. In the near future, the regulatory tools used should ensure the transition of these territories from the micro-level of primary, mainly raw material, spatial-economic formations to a new stage, to a higher meso-level of industrial development of economic complexes. As studies show, this transition will occur on the basis of advanced creation of a system-organized critical infrastructure, its main elements, which, due to their new spatial configuration, will provide the necessary conditions for this transition and give the opportunity to maximize the use of exogenous factors and emergent effects of the development of economic entities.

**Keywords:** *transboundary territory, the Far Eastern Arctic, the Arctic zone of the Russian Federation (AZRF), critical infrastructure, trunk infrastructure, state regulation, North-Eastern mesoregion*

### *Acknowledgments and funding*

The article was prepared as part of the implementation of the research program “Theoretical and methodological justification for the transformation of methods and mechanisms of state regulation at the current stage of development of the territories of the Far Eastern Arctic” on the planned topic of the Institute of Economic Research of the Far Eastern Branch of the Russian Academy of Sciences for 2023 “Study of trends and patterns of socio-economic development of the Far Eastern macroregion”.

### *Introduction*

The development of geostrategic territories of the North Arctic part of the Far East is currently associated with serious transformations in the formation of their spatial and economic

---

\* © Krasnopolskiy B.Kh., 2023

For citation: Krasnopolskiy B.Kh. Transformation of the Development Processes of Transboundary Territories of the Far Eastern Arctic and Mechanisms of Their Regulation: The Role of Critical Infrastructure. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 62–86. DOI: 10.37482/issn2221-2698.2023.52.62

structures and infrastructures. In the infrastructure support for the formation of economic entities, first of all, the role of critical infrastructure elements, especially its main components, increases significantly. This is caused mainly by the processes of formation of a new economic structure and the transition of their economic systems from primary raw material industrial production specialization to the level of more industrially developed forms. Here, to assess the influence of infrastructure, in particular its external, exogenous, backbone elements, on the final efficiency of emerging economic entities, it is necessary to use non-traditional approaches established in the “mainstream” economy according to a certain “sectoral” principle of direct assessment of “costs — results”, and system-evolutionary approaches arising from the postulates of synergetics and their application in the newly developing direction of economic analysis — system economics.

In addition, the emerging transformations in the processes of development of economic entities in the North Arctic sector of the Far East are also associated with increased requirements for their socio-economic sustainability as the border territories of the country, representing its geostrategic “outpost” in the Pacific Arctic zone at the junction with such a country like the United States, which is currently pursuing an unfriendly policy towards Russia and is practically leading various anti-Russian actions and sanctions in the world.

Such transboundary spatial and economic formations at the junction of different states are basically homogeneous, naturally similar territories that do not have large internal differences. But significant differences can form between them in other main regional-forming characteristics: population density, socio-economic development, per capita income, etc., which depends on belonging to one or another country. If there are significant gaps in these indicators, serious problems may arise in organizing cross-border cooperation.

This entire complex of problems and issues is discussed in this article on the basis of the research conducted.

### ***Conceptual approaches to research***

The study uses conceptual approaches derived from theories of spatial economics and infrastructure. To date, there are no standard and clear definitions of not only the concept of spatial economics as a science, but also the term “infrastructure”, arising from some more or less complete theory and model of economic processes. However, the completeness of the model of these processes is still questionable.

As for research in the field of spatial economics, it is believed that this area of science is more integrated and better reflects the real processes of spatial development of the entire society in comparison with its competing traditional regional economy. The subject of spatial economics is those economic processes that occur not only in regions and their systems, but also in all spatial forms in the natural resource and environmental spheres and the closely related economic and social activities of individual and society as a whole.

In modern economic literature, which is replete with scientific works devoted to spatial economics as a science, the works of the major Russian scientist A.G. Granberg stand out for their fundamental nature <sup>1</sup> [1, pp. 18–24; 2, pp. 87–107].

The scientific works of P.A. Minakir, who for the first time analyzed and generalized the existing rather disparate concepts in this scientific direction and formulated his own idea of its subject, objects and tools [3; 4, pp. 8–20], are of high scientific significance. The works of other specialists in this field are also of great importance, dozens of publications of which are published, for example, in the fundamental monograph “Modern problems of spatial development” [5].

Based on prevailing opinions in the field of studying problems in spatial economics, the author believes that solutions to these problems should be sought at the intersections of three basic economic disciplines: economic geography, regional economics and household economics, exploring the elements of such important components as nature–man–society in a system of universal planetary co-evolutionary processes that create opportunities for the life of all humanity [6, Krasnopolskiy B.Kh., pp. 147–156]. In this approach, spatial economics also collaborates with research in the field of natural science, which includes the totality of natural sciences taken as a whole, especially astronomy, geography, geology, ecology, biology.

Theoretical approaches to the formation and functioning of such a category of economic systems as infrastructure have long been of interest to both foreign and domestic scientists [7, Jochimsen R.; 8, Buhr W; 9, Carlsson R., Otto A., Hall J.W., pp. 263–273; 10, Gramlich E., pp. 1176–1196; 11, Kuznetsova A.I.; 12, Lantsov A.E., pp. 47–52; 13, Mallaev Kh.N., Avramchikova N.T., pp. 39–46, etc.]. Most of the literature in this area shows that methodological approaches to the study of such a phenomenon as infrastructure are based mainly on the perception of it as a certain specific, but generally “industry” type of activity and on assessing its role in the growth of economic efficiency of a region according to the direct principle of assessing the “cost–results” of its constituent industries. Such assessments are, of course, applicable and play their role. But in our opinion, they are not sufficiently scientifically substantiated and promising.

As for the concept of infrastructural analysis of natural and economic formations, which the author of this article adheres to, it is based on his scientific views presented in various publications, for example [14, Krasnopolskiy B.Kh.]. Research on the phenomenon of infrastructure, according to the author, should be carried out on the methodological basis of such a relatively new direction of economic science as system-evolutionary economics, which arose on the basis of the postulates of modern natural science [15, Nelson R.R., Winter N.J.; 16, Kleiner G.B.; 17, Kleiner G.B., Rybachuk M.A. et al.]. We also believe that scientifically based methods of truly systemic regulation of various ranks of economic entities based on the creation and maintenance of the functioning of their infrastructure subsystems should be associated with such a scientific direction

---

<sup>1</sup> Granberg A.G. Prostranstvennaya ekonomika v sisteme nauk: Doklad na Pervom rossiyskom ekonomicheskom kongresse (7-12 dekabrya 2009 g.) [Spatial economics in the system of sciences: Report at the First Russian Economic Congress (December 7-12, 2009)]. Moscow, 2009.

as synergetics [18, Haken G.; 19, Prigozhin I., Stengers I.; 20, Zang W.-B. et al.]. This scientific discipline studies the processes that are closely related to such concepts as chaos (disorder) and stability (order), as well as with two opposing but complementary models of systems organization: hierarchical and heterarchical. In this case, there is a certain pattern in the implementation of these processes, where internal (endogenous) and external (exogenous, backbone) elements of infrastructure realize states of order and chaos in the development of systems <sup>2</sup>.

Understanding the role of infrastructure with this conceptual approach is closely related to such an indicator of systems development as “self-organization”, which should be implemented practically throughout the entire life cycle of a dynamic system. The need for constant self-regulation of the processes of “survival” of the current system is expressed in the formation of its infrastructure, the external elements of which are constantly aimed at “probing” future options for its development, adapting the system and its main elements to new operating conditions and creating opportunities for future development. In critical cases, when approaching the bifurcation point, it is this element of the infrastructure that first of all signals the emergence of crisis situations that can lead it to stagnation [21, Krasnopolsky B.Kh., pp. 353–368].

The territories considered in this article with their aquatorial areas are the primary complex element of geosystems, their “original” spatial “cell”, closest to the “earth”, to the surrounding natural environment, and to the potential of natural resources. They include a number of interrelated components, the functioning of which depends on their location, on the ecological features of the area, on its established biogeocenoses and their natural and environmental sustainability, on the mentality of the indigenous population and their attachment to the given territory, as well as on the combination of historical experience and economic activity in the arrangement of their own habitat.

As for cross-border economic entities, the category of which also includes the regions under study, it is known from practice that sometimes uncontrollable processes of divergence take place, expressed in significant differences, primarily in the levels of socio-economic development of the regions. This leads to increasing differentiation of the economic space in the transborder zone, to the accumulation of interregional gaps in the general levels of economic activity, the quality of life in neighboring spatial formations and, ultimately, to various kinds of contradictions and conflicts.

Many studies are devoted to these problems [22, Kuznetsov A.V., Kuznetsov O.V., pp. 58–72; 23, Prokopyev E.A., Kurilo A.E., pp. 3–14; 24, Kolosov V.A., Zotova M.V., Sebentsov A.B., pp. 8–20; 25, Skufina T.P., Mitroshina M.N., pp. 87–112, etc.].

The main fundamental conclusion from these works is that in the spatial and economic areas of border countries, which are usually close in their natural geographic location, there may be

---

<sup>2</sup> Internal elements of the infrastructure are responsible for creating and maintaining order in the system, external elements are responsible for its openness, which is associated with the introduction of a certain portion of chaos from the exogenous level. This forces the system under consideration to constantly improve the mechanisms of self-organization and adaptation to changing internal and external conditions.

significant gaps between their natural homogeneity and socio-economic heterogeneity, which depends on the characteristics and capabilities of their development in each of the cross-border countries. The various socio-economic disproportions that arise in the development of the border regions of each country and neighboring countries should be identified at an early stage and, if they lead to significant divergence and differentiation, then measures should be immediately taken to adjust the existing methods and mechanisms for regulating and overcoming these differences and reducing them to a minimum.

### Objects of research

The objects of study are the territories of the Arctic zone of the Russian Federation (AZRF), in particular its Far Eastern sector, which, according to the Russian classification of this zone, includes the administrative regions of the Chukotka Autonomous Okrug and the thirteen North Arctic uluses of the Republic of Sakha (Yakutia) and the waters of the exclusive economic zones surrounding these territories of the seas.

Besides, due to the discussion of issues of transboundary interaction of this region in the Pacific sector of the world Arctic, the object of study is the state of Alaska, USA, with its water zones. The Chukotka Autonomous Okrug, which is part of the Far Eastern Arctic sector, is also a region of Russia directly adjacent to this state in the Pacific Arctic sector across the Bering Strait (see Fig. 1).



Fig. 1. Map of the Pacific Arctic sector (the Bering Strait region is in the square)<sup>3</sup>.

The state of Alaska occupies a special place in US geostrategy in the Arctic. As it is known, US President Joe Biden on October 7, 2022 approved a new US strategy for the Arctic region, de-

<sup>3</sup> Source: [26].

signed for 2022–2032 — “National Strategy for the Arctic Region”<sup>4</sup>. One of the recently published foreign scientific works on this subject states the following: “Alaska occupies a central place in the Biden administration, which plans to increase its influence in the Arctic to ensure national security, coordinating common approaches with North Pole partners”<sup>5</sup>, and another: “The new Arctic strategy released on Friday by the White House recognizes big changes in the region over the past decade — the rise of military threats posed by Russia, the largest Arctic country”<sup>6</sup>. For us, this speaks volumes, in particular, about the growing role of the trans-border Far Eastern territories of the Russian Arctic in ensuring the geopolitical security of our country.

In general, the transboundary zone of the Far Eastern and Pacific Arctic in the entire global Arctic basin occupies approximately 1/6 of its part. This entire sector of the global Arctic with its Far Eastern and Pacific territories represents a contact zone between the Eurasian and North American continents at the junction of two oceans — the Arctic and the Pacific. In this sector, as in almost any trans-border zone, both centripetal forces, dictated by its closely interconnected geo-structural natural features, and centrifugal forces, dependent on state-administrative borders and the geopolitics of neighboring countries, are constantly and simultaneously operating.

As for our national Arctic zone, the development of more complete reproductive cycles and chains for deep processing of extracted natural resources at the level of higher technological stages and obtaining added value is extremely expensive and economically unprofitable. This applies to the greatest extent to the East Eurasian part of the Russian Arctic, since in the European part of the Arctic, transboundary territories are (due to a number of historical reasons) socio-economically more developed compared to its eastern part. Almost this entire zone, including areas of the Far Eastern Arctic, is a territory with weak infrastructural links connecting individual centers of industrial and production development around localized natural and economic centers. Here, in contrast to fairly developed territorial-production complexes that have ample opportunities for organizing reproductive processes, these centers are characterized mainly by a narrow specialization in the extraction of local natural resources concentrated in their depths and surrounding space, the development of which causes the formation of “truncated” in its structure natural-economic formations.

The first step in overcoming this situation should be a significant increase in the infrastructure provision of the regions, primarily with elements of critical infrastructure, which, by the most general definition, includes economic and defense facilities, networks, services and systems, the failure of which will affect security and life support and the well-being of the country’s citizens. In a more specific form, its composition is determined by the area that is being considered in this

---

<sup>4</sup> Lukin Yu.F. Arkticheskie strategii SShA: i ne drug, i ne vrag, a tak... [US Arctic strategies: neither friend nor foe, just...]. URL: <http://www.arcticandnorth.ru/upload/medialibrary/293/> (accessed 11 February 2023).

<sup>5</sup> The Role of Alaska in U.S. Arctic Strategy (2022). URL: <https://warsawinstitute.org/role-alaska-u-s-arctic-strategy/> (accessed 11 February 2023).

<sup>6</sup> White House Arctic strategy puts new emphasis on national defense and threats posed by Russia (2022). URL: <https://alaskabeacon.com/briefs/white-house-arctic-strategy-puts-new-emphasis-on-national-defense-and-threats-posed-by-russia/> (accessed 11 February 2023).



case. Regarding the spatial development of our country, there is its own classification of critical infrastructure [27].

In our study of the North Arctic territories of the Far Eastern macroregion, leaving aside the types of critical infrastructure in the purely defense sector, which are not discussed in this article, we will consider such classical for the formation and development of spatial economic entities types of activities as transport and energy supply with their communication functions, as well as social infrastructure. The need to include these infrastructure components is related to the current and future situation in the development of both the entire Far East and its North Arctic territories and waters. Communication infrastructure will significantly increase the possibilities of access to local resources along reproduction chains from places of their extraction to places of sale, and developed social infrastructure will significantly increase the social and labor sustainability of territories.

### ***Discussion and results***

When talking about the Far Eastern Arctic sector, we focus on its transboundary location. These territories, according to the classification, are geostrategic; according to the relevant government decree, they include regions with an exclave position that are part of the Russian Arctic, as well as those located in the North Caucasus, the Far East and bordering countries that are part of the European and Eurasian economic unions.

It should be noted that the Arctic region of the Far East (Far Eastern Arctic), bordering the state of Alaska, USA, is simultaneously included in two state geostrategic zones of Russia: as part of the Far East and as an eastern “outpost” of the Russian Arctic. This region, the most remote border “corner” of our country both in its Arctic zone and on the Northern Sea Route (Northern Sea Route), is now in the most difficult situation in terms of its sustainable socio-economic development. In addition, in relation to this region, there are some risks in ensuring the geopolitical security of the country in the Beringian zone due to its close proximity to Alaska.

Let us emphasize once again that we are not talking about the military-political confrontation between Russia and the United States. In our case, we are talking about the sustainability of the socio-economic development of the region in the transboundary zone, which to a certain extent is connected, as world and domestic practice shows, with the creation of more or less comparable socio-economic conditions in comparison with the territories of neighboring countries. For example, one of the studies on this topic emphasizes: “An important feature of Russian federal policy towards border regions is the regulation of their socio-economic development based not so much on considerations of economic feasibility, but on ensuring territorial integrity and national security” [22, Kuznetsov A.V., Kuznetsova O.V., p. 65].

Infrastructural analysis of the development of the territories of the Far Eastern Arctic leads to the perception of this zone as a single, newly emerging spatial and economic entity. This conclusion is confirmed primarily by the systemic role of infrastructure, as well as the geographical



features of this zone and the entire history of its economic development, including the activities of indigenous peoples, the development of the mineral resource base and the processes of its development and settlement of newcomers, the influence of the Northern Sea Route and the action of other factors. The integration processes of the North Arctic territories of Yakutia and Chukotka demonstrate the growing mutual influence of external, main elements <sup>7</sup> of both the transport and energy infrastructure of both regional entities, which indicates the gradual formation under the influence of these processes of a closely interconnected high-latitude spatial-economic entity. The main purpose of these main elements is to prevent the possible “sliding” of economic entities towards processes of “stagnation”, to an increase in autarky in their development and “looping” at the stages of primary development of natural resources, which turns them into an eternal raw material appendage of the country’s national economy.

The government decisions create promising opportunities for their more comprehensive and sustainable development, but these changes are associated mainly with their sectors of industrial specialization and technical and technological infrastructure support, i.e., internal elements of infrastructure. In particular, these documents proposed the creation of several priority development territories (TAD) and eight supporting economic zones, which were scheduled for creation in one of the early editions of the Program for the socio-economic development of the Arctic zone <sup>8</sup>. The formation of mineral resource centers was planned as a priority project for most of these support zones as their industrial specialization. As for the Far Eastern Arctic, they include the seventh (North Yakutsk) and the eighth (Chukotka) support economic zones.

An important role at the present stage of development of these territories is played by the “Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2035” approved by the Decree of the President of the Russian Federation in 2020 with its adjustment based on the Decrees of 2021 and 2023 <sup>9</sup>. It presents a broad program of development directions for the Chukotka Autonomous Okrug and the Republic of Sakha (Yakutia).

As for Chukotka, these areas include:

- development of the seaport of Pevek and its terminals;
- creation of a transport and logistics hub in the deep-water, year-round seaport of Provideniya;

---

<sup>7</sup> When we speak here in the language of spatial economics about the main elements of the infrastructure of any spatial economic entities, then in the language of administrative management of the entire hierarchical “pyramid” of these entities we need to understand that we are talking about sectors of the infrastructure of federal subordination.

<sup>8</sup> Opornye zony razvitiya sostavyat osnovu gosprogrammy po Arktike, 7 sentyabrya 2017 [Support zones for development will form the basis of the state program for the Arctic, September 7, 2017]. URL: <https://tass.ru/ekonomika/4543491> (accessed 12 April 2023).

<sup>9</sup> Strategiya razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda. Utverzhdena Ukazom Prezidenta RF ot 26.10.2020 g. № 645 v redaktsii ukazov Prezidenta ot 12.11.2021 № 651 i ot 27.02.2023 № 126 [Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035. Approved by Decree of the President of the Russian Federation dated October 26, 2020, No. 645 as amended by Presidential Decrees dated November 12, 2021, No. 651 and dated February 27, 2023 No. 126]. URL: <http://pravo.gov.ru/proxy/ips/?docbody=&firstDoc=1&lastDoc=1&nd=102888023> (accessed 15 April 2023).

- modernization of the Chaun-Bilibino energy hub in the west of Chukotka, bordering Yakutia, on the basis of a floating nuclear power plant (FNPP) in the city of Pevek;
- joining the unified telecommunications network of the Russian Federation by creating an underwater fiber-optic communication line Petropavlovsk-Kamchatskiy – Anadyr;
- development of the Baim ore zone and the Pyrkakaysko-Mai mineral resource center in the Chaun-Bilibino industrial complex bordering Yakutia, including the gold-bearing porphyry copper deposit “Peschanka”, the largest world-class copper deposit in the north-east of Russia;
- formation of the Beringovskiy priority development territory — development of deposits in the Amaam and Verkhne-Alkatvaam areas of the Bering coal basin, focused on the export of high-quality coal to the countries of the Asia-Pacific region;
- construction of a year-round terminal in the deep-sea Arinay lagoon, etc.

It is worth noting that in terms of creating elements of the main critical transport infrastructure, the first step has been taken and the construction of the Kolyma–Omsukchan–Omolon–Anadyr interregional highway is planned, which will connect the Magadan region with Chukotka.

This project shows that the turn to the active creation of an infrastructure backbone “framework” not only in the Arctic territories, but also in the territories connecting them with the “sub-Arctic” regions of the Northeast has already begun, as will be discussed below.

The main directions of implementation of the Strategy in the North Arctic municipalities of the Republic of Sakha (Yakutia) are:

- dredging of the Anabar, Lena, Yana, Indigirka and Kolyma rivers;
- comprehensive development of the regions of the Anabar and Lena basins, including the world’s largest Tomtor deposit of rare earth metals, alluvial diamond deposits in the territories of the Anabar, Bulun, Olenek districts, the Verkhne-Munskoe diamond deposit, the Taymyl’skoe coal deposit, the West Anabarskoe oil mineral resource center;
- comprehensive development of the Tiksi village, including the development of dual-use infrastructure and the reconstruction of the Tiksi seaport and its terminals;
- comprehensive development of territories located in the Yana River basin, providing for the construction of energy and transport infrastructure facilities, development of the mineral resource base of solid minerals in the Yana basin, including the Kyuchus gold deposit<sup>10</sup>, the Prognos silver deposit, the Deputatskoe tin deposit and the Tirekhtyakh tin deposit; comprehensive development of territories located in the Indigirka River basin, ensuring their energy security and diversifying the economy through the develop-

---

<sup>10</sup> Kyuchus cluster of solid mineral deposits using electricity from a low-power nuclear power plant based on two RITM-200N reactor units. The project is closely related to the development of the Northern Sea Route. The volume of transportation along the NSR should exceed 100 million tons in 3 years, and by 2030 - 200 million tons. See: The Kyuchus industrial cluster project may receive TAD status. URL: <https://www.sakha.gov.ru/news/front/view/id/3336211> (accessed 11 March 2023).

ment of the Krasnorechenskoe coal deposit and organizing the production of building materials; comprehensive development of territories located in the Kolyma River basin, providing for the modernization of the river port of Cape Verde and the development of the Zyryanskiy coal mineral and raw materials center<sup>11</sup> at the junction with the territory of Chukotka;

- construction of the Zhatai shipyard, construction of river vessels of various types and purposes, including the “river-sea” class to provide coastal transportation throughout the Arctic zone between Yakutia and Chukotka, etc.

As for the transboundary Pacific sector of the global Arctic, we justified and proposed in 2019 at the official level the creation of a joint interstate/interregional organization between the Far Eastern North Arctic territories and the state of Alaska, USA, namely the Bering/Pacific Arctic Council Region (BPAC), which was to operate under the auspices of the Arctic Council and in close cooperation with the Barents/Euro-Arctic Council (BEAC). This proposal was supported by the International Council on US-Russia Relations, and a Working Group was established to implement it, consisting of a representative of Alaska, Mr. Paul Foose, Honorary Chairman of the State Marine Exchange, and the author of this article, a representative of Russia (see Fig. 2).

---

<sup>11</sup> Strategiya razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda. Utverzhdena Ukazom Prezidenta RF ot 26.10.2020 g. № 645 v redaktsii ukazov Prezidenta ot 12.11.2021 № 651 i ot 27.02.2023 № 126 [Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035. Approved by Decree of the President of the Russian Federation dated October 26, 2020, No. 645 as amended by Presidential Decrees dated November 12, 2021 No. 651 and dated February 27, 2023 No. 126]. URL: <http://pravo.gov.ru/proxy/ips/?docbody=&firstDoc=1&lastDoc=1&nd=102888023> (accessed 15 April 2023).

To support U.S. -  
Russia Relations  
and expand  
bilateral  
commerce.



## Council for U.S.-Russia Relations Совет по отношениям «США-Россия»

August 9, 2019

*On the initiative establishing a "Bering Pacific Arctic Council" Working Group:*

At the 24<sup>th</sup> annual meeting of the Russian American Pacific Partnership (RAPP) in Khabarovsk, Russia June 26-27, 2019, a proposal was made at the "North Pacific and Arctic Cooperation" panel for the creation of a bi-national Russia and United States Bering Pacific Arctic Council (BPAC), modeled on the precedent of the Barents Euro-Arctic Council (BEAC) and Barents Regional Council (BRC), each established in 1993.

RAPP supported this proposal proposing that a volunteer Working Group be established outside of RAPP to advance the BPAC initiative, but reporting periodically to the RAPP forum. RAPP agreed to provide the Working Group reasonable assistance within its capacities to the Working Group. Two volunteer co-chairs were identified to lead the initiative Working Group: Paul Fuhs, President Emeritus of the Marine Exchange of Alaska and Professor Boris Krasnopolski, Senior Economist of the Far Eastern Branch of the Economic Research Institute, Russian Academy of Sciences. Numerous RAPP meeting attendees agreed to participate in the Working Group, however the Working Group seeks to be inclusive of additional members beyond meeting attendees wanting to participate in the Working Group and contribute in the BPAC initiative.

The purpose of the Working Group is to formulate the structure of the Council, to draft a Declaration defining the purpose and purview of the Council factoring the range of interests of parties in the national, regional and local governments, organizations and businesses in the defined geography of the BPAC in the Russian Far East and Alaska. Once these draft documents are finalized, a Council founding meeting date and place is to be determined.

The national governments hold important legal and regulatory powers over the lands and oceans of the Council's geographical focus, however, like the BEAC and the BRC, the BPAC also seeks the active participation of regional and local community and business entities in the Working Group, in defining the Council structure and purpose, and later in determining the agenda and implementation strategies of the Council. Such a collective and broadly inclusive approach is supported by RAPP and the Working Group co-chairs.

I ask for your cooperation and assistance to this important Working Group initiative. If you would like to participate in the Bering Pacific Arctic Council (BPAC) Working Group, please contact Paul Fuhs: [Paulfuhs@earthlink.net](mailto:Paulfuhs@earthlink.net) and/or Boris Krasnopolski: [boriskrasno@gmail.com](mailto:boriskrasno@gmail.com)

Sincerely,

Derek Norberg  
Executive Director RAPP  
President Council for US-Russia Relations

Council for U.S.-Russia Relations

- 4241 21st Avenue West, Suite 104 Seattle, Washington 98199 Tel 206-770-4015
- [council@usrussia.org](mailto:council@usrussia.org) <http://www.usrussia.org>

Fig. 2. Order of the Executive Director of the Russian-American Pacific Partnership (RAPP), President of the Council on US-Russia Relations Derek Norberg on the organization of a Working Group to study the issue of creating the Bering Pacific Arctic Council (BPAC).

The working group prepared the necessary materials on this issue during the year, which were developed in close accordance with the issued decree of the Russian government on the Concept of Cross-Border Cooperation<sup>12</sup> and discussed in various expert communities in both

<sup>12</sup> Rasporyazhenie Pravitel'stva RF ot 7 oktyabrya 2020 g. № 2577-r «O Kontseptsii prigranichnogo sotrudnichestva v RF» [Order of the Government of the Russian Federation of October 7, 2020 No. 2577-r "On the Concept of cross-

countries. This made it possible to bring these proposals to the government level during the Russian Chairmanship of the Arctic Council. In particular, the Minister of Foreign Affairs of the Russian Federation S. Lavrov, speaking at a meeting of the Council of Heads of Subjects of the Russian Federation on June 15, 2021, stated that Moscow is open to the development of interregional cooperation with the United States, and is also interested in creating new regional structures to work on the Pacific dialogue with Washington. The conversation was specifically about the Bering/Pacific-Arctic Council and strengthening our relations within the framework of the Russian-American Pacific Partnership (RAPP). S. Lavrov emphasized: “We are interested in creating new regional structures, including the Bering/Pacific-Arctic Council, which involves the participation of a number of Russian Arctic entities and Alaska. So far, our American partners are thinking about this proposal”<sup>13</sup>.

On the American side, these proposals had their supporters — groups of scientists and specialists from the state of Alaska, as well as US representatives in the Council on US-Russia Relations. One can give an example of a relatively recent publication in the American scientific press by such a well-known scientist in the field of Arctic issues as Betsy Baker, a specialist in the field of international diplomacy with 25 years of experience, living in Alaska, an employee of the Wilson Center of the Polar Institute, director of the Research Department North Pacific Research Board, Alaska Marine Science Center. In her article, she refers to proposals prepared by the Working Group of the Russian-American Pacific Partnership (RAPP) for the creation of the Bering/Pacific-Arctic Council (BPAC), and characterizes this initiative very positively [28, Baker B., p. 1–27].

But at present, as noted above, these positive developments in relations between these countries are practically reduced to zero precisely on the part of the United States [29, Lukin Yu.F., pp. 249–271; 30, Zhuravel V.P., pp. 105–124]. This causes serious damage, first of all, to the solution of natural and environmental problems in such a “corner of the world” as the Pacific sector of the world Arctic, and also sharply reduces its role as the future largest transport and logistics natural channel on the Arctic sea communications of the Russian Northern Sea Route and the Northwest Passage (NWP) along the coast of Canada, which would allow it to become a serious competitor, for example, to the Suez Canal for connections between Asian countries and Europe.

The state of Alaska, USA, despite its more mature and large-scale forms of spatial and economic development, compared to the regions of the Far Eastern Arctic, can also be classified as primary raw material natural and economic formations, since the basis of its economy is also predominantly initial forms production specialization, such as hydrocarbon production in the Arctic zone, development of solid mineral deposits and fishing. That is, in the transboundary Bering zone under consideration, all its areas belong to the category of raw materials natural and economic complexes. In these transboundary territories, over the course of many years, significant differ-

---

border cooperation in the Russian Federation”]. URL: <https://www.garant.ru/products/ipo/prime/doc/74639793/> (accessed 20 February 2023).

<sup>13</sup> Lavrov: Rossiya gotova razrabatyvat' novye formaty dialoga s SShA [Lavrov: Russia is ready to develop new formats of dialogue with the United States]. URL: <https://tass.ru/politika/11650987> (accessed 20 February 2023).



ences have accumulated between their natural homogeneity, which has its origins in the early forms of existence of the so-called “Beringia”<sup>14</sup>, and socio-economic heterogeneity, which is associated with the possibilities of their development in each of the transboundary countries. Unfortunately, in terms of socio-economic development, the state of Alaska is significantly superior to the regions of the Far Eastern Arctic (see Table 2 below). Such a “distortion” due to various reasons, of course, is created in many countries, but in border areas, in our opinion, it should be kept to a minimum.

In these processes, public administration and the entire system of interconnected government documents on strategic planning play a significant role. This system is based on the federal law “On strategic planning in the Russian Federation”<sup>15</sup>. Significant additions to the strategic planning system were made in June 2022 by a special Order of the Government of the Russian Federation<sup>16</sup>. It particularly notes the importance and necessity of developing and approving development strategies for macroregions and their constituent regions located in priority geostrategic territories. In this case, it is particularly emphasized that in order to solve this problem, the implementation of the national development program for the Far East for the period until 2025 and for the future until 2035 is of great importance, since the vast majority of its regions are border ones<sup>17</sup>.

The need to develop and approve a set of measures for the socio-economic development of support settlements (SS) and their social infrastructure in the geostrategic regions of the Russian Arctic and the development and approval of criteria for classifying settlements as SS was also emphasized. A scientific and applied work has recently been prepared on these issues, which makes a significant contribution to solving the problems of forming SS in the Russian Arctic<sup>18</sup>.

In this work, the main criteria and functions of the emerging SSs were ensuring external and internal security and increasing the level of development of social infrastructure facilities, corresponding not only to standard norms, but also reflecting the specific characteristics of each settlement. In general, in the territories of the Republic of Sakha (Yakutia) and the Chukotka Auton-

<sup>14</sup> Beringia is a paleo-bio-geographical province that connected northeast Asia and northwestern North America (the Beringian sector of the Holarctic) in the Quaternary period, during global glaciations. Currently spreading to the areas surrounding the Bering Strait, Chukchi and Bering Seas. Includes part of Yakutia, Chukotka and Kamchatka in Russia, as well as Alaska in the USA. In a historical context, it also included the Bering land or Beringian Isthmus, which repeatedly connected Eurasia and North America into a single supercontinent. URL: <https://ru.wikipedia.org/wiki/Берингия> (accessed 17 March 2023).

<sup>15</sup> Federal'nyy zakon ot 28.06.2014 N 172-FZ (red. ot 31.07.2020) "O strategicheskom planirovanii v Rossiyskoy Federatsii" [Federal Law of June 28, 2014 N 172-FZ (as amended on July 31, 2020) “On Strategic Planning in the Russian Federation”]. URL: [https://www.consultant.ru/document/cons\\_doc\\_LAW\\_164841/](https://www.consultant.ru/document/cons_doc_LAW_164841/) (accessed 17 February 2023).

<sup>16</sup> Rasporyazhenie Pravitel'stva RF ot 25.06.2022 N 1704-r «O vnesenii izmeneniy v rasporyazhenie Pravitel'stva RF ot 13.02.2019 N 207-r» [Order of the Government of the Russian Federation dated June 25, 2022 N 1704-r “On introducing amendments to the order of the Government of the Russian Federation dated February 13, 2019 N 207-r”]. URL: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_420383/25ab2a7d8fd7d8dcde11c233997f6517915bfbaf/](http://www.consultant.ru/document/cons_doc_LAW_420383/25ab2a7d8fd7d8dcde11c233997f6517915bfbaf/) (accessed 18 February 2023).

<sup>17</sup> Ibid.

<sup>18</sup> Opornye naselennye punkty Rossiyskoy Arktiki: materialy predvaritel'nogo issledovaniya [Supporting settlements of the Russian Arctic: materials of preliminary research]. URL: <https://arctic-russia.ru/article/opornye-naselennye-punkty-novyy-subekt-prostranstvennogo-razvitiya-arktiki/> (accessed 11 February 2023).



omous Okrug, about two dozen SSs were identified according to these criteria; it quite objectively reflects the tasks set in the above-mentioned government documents.

But here the question arises: are these assessments at the municipal level sufficient to solve problems at higher hierarchical levels of the development of spatial and economic entities in the Russian Arctic, and in particular in the Far Eastern Arctic? The answer to this question: they may be one of the factors of this development, but this is not enough to assess the whole picture of the intensification of economic activity in this zone, which should be supplemented by the study of its related areas at higher levels of management.

In general, such a summary assessment can be presented in the following form: the first stage is an assessment of the development of the SS and the level of development of social infrastructure within the boundaries of the support settlements; the second stage is an assessment of possible economic zones for industrial and raw materials development, taking into account supporting settlements; the third stage — assessment of the core network and spatial configuration of the critical backbone infrastructure (federal subordination); and the fourth stage — the final scheme for the formation of spatial and economic entities of the region, taking into account all previous stages of the assessment. The first two steps have already been completed in the above documents. The main emphasis of the proposed work on the summary assessment should be placed on its third and fourth stages. The resulting final assessment of the scheme of the emerging spatial and economic formations of the Far Eastern Arctic, covering the entire region under study, will continue to be the main object of strategic state-regional regulation and public-private partnership for many years to come.

With regard to the latter two components of the assessment, some considerations arise, also partly derived from the above-mentioned work on the SS of the Russian Arctic<sup>19</sup>. This work draws attention to the fact that when identifying SS in the Arctic zone, it is necessary to take into account the role of base settlements in the “sub-Arctic” territories that are not directly part of the Russian Arctic. In the Far Eastern sector of the Russian Arctic, this applies to both Chukotka and the North Arctic uluses of Yakutia, where the settlements of the Arctic territories of the Magadan Oblast and the central regions of the Republic of Sakha (Yakutia) act as such supporting settlements.

Such close interaction between the regions of the high-latitude Far North and the Near North has developed historically<sup>20</sup>, and it is practically inextricable. In relation to the North Arctic territories of the Far East, a very extraordinary idea arises about the natural existence of a certain Northeastern mesoregion as part of the Far Eastern macroregion (Fig. 3). The zone of this mesore-

---

<sup>19</sup> *Ibid*, pp. 113–115.

<sup>20</sup> Here we can recall the “North-Eastern Economic Council” that existed during the USSR, which made a significant contribution to strengthening the territorial management and spatial integration of the Republic of Sakha (Yakutia) and the Magadan region, which then included Chukotka, by creating infrastructure transport (in particular, the highway “Kolyma” between Magadan and Yakutsk) and energy connections between these territories, as well as a unified base for the development of mineral resources and an extensive system of permanent residence centers for labor resources and the population.

gion also includes the Kamchatka Krai, since its role here is significantly increasing. It is of great importance in the development of the transport infrastructure backbone for the Arctic territories — the Northern Sea Route with its base port-hub in Petropavlovsk-Kamchatskiy [31, Krasnopolskiy B.Kh., pp. 233–242].



Fig. 3. North-Eastern mesoregion as part of the Far Eastern macro-region, highlighting its Arctic territories (in purple)<sup>21</sup>

The North-Eastern mesoregion is important in this part of the country for its global economic and organizing role in providing elements of critical infrastructure (transport, energy, basic social facilities) to both the geostrategic territories of Chukotka and Kamchatka in the Pacific Arctic zone (neighborhood with the state of Alaska), and the geostrategic North-Arctic uluses of the Republic of Sakha (Yakutia) (contact zone with the world Arctic basin). The rapid formation of main (federal significance) elements of critical infrastructure here should significantly strengthen the “supporting” socio-economic potential of these immediate border territories of Chukotka, Kamchatka and Yakutia.

Looking at the existing dynamics of growth of the length of the main elements of critical infrastructure, for example, highways in the territories of the North-Eastern mesoregion in 2015–2021, one can see that the above conclusion about the intensification of its creation here is absolutely correct (Table 1).

Table 1  
Change in the length of highways in the Far Eastern macroregion and North-Eastern mesoregion (2015–2021)<sup>22</sup>

Regions of the Far East	Growth of total length		Growth (decrease) in the length of roads according to purpose (km)		
	(km)	(%)	Federal	Regional (inter-settlement)	Settlement
Far Eastern macroregion	5109.4	104.2	1524.6	–322.0	3906.8

<sup>21</sup> Source: Copied from a map in the research work “Modeling the consequences of decisions in the field of public policy for the development of the Far East and the Arctic zone of the Russian Federation”. URL: [https://vostokgosplan.ru/research/?\\_sft\\_research\\_cat=nir](https://vostokgosplan.ru/research/?_sft_research_cat=nir) (accessed 15 March 2023).

<sup>22</sup> Source: Transport. URL: <https://rosstat.gov.ru/statistics/transport> (accessed 11 March 2023).

North-Eastern mesoregion, incl.	2605.0	104.9	7.6	1223.2	1374.1
The Republic of Sakha (Yakutia)	2321.9	108.1	7.6	988.0	1326.2
Kamchatka Krai	164.8	107.8	0.0	-8.0	172.8
Magadan Oblast	17.6	100.7	0.0	138.0	-120.4
Chukotka Autonomous Okrug	100.7	104.7	0.0	105.2	-4.5

The table shows that main (federal) elements of transport infrastructure were not created at all for almost seven years in Kamchatka, Chukotka and the Magadan region, and to a minimal extent — in Yakutia (7.6 km), and even then, mainly in its southern part, without affecting the North-Eastern mesoregion as a whole. The emphasis in road construction was on regional and settlement roads that naturally corresponded to the economic development policy, which was based on the development of local deposits of natural resources in these territories. The Kamchatka Krai was generally deprived of even inter-settlement roads, and the Magadan Oblast was deprived of settlement roads. In the entire Far East, only 1.5 thousand km of main roads were built, no regional roads were built at all, only about 4.0 thousand km of settlement roads. In general, it is clear that during this period, in the entire North-Eastern mesoregion, practically no roads of the main (federal) level were built, the movement of goods through the territory of which in this regard was carried out along temporarily created winter roads, mainly at the expense of regional and business structures.

This situation at the new stage of exploration and development of these territories and the increase in their geostrategic importance cannot be considered normal. Here the role of each of the territories in solving all the problems that arise before them should be significantly strengthened.

The Magadan Oblast will act as a kind of “second echelon”, “supporting” the immediate cross-border territories of Chukotka and Kamchatka with Alaska. By the way, as for the energy supply infrastructure of this territory, the issue of completing the Ust-Srednekanskaya HPP, the full capacity of which is designed to provide electricity for the development of the Baimskaya ore zone in Chukotka, is still acute. The construction of a power line at the Baimskiy MPP would be the beginning of work to eliminate the isolation of the Chukotka energy system from the Central Energy System of Russia and, in addition, could solve the issues of creating an energy reserve. However, the currently implemented supply scheme for the Baimskiy MPP ignores the existing development base in the Magadan Oblast and follows the path of forming a new, rather expensive power supply scheme based on the Northern Sea Route <sup>23</sup>.

<sup>23</sup> Opornye naselennye punkty Rossiyskoy Arktiki: materialy predvaritel'nogo issledovaniya [Supporting settlements of the Russian Arctic: materials of preliminary research]. URL: <https://arctic-russia.ru/article/opornye-naselennye-punkty-novyy-subekt-prostranstvennogo-razvitiya-arktiki/> (accessed 11 February 2023).

The central regions of the Republic of Sakha (Yakutia) in this mesoregion will also serve as the “second echelon” for the North Arctic uluses of Yakutia in the contact zone with the global Arctic. The North-Eastern mesoregion itself will rely on a fairly developed transport and energy supply infrastructure “grid” of communications: in the latitudinal plan — in the southern part on the Kolyma highway from Magadan to Yakutsk and in the Arctic part — on the high-latitude highway planned for construction on the route of the current winter roads along the Arctic coast from Tiksi (Yakutia) to Anadyr (Chukotka), and in the meridional plan — to the network of river communications along the rivers of the region (Anabar, Lena, Yana, Indigirka and Kolyma), which took and should take an even greater part in the development of the North Arctic territories. It is necessary to take a more practical approach to the possibility of building a meridional year-round highway along the route of the current winter road “Arctic” with a length of 1600 km, connecting the central part of the Kolyma highway between Yakutsk and Magadan with remote and inaccessible areas of the north-east of Yakutia and Chukotka up to the Cherskiy settlement<sup>24</sup>. The Arctic route practically crosses the entire central part of the North-Eastern mesoregion from south to north and is a “core” mainline infrastructure element in latitudinal terms. It was said above that in the Development Strategy of the Russian Arctic up to 2035, the construction of the interregional highway Kolyma — Omsukchan — Omolon — Anadyr was determined, which, connecting the Magadan Oblast with Chukotka, will also be a meridional element of the infrastructure trunk “framework” connecting Arctic territories of the Far East with “sub-Arctic” northeastern regions.

Table 2 shows comparative indicators of the main basic parameters of the state of Alaska and regions of our country located in the adjacent zone and representing the North-Eastern mesoregion, which show a significant advantage in the economic development of Alaska compared not only with transboundary regions, but also with the entire North-Eastern zone of our country.

*Table 2*

*Main indicators of the districts of the North-Eastern mesoregion compared to the state of Alaska, USA*<sup>25</sup>

Area	Area of territories with islands (without water areas)	Gross Regional Product (GDP)	Population	Share of indigenous peoples of the North	Per Capita Personal Income
<i>State of Alaska, USA</i>	1481.3 thousand km <sup>2</sup>	\$50.3 billion (2022); 50.3 X 80.2 rub. = 4034.0 billion rubles (\$1 = 80.2 rubles as of	733.6 thousand people (2022)	16% (2022)	69.0 thousand dollars per year (2022): 12 = 5.8 thousand dollars per month X 80.2 rubles = 465.2 thousand

<sup>24</sup> Arkticheskaya doroga zhizni [Arctic road of life]. URL: <https://arctic-russia.ru/article/arkticheskaya-doroga-zhizni/> (accessed 11 March 2023).

<sup>25</sup> Source: compiled by the author based on information from the websites of the administrations of all territories and from statistical sources: Alaska. URL: <https://en.wikipedia.org/wiki/Alaska>; <https://fred.stlouisfed.org/series/AKPCPI>. Regional statistics. URL: [https://rosstat.gov.ru/regional\\_statistics](https://rosstat.gov.ru/regional_statistics); Arctic zone of the Russian Federation. URL: [https://rosstat.gov.ru/storage/mediabank/arc\\_zona.html](https://rosstat.gov.ru/storage/mediabank/arc_zona.html); Economic and social indicators of the regions of the Far North and equivalent areas. URL: <https://rosstat.gov.ru/compendium/document/13279> (accessed 11 April 2023).

		04/05/2023)			rub. per month (\$1 = 80.2 ru- bles)
North-Eastern mesoregion (NEMR)					
<i>Chukotka Autonomous Okrug</i>	737.7 thousand km <sup>2</sup> (2.0 times less)	94.9 billion rubles (2022) (42.5 times less)	47.5 thousand people (2023). (15.4 times less)	33.7% (2022)	89.4 thousand rubles (2022) (5.2 times less)
<i>Magadan Oblast</i>	461.4 thousand km <sup>2</sup> (3.2 times less)	337.7 billion rubles (2022) (11.9 times less)	137.5 thousand people (2023) (5.3 times less)	3.2% (2022)	85.4 thousand rubles (2022) (5.4 times less)
<i>Kamchatka Krai</i>	472.3 thousand km <sup>2</sup> (3.1 times less)	319.0 billion rubles (2022) (12.6 times less)	289.0 thousand people (2023) (2.5 times less)	2.7% (2022)	55.0 thousand rubles (2022) (8.5 times less)
<i>Republic of Sakha (Yakutia) as a whole, incl. 13 North Arctic uluses (NAU)</i>	Total: 3103.2 thousand km <sup>2</sup> Of these, NAU = 1608.8 thousand km <sup>2</sup> = 52% of the territory of Yakutia (Yakutia: 2 times more)	Total: 1936.0 billion rubles (2022) Of these: NAU = about 7% = 135.8 billion rubles (Yakutia: 2.9 times less)	Total: 996.2 thousand people (2023) Of these, NAU = 69.7 thousand people = 7% of the entire territory (Yakutia: 1.4 times more)	4.2% (2022) (average for Yakutia, including NAU)	82.8 thousand rubles (2022) (average for Yakutia, including NAU) (5.6 times less)
Total: NEMR (Chukotka, Magadan Oblast, Kamchatka, Yakutia)	4774.6 thousand km <sup>2</sup> (3.2 times more)	2687.6 billion rubles (1.5 times less)	1470.2 thousand people (2.0 times more)	===	78.5 thousand rubles (regional average) (5.9 times less)

Of course, the reasons for these disproportions are explained by the entire history and specifics of the political and socio-economic development of our country, its enormous geographical scale and other problems that limit capital expenditures for the development of the north-eastern territories. But when such differences reach significant gaps, and the main indicators of the regions begin to lag several times behind the indicators of the territories of border states, such a situation should cause serious concern to the country's leadership. As for the eastern sector of the Russian Arctic (territories of the Far Eastern Arctic) with its indicators given in table 2, it can be argued that nowhere along the entire border of Russia and its border territories there is such a lag and gap in their socio-economic sphere as in this North Arctic sector, in comparison with the neighboring territory of the state of Alaska.

The above data on the development of the north-eastern and closely connected in natural and socio-economic terms arctic territories of the Far East of Russia give reason to draw the following conclusion: at the current stage, it is necessary to develop a federal target program for the creation of a support network of backbone elements of critical infrastructure in the North-Eastern

mesoregion. This program should have a sufficient long-term time lag and be of strategic importance in this region, not only for the implementation of projects for the commissioning of the natural resource potential in this area and the transition to a new industrial way of economic management, but also for the sustainable development of the spatial and economic entities emerging here taking into account their geostrategic importance in the North Pacific sector of the global Arctic [31, Krasnopol'skiy B.Kh., pp. 233–242].

The implementation of this program will be the “driver”, a key element in the transformation of methods and mechanisms of state-regional regulation and closely related private-entrepreneurial partnerships, which will quite clearly determine the processes of future development of the spatial and economic entities under study.

### ***Conclusion***

The discussion of the natural resource features of the territories and water areas of the Far Eastern and Pacific sectors of the world Arctic, as well as the problems of the formation of various kinds of spatial and economic entities here and the assessment of the systemic influence of their critical infrastructure, especially its external, main elements on the effectiveness of the socio-economic development of these territories, shows that there is an urgent need for their further scientific study. Regarding these territories, which are the most remote from the central regions of the country and are in the initial stages of developing their resource potential, we can conclude that for them, accelerating trends towards a transition from the raw material direction of development, which is pressing in the country's economy, to an industrial type of formation, are already beginning to take effect. This will require serious and very significant transformations both in the entire production apparatus [32] and in the areas of infrastructure that serve it. A deeper understanding of the processes of increasing regional efficiency and methodological techniques for assessing the impact of infrastructure on these processes is becoming extremely important. It is the systemic, understood in the framework of the postulates of synergetics, rather than purely economic, “sectoral” assessment of its role in the growth of efficiency according to the traditional in the economic mainstream principle of “costs — results” that comes to the fore.

In this case, the emphasis in the research should be placed on the problems of creating a spatial network of backbone elements of the main critical infrastructure at an accelerated pace, which to the maximum extent realize the principle of systemic, multiplicative, emergent formation of economic entities in the North-Arctic zone under consideration. With their strictly systemically organized “grid”, both latitudinally and meridionally, they create new opportunities for the integrated development of not only individual regional economic conglomerates, but also branched reproduction cycles and chains between the basic elements of their industries of specialization with external economic structures. It also seems quite logical to consider the problems of economic development of the studied North Arctic regions together with the “sub-Arctic” territories of the Far



East, which have close communicative economic ties with these regions, which together constitute a certain North-Eastern mesoregion.

There is a fairly clear pattern in the current stage of development of the Eastern Arctic territories of the Russian Arctic, when this development naturally moves in spatial terms from the lower “point” regional micro-level to the next stage — the meso-level of interregional spatial systems. It can be suggested that this process has already taken place in the European part of the country’s Arctic zone, more “full-blooded” spatial and economic complexes have already formed there, and now it is spreading to its eastern province. This process occurs for the reason that at the grassroots level it becomes impossible to form the required groundwork in the rapid spatial development of critical infrastructure, the underdeveloped configuration of which in the external environment of primary economic entities begins to hinder their transition from the natural resource level to a higher level of industrial development.

This is the transformation of the forms of development of the North Arctic territories of the Far East at its new stage, which requires significant adjustments to the methods and mechanisms for regulating the development of transboundary spatial and economic entities in this sector of the Russian Arctic. These processes, as discussed above, are also associated with their border position in the Pacific Arctic zone, their proximity to a state that is currently unfriendly to our country — the United States. The implementation of this task will most likely take place in the form of state-regional targeted programs to develop optimal algorithms for interaction between participants in their implementation at the federal (hierarchical) and regional (heterarchical) levels, including the development of the necessary regulatory framework to achieve this goal. Considering the accumulated problems in the eastern territories of the Arctic and in the North-East of the country as a whole, as well as the practical absence of a working methodology for assessing the systemic, multiplicative, emergent effects of infrastructure in relation to various levels of spatial and economic entities, solving the problems identified seems quite difficult [32].

## References

1. Granberg A.G. Stanovlenie v Rossii nauchnogo napravleniya «prostranstvennaya ekonomika» [Formation of the Scientific Direction "Spatial Economy" In Russia]. *Vestnik Universiteta (Gosudarstvennyy universitet upravleniya)*, 2009, vol. 2, no. 26, pp. 18–24.
2. Granberg A.G. Modelirovanie prostranstvennogo razvitiya natsional'noy i mirovoy ekonomiki: evolyutsiya podkhodov [Modelling Spatial Development of National and World Economies: Evolution in Approaches]. *Region: ekonomika i sotsiologiya* [Region: Economics and Sociology], 2007, no. 1, pp. 87–107.
3. Minakir P.A., Demyanenko A.N. *Ocherki po prostranstvennoy ekonomike: monografiya* [Essays on Spatial Economics]. Khabarovsk, ERI FEB RAS Publ., 2014, 272 p. (In Russ.)
4. Minakir P.A. «Strategiya prostranstvennogo razvitiya» v interyere kontseptsii prostranstvennoy organizatsii ekonomiki [Spatial Development Strategy: A View from the Concepts of Spatial Organization in the Economy]. *Prostranstvennaya ekonomika* [Spatial Economics], 2018, no. 4, pp. 8–20. DOI: 10.14530/se.2018.4.008-020
5. Sovremennye problemy prostranstvennogo razvitiya [Modern Problems of Spatial Development]. In: *Materialy Mezhdunarodnoy nauchnoy konferentsii, posvyashchennoy pamyati i 75-letiyu so dnya*

- rozhdeniya akademika A.G. Granberga* [Proc. Intern. Sci. Conf. dedicated to the Memory and 75th Anniversary of Academician A.G. Granberg.]. Moscow, Poligraf-Plus Publ., 623 p. (In Russ.)
6. Krasnopol'skiy B.H. Prostranstvennyye nauki i ikh rol' v izuchenii ekonomiki prostranstvennykh obrazovaniy [Spatial Sciences and Their Role in Studying Spatial Formations Economics]. *Prostranstvennaya ekonomika* [Spatial Economics], 2010, no. 1, pp. 147–156.
  7. Jochimsen R. *Theorie der Infrastruktur: Grundlagen der marktwirtschaftlichen Entwicklung*. Tübingen, J.C.B. Mohr, 1966. 253 p.
  8. Buhr W. What is Infrastructure? *Siegen Discussion Paper*, 2003, no. 107–03, 32 p.
  9. Carlsson R., Otto A., Hall J.W. The Role of Infrastructure in Macroeconomic Growth Theories. *Civil Engineering and Environmental Systems*, 2013. vol. 30 (3–4), pp. 263–273. DOI: 10.1080/10286608.2013.866107
  10. Gramlich E. Infrastructure Investment: A Review Essay. *Journal of Economic Literature*, 1994, vol. 32 (3), pp. 1176–1196.
  11. Kuznetsova A.I. *Infrastruktura: Voprosy teorii, metodologii, prikladnye aspekty sovremennogo infrastruktornogo obustroystva. Geoekonomicheskii podkhod: monografiya* [Infrastructure: Issues of Theory, Methodology, Applied Aspects of Modern Infrastructural Development. Geo-Economic Approach]. Moscow, KomKniga Publ., 2013, 456 p. (In Russ.)
  12. Lantsov A.E. Infrastruktura: ponyatie, vidy i znachenie [Infrastructure: Concept, Types and Value]. *Ekonomika, statistika, informatika* [Scientific-Practical Journal of Economics, Statistics and Computer Science. Journal of UMO], 2013, no. 3, pp. 47–52. DOI: 10.21686/2500-3925-2013-3-47-52
  13. Mallaev Kh.N., Avramchikova N.T. Teoreticheskie osnovy formirovaniya institutsional'noy infrastruktury regiona [Theoretical Bases of Formation of the Institutional Infrastructure of the Region]. *Menedzhment sotsial'nykh i ekonomicheskikh system* [Social and Economic Systems Management], 2017, no. 1, pp. 39–46.
  14. Krasnopol'skiy B.H. *Infrastruktura v sisteme regional'nogo khozyaystvennogo kompleksa Severa (metodicheskie osobennosti issledovaniya)* [Infrastructure in the System of Regional Economic Complex of the North (Methodological Features of the Research)]. Moscow, Nauka Publ., 1980, 145 p. (In Russ.)
  15. Nelson R.R., Winter S.G. *Evolutsionnaya teoriya ekonomicheskikh izmeneniy* [The Evolutionary Theory of Economic Change]. Moscow, Delo Publ., 2002, 535 p. (In Russ.)
  16. Kleyner G.B. *Sistemnaya ekonomika: shagi razvitiya: monografiya* [Systemic Economics: Steps of Development]. Moscow, Nauchnaya biblioteka Publ., 2021, 746 p. (In Russ.)
  17. Kleyner G.B., Rybachuk M.A. *Sistemnaya sbalansirovannost' ekonomiki: monografiya* [Systemic Balance of the Economy]. Moscow, Nauchnaya biblioteka Publ., 2017, 320 p. (In Russ.)
  18. Haken G. *Sinergetika. Ierarkhiya neustoychivostey v samoorganizuyushchikhsya sistemakh i ustroystvakh* [Advanced Synergetics. Instability Hierarchies of Self-Organizing Systems and Devices]. Moscow, Mir Publ., 1985, 424 p. (In Russ.)
  19. Prigogine I., Stengers I. *Poryadok iz khaosa. Novyy dialog cheloveka s prirodoy* [Order out of Chaos: Man's New Dialogue with Nature]. Moscow, Progress Publ., 1986, 432 p. (In Russ.)
  20. Zang V.-B. *Sinergeticheskaya ekonomika. Vremya i peremeny v nelineynoy ekonomicheskoy teorii* [Synergetic Economics: Time and Change in Nonlinear Economics]. Moscow, Mir Publ., 1999, 335 p. (In Russ.)
  21. Krasnopol'skiy B.H. Institutsional'naya infrastruktura prostranstvenno-khozyaystvennykh obrazovaniy Arktiki [Institutional Infrastructure of Arctic Spatial-Economic Units]. *Ekonomika regiona* [Economy of Regions], 2022, vol. 18, iss. 2, pp. 353–368. DOI: 10.17059/ekon.reg.2022-2-4
  22. Kuznetsov A.V., Kuznetsova O.V. Izmenenie roli prigranichnykh regionov v regional'noy politike stran ES i Rossii [The Changing Role of Border Regions in the Regional Policies of the EU and Russia]. *Baltiyskiy region* [Baltic Region], 2019, vol. 11, no. 4, pp. 58–75. DOI: 10.5922/2079-8555-2019-4-4
  23. Prokopyev E.A., Kurilo A.E. Otsenka vliyaniya prigranichnogo polozheniya na sotsial'no-ekonomicheskoe razvitie regiona (obzor otechestvennoy literatury) [Assessment of Border Location Impact on Socio-Economic Development of the Region (Russian Literature Review)]. *Pskovskiy regionologicheskii zhurnal* [Pskov Journal of Regional Studies], 2016, no. 4 (28), pp. 3–14.

24. Kolosov V.A., Zotova M.V., Sebentsov A.B. Bar'ernaya funktsiya rossiyskikh granits [Barrier Function of Russian Borders]. *Izvestiya RAN. Ser.: Geograficheskaya* [Proceedings of the Russian Academy of Sciences, Geographic Series], 2016, no. 5, pp. 8–20. DOI: 10.15356/0373-2444-2016-5-8-20
25. Skufina T.P., Mitroshina M.N. Transformation of the Socio-Economic Space of the Russian Arctic in the Context of Geopolitics, Macroeconomics, and Internal Factors of Development. *Arktika i Sever* [Arctic and North], 2020, no. 41, pp. 87–112. DOI: 10.37482/issn2221-2698.2020.41.87
26. *Dal'nevostochnaya i Tikhookeanskaya Arktika: na perekrestke dvukh okeanov i kontinentov: monografiya* [Far Eastern and Pacific Arctic: At the Crossroads of Two Oceans and Continents]. Khabarovsk, IEI DVO RAN Publ., 2021, 248 p. (In Russ.)
27. *Infrastruktura prostranstvennogo razvitiya RF: transport, energetika, innovatsionnaya sistema, zhizneobespechenie: monografiya* [Infrastructure of Spatial Development of the Russian Federation: Transport, Energy, Innovative System, Life Support]. Novosibirsk, IEIE SB RAS Publ., 2020, 456 p. (In Russ.)
28. Baker B. Beyond the Northern Sea Route: Enhancing Russian-United States Cooperation in the Bering Strait Region. *Polar Perspectives*, 2021, no. 8, pp. 1–27.
29. Lukin Yu.F. 2022: The Russian Arctic in Times of Change. *Arktika i Sever* [Arctic and North], 2023, no. 50, pp. 249–271. DOI: 10.37482/issn2221-2698.2023.50.249
30. Zhuravel V.P., Timoshenko D.S. The Russian Arctic, Sanctions Pressure and Geopolitical Instability. *Arktika i Sever* [Arctic and North], 2022, no. 49, pp. 105–124. DOI: 10.37482/issn2221-2698.2022.49.105
31. Krasnopol'skiy B.Kh. Severo-Vostok Rossii: rol' magistral'noy infrastruktury v formirovaniy mezoregiona arkticheskikh i «podarkticheskikh» territoriy Dal'nego Vostoka [North-East of Russia: The Role of Trunk Infrastructure in the Formation of the Mesoregion of Arctic and "Subarctic" Territories of the Far East]. In: *Ustoychivyy Sever: obshchestvo, ekonomika, ekologiya, politika* [Sustainable North: Society, Economy, Ecology, Politics]. Yakutsk, 2022, pp. 233–242. (In Russ.)
32. Krasnopol'skiy B.Kh. Vliyanie magistral'noy infrastruktury na effektivnost' prostranstvenno-khozyaystvennykh obrazovaniy: podkhody k otsenke [The Impact of the Main Infrastructure on the Effectiveness of Spatial and Economic Formations: Approaches to the Assessment]. *Regionalistika* [Regionalistics], 2021, no. 3, pp. 56–71. DOI: 10.14530/reg.2021.3.56

*The article was submitted 26.04.2023; approved after reviewing 28.04.2023;  
accepted for publication 28.04.2023*

*The author declares no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 76–86.

Original article

UDC [332.145:336.14](470.11)(045)

doi: 10.37482/issn2221-2698.2023.52.87

## Availability of Budget Investments for Regions under the Program-Targeted Approach to Budget Formation (On the Example of Municipalities of the Arkhangelsk Oblast)

Elena V. Kozhina<sup>1</sup>, Cand. Sci. (Econ.), Associate Professor

Kseniya I. Sergeeva<sup>2</sup>✉, Senior Lecturer

<sup>1</sup> Saint Petersburg State Marine Technical University, ul. Lotsmanskaya, 3, Saint Petersburg, Russia

<sup>2</sup> Northern (Arctic) Federal University named after M.V. Lomonosov, ul. Kapitana Voronina, 6, Severodvinsk, Russia

<sup>1</sup> elenakojina29@mail.ru, ORCID: <https://orcid.org/0000-0002-6161-3068>

<sup>2</sup> k.sergeeva@narfu.ru ✉, ORCID: <https://orcid.org/0000-0003-1005-0450>

**Abstract.** The article is devoted to the study of the availability of investment funds for the regions of investment funds of state development programs in the context of the program-targeted approach to budget formation. The use of program-targeted budgeting methods undoubtedly opens up extensive opportunities for optimizing the public finance management system, but the management tools and implementation mechanism at the regional level have not yet been sufficiently developed, which reduces the effectiveness of their application. The paper evaluates the uniformity of distribution of funds of the Targeted Investment Program of the Arkhangelsk Oblast for the period 2017–2021 between four districts that are similar in their parameters, as well as the distribution of budget investments within the framework of inter-budget transfers to local budgets of the Arkhangelsk Oblast for the period 2021–2023. The process and principles of a program-targeted approach to strategic planning and management of the public finance system as the main tool for improving the efficiency of budget expenditures are considered. The methods used in the study include analyzing the dynamics and structure of budget investment distribution, drawing conclusions on the basis of the obtained data about the uniformity of funds distribution and investment accessibility for the regions. This article can be useful for assessing the availability of budget investments when using the program-targeted approach to budget planning, as well as for developing an effective mechanism for implementing program-targeted budgeting approaches in the budget process at the local and regional levels.

**Keywords:** *program-target planning, budgeting, budget investments, state program, socio-economic development, region*

### Introduction

Reforming the public finance management system, studying the best international practices and improving the budget process on their basis at all levels of government is one of the most important directions of increasing the efficiency of budget funds use [1]. Budget investments form the basis for the development of infrastructure, business, and the social sphere. Many regional investment projects can be implemented only with the use of federal funds, which provides a significant impetus for the revitalization of socio-economic processes and the development of the territories [2]. The opportunity for such development should be available to all regions of Russia, not only to large cities.

\* © Kozhina E.V., Sergeeva K.I., 2023

For citation: Kozhina E.V., Sergeeva K.I. Availability of Budget Investments for Regions under the Program-Targeted Approach to Budget Formation (On the Example of Municipalities of the Arkhangelsk Oblast). *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 87–99. DOI: 10.37482/issn2221-2698.2023.52.87

In this regard, the budget process should be managed in such a way as to ensure the availability of budget resources for the development of all regions and territories [3].

The scientific novelty is in the fact that in the course of the analysis of the uniformity of the distribution of investment funds of the Arkhangelsk Oblast budget between the budgets of municipalities within the framework of the research, the conclusion about the unevenness of such distribution was made. At present, there is no effective mechanism for distributing investments from the regional budget between the budgets of municipalities; the funds are distributed between competing projects within the entire region. This approach reduces the accessibility of budget investments for regions that initially have insufficient resource and financial potential, and deprives these territories of the opportunity to use budget resources for socio-economic development and capacity building. To resolve this contradiction, the authors proposed a mechanism for distributing regional budget investments between municipalities based on the distribution coefficient, taking into account the objective physical characteristics of the territories. The distribution of investment resources between competing investment projects on the basis of program-target efficiency indicators should be carried out within each municipality.

The goal was achieved by means of data collection, systematization and analysis, as well as by drawing conclusions on the basis of the obtained results about the real possibilities of using budgetary funds by the Oblast districts for investment development of their territories.

### ***Reforming the state financial management system***

As a result of the reform of the state financial management system in the early 2000s, carried out with the aim of increasing the efficiency of spending budget funds, a systematic restructuring of the budget formation process at all levels was implemented on the basis of the principles of program-targeted budgeting. In accordance with the amendments made to the Budget Code of the Russian Federation, the basis for the formation of budgets for the upcoming and planned financial periods are municipal and state programs, and the Federal Law "On strategic planning in the Russian Federation" No. 172-FZ dated June 28, 2014 defined such programs as the main tool for connecting budget and strategic planning [4]. The transition to the existing system of formation and implementation of state programs began in 2010; the Astrakhan and Sverdlovsk oblasts became pilot subjects for their implementation. The following year, a similar practice was implemented in another fifteen regions, and a year later about twenty additional entities joined them. Thus, by 2015, almost all regions of our country switched to the program-targeted method of budget formation [5].

The typification of state programs of the Russian Federation was fixed by the Decree of the Government of May 26, 2021 No. 786 "On the management system of state programs of the Russian Federation" (with amendments and additions) and is presented in Fig. 1.

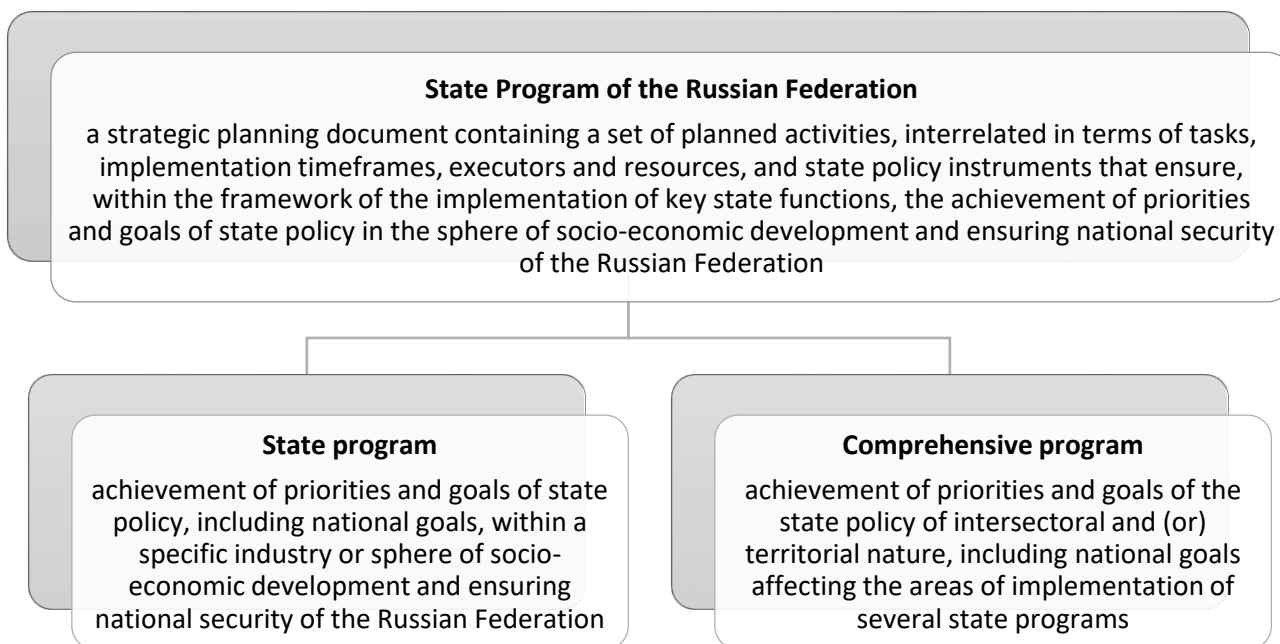


Fig. 1. Types of state programs of the Russian Federation <sup>1</sup>.

The program-target method of budgeting is based on the need to establish the relationship between the allocated budgetary resources and the achieved results of their use [6], and these results (unlike the item-by-item method of budgeting) are planned for several years ahead, not only for the upcoming financial period, i.e. the principles of prospective budgeting are implemented. With this approach, requests for the reservation of budget funds take into account both the required results and the results actually obtained in previous periods, which should lead to more efficient use of budgetary funds. According to Decree No. 786, the development and implementation of state programs should be carried out in accordance with the outlined basic principles (Fig. 2).



Fig. 2. List of principles for the development and implementation of state programs of the Russian Federation <sup>2</sup>.

<sup>1</sup> Source: Postanovlenie Pravitel'stva RF ot 26 maya 2021 g. № 786 «O sisteme upravleniya gosudarstvennymi programmami Rossiyskoy Federatsii» [Decree of the Government of the Russian Federation of May 26, 2021 No. 786 "On the management system of state programs of the Russian Federation"].



The development of state federal and regional development programs, which form the basis for the formation of the corresponding budgets, is based on the goals and forecasts of the socio-economic development of the region and the country [7]. This approach is designed to increase the transparency of the budget process, to link the results of budget execution with the set goals and costs and thus to rationalize the use of budget funds, as well as to increase the responsibility of performers and relevant executive authorities for the results of planning and execution of budgets at all levels. The starting point of budget development is the definition of the results to be achieved, and only then the amount of funding required to obtain these results is planned [8]. In general, the planning process based on program-targeted methods is presented in Fig. 3. An assessment of the achieved results of the program, their comparison with the planned target indicators is carried out both during the implementation process in the form of annual monitoring, and at the end of this implementation.

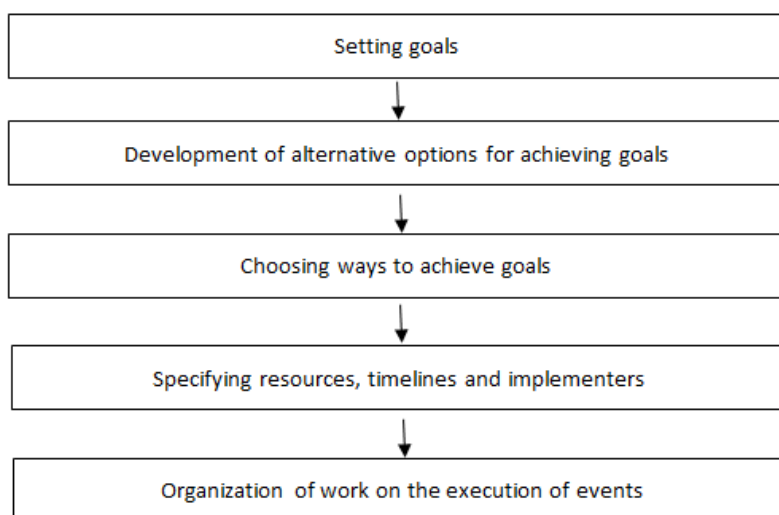


Fig. 3. The process of program-target planning<sup>3</sup>.

Subsequently, the use of an approach to planning the state budget of all levels on the basis of state programs was enshrined in the Concept of improving the efficiency of budget expenditures<sup>4</sup>, and today the program-targeted approach to budgeting is designated as the leading direction for increasing the efficiency of budget expenditures. However, this approach has certain disadvantages [9].

### ***Analysis of budget allocation at the regional level***

In the course of this study, the uniformity of budgetary funds distribution between municipalities of the Arkhangelsk Oblast was analyzed in order to assess the degree of accessibility of budget resources for the subjects of one region.

<sup>2</sup> Source: Postanovlenie Pravitel'stva RF ot 26 maya 2021 g. № 786 «O sisteme upravleniya gosudarstvennymi programmami Rossiyskoy Federatsii» [Decree of the Government of the Russian Federation of May 26, 2021 No. 786 "On the management system of state programs of the Russian Federation"].

<sup>3</sup> Source: Compiled by the authors based on [1, 3, 4].

<sup>4</sup> The concept of increasing the efficiency of budget expenditures in 2019–2024 was approved by Decree of the Government of the Russian Federation dated January 31, 2019 No. 117-r.

The comparative analysis of the distribution of funds of the Targeted investment program of the Arkhangelsk Oblast for the period of 2017–2021<sup>5</sup> between four districts that are close to each other (Ustyanskiy, Velskiy, Primorskiy and Onega) showed the unevenness of this distribution, the data are presented in Fig. 4. At the same time, in absolute terms, for the entire analyzed period, the maximum amount of funding falls on the Primorskiy district, the Ustyanskiy district — in the second place with a slight lag. The volumes of funding for the other two districts (Velskiy and Onega) are approximately equal and are almost twice less. The structure of financing of the analyzed districts for the period 2017–2021 is shown in Fig. 5.

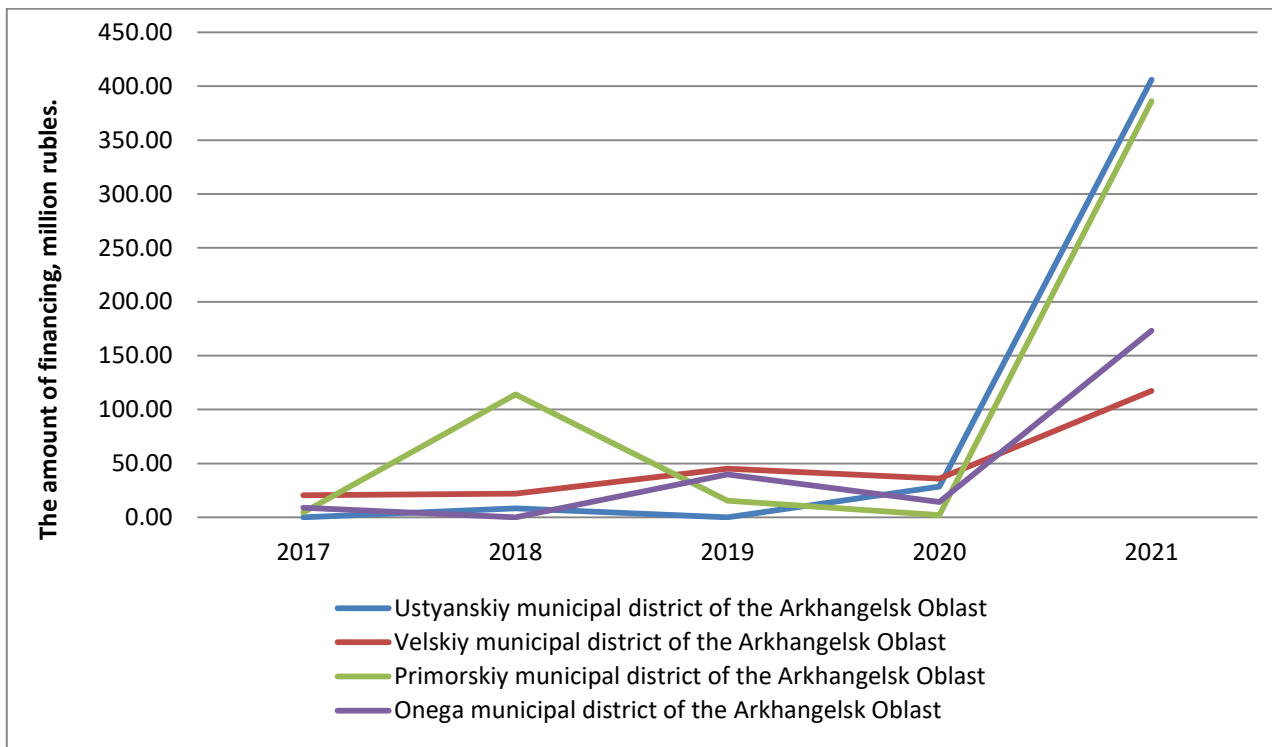


Fig. 4. Amounts of financing of the analyzed districts within the framework of the Targeted investment program of the Arkhangelsk Oblast for the period 2017–2021<sup>6</sup>.

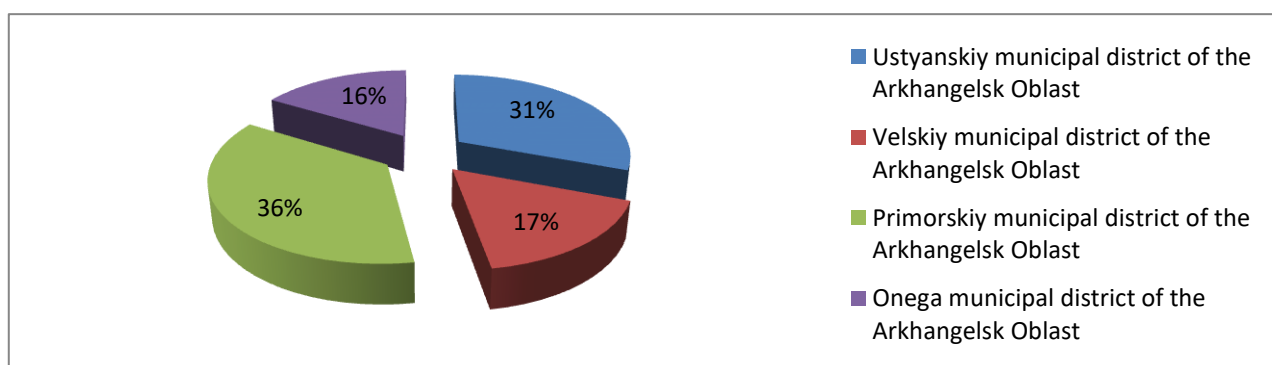


Fig. 5. Structure of financing of the analyzed districts within the framework of the Targeted investment program of the Arkhangelsk Oblast for the period 2017–2021<sup>7</sup>.

<sup>5</sup>Official website of the government of the Arkhangelsk Oblast. URL: <https://dvinland.ru/budget/zakon/> (accessed 01 December 2022).

<sup>6</sup>Source: Compiled by the authors.

<sup>7</sup>Source: Compiled by the authors.

If in the Primorskiy district such a priority could be explained by its larger area, then this criterion does not explain the situation in the Ustyanskiy district, since its area is comparable to the Velskiy district and twice as small as the Onega district. Table 1 shows the specific indicators of financing per unit area and per capita in the context of the analyzed regions. The Ustyanskiy municipal district is the leader in terms of specific financing per unit area (8.26 thousand rubles/km<sup>2</sup> on average per year), Onega district is in last place (1.99 thousand rubles/km<sup>2</sup> on average per year), with a 4-fold difference in this indicator.

Population size as a criterion also does not explain the uneven distribution of funds. The Velskiy municipal district is the most populous, while the other municipal districts are approximately comparable. The Primorskiy district is the leader in terms of per capita financing (4.13 thousand rubles per person on average per year), followed by the Ustyanskiy municipal district (3.39 thousand rubles per person per year), Onega and Velskiy districts lag behind in this indicator by almost three times (1.6 thousand rubles/person and 0.99 thousand rubles/person, respectively).

*Table 1*  
*Ratio of total funding for the period 2017–2021 to the area of the municipal district and the population*

Municipalities of the Arkhangelsk Oblast	Average annual funding for the period 2017/2021 per 1 km <sup>2</sup>		Average annual funding per person for the period 2017/2021	
	Value, thousand rubles/km <sup>2</sup>	Specific weight, %	Value, thousand rubles/person <sup>8</sup>	Specific weight, %
Ustyanskiy municipal district	8.26	47.74%	3.39	33.54%
Velskiy municipal district	4.79	27.68%	0.99	9.77%
Primorskiy municipal district	2.26	13.08%	4.13	40.85%
Onega municipal district	1.99	11.51%	1.60	15.83%
Total	17.31	100.00%	10.11	100.00%

Thus, based on this analysis, we can conclude that the distribution of funding between municipal districts is uneven, and this distribution does not take into account the objective physical characteristics of municipalities, such as area and population.

Additionally, if we consider the distribution of budget investments within the framework of interbudgetary transfers between municipalities of the Arkhangelsk Oblast for the period 2021–2023<sup>9</sup> (Table 2), it is clear that the distribution is also uneven: in particular, out of the four regions analyzed, budget investments are not planned at all for the Onega municipal district for the specified period.

<sup>8</sup> Source: Compiled by the authors.

<sup>9</sup> Official website of the government of the Arkhangelsk Oblast. URL: <https://dvinland.ru/budget/zakon/> (accessed 01 December 2022).

*Table 2*  
*Distribution of budget investments within the framework of interbudgetary transfers to local budgets of the Arkhangelsk Oblast for the period 2021–2023, million rubles*

Name of territory	2021	2022	2023	Total 2021–2023	
				Value, million rubles <sup>10</sup>	Specific weight, %
Arkhangelsk	463.56	50.76	1.04	515.36	11.37%
Novodvinsk	0.00	0.00	0.00	0.00	0.00%
Severodvinsk	531.58	519.28	446.66	1 497.52	33.03%
Velskiy district	23.72	0.84	0.00	24.56	0.54%
Konosha district	0.00	0.00	0.00	0.00	0.00%
Vilegodskiy district	177.85	22.47	0.00	200.32	4.42%
Primorskiy district	83.56	198.87	108.05	390.48	8.61%
Kargopol district	29.77	0.00	0.00	29.77	0.66%
Plesetsk district	0.00	0.00	0.00	0.00	0.00%
Kotlas district	2.31	0.00	0.00	2.31	0.05%
Lenskiy district	0.00	0.00	0.00	0.00	0.00%
Kholmogory district	41.18	0.00	0.00	41.18	0.91%
Nyandoma district	255.53	2.04	0.00	257.57	5.68%
Onega district	0.00	0.00	0.00	0.00	0.00%
Pinezhskiy district	0.00	0.00	0.00	0.00	0.00%
Shenkurskiy district	79.85	0.00	0.00	79.85	1.76%
Verkhnetoyemskiy district	0.00	0.00	0.00	0.00	0.00%
Ustyanskiy district	305.42	222.22	0.00	527.64	11.64%
Krasnoborskiy district	51.58	109.15	0.00	160.73	3.55%
Mezenskiy district	39.01	0.00	0.00	39.01	0.86%
Leshukonskiy district	0.00	0.00	0.00	0.00	0.00%
Kotlas	85.18	11.29	0.00	96.47	2.13%
Vinogradovskiy district	0.00	0.00	0.00	0.00	0.00%
Koryazhma	0.00	0.00	0.00	0.00	0.00%
Mirnyy	670.77	0.00	0.00	670.77	14.80%
Novaya Zemlya	0.00	0.00	0.00	0.00	0.00%
Not distributed across MD	0.00	0.00	0.00	0.00	0.00%
Total	2 840.87	1 136.92	555.75	4 533.54	100.00%

### *Availability of budget investments for regions*

At the same time, the drafting of the regional budget for the forecast period should be based on the provisions of the message of the President of the Russian Federation to the Federal Assembly (determining the country’s budget policy), as well as on the provisions of the annual message of the Governor of the region on the socio-economic and socio-political situation in the Arkhangelsk Oblast (determining its budget and tax policy).

In his message to the Federal Assembly dated April 21, 2021, the President noted that the development of the country is impossible without the development of its regions, each of which has its own significant unique potential, the use and increase of which should be encouraged. Such instruments as restructuring of regional debts, as well as a fundamentally new instrument — infra-

<sup>10</sup> Source: Compiled by the authors.

structure budget loans at a rate of no more than 3% per annum and a repayment period of 15 years (by the end of 2023, it was planned to allocate about 500 billion rubles for these purposes) were offered to support the constituent entities of the Federation. It is also planned to allocate federal resources to solve particularly acute systemic problems that have a complex effect on the recovery of territories and improving the quality of life of people.

These tools, according to the President, should make it possible to expand the planning horizon, launch new solutions related to the implementation of national projects, industry strategies, and a comprehensive plan for modernizing the main infrastructure. However, they are provided only for specific projects that have undergone detailed examination at the federal level. As practice shows, not all regions have equal opportunities to fulfill such conditions, which means that they initially cannot compete with large centers for the availability of federal resources for their development.

The support measures provided are “a powerful resource, but the extent to which it will work for development and attracting private investment largely depends on how regional management teams act, on their openness to an honest dialogue with business and investors, and, of course, first and foremost, with citizens. Regional infrastructure projects should be implemented primarily in the interests of people, serving as investments in creating new jobs, in increasing the well-being of millions of Russian families, and in the future of our children. The priorities will be highways, city bypasses, renewal of housing and communal services and public transport systems, integrated development of territories and the creation of tourism industry facilities”<sup>11</sup>.

Thus, in accordance with the investment policy of the federal center, the distribution of budget investments between their recipients in the regions is carried out between the proposed infrastructure projects in terms of their effectiveness for the development of the entrusted territory on the basis of priorities allocated by the President of the Russian Federation, while there is no system of distribution of regional budget investments between individual municipalities of the region. Consequently, in order to receive federal investments, the heads of municipalities should actively initiate, encourage, and create conditions for initiatives and develop such projects. This program-project principle is the basis for the distribution of federal budget investments. At the same time, neither objective characteristics, nor needs, nor different starting opportunities of the regions are taken into account.

It is debatable whether such an approach is fair for the territories that have inherently insufficient resource and financial potential, as well as low investment attractiveness due to, for example, underdeveloped infrastructure or transport accessibility. In this case, the region will need a stronger management team, capable of more rational use of available resources, planning and setting priorities, while in the case of low attractiveness of the region, staffing problems will be more acute. A longer period of time will be required to achieve the intended results. In practice, this

---

<sup>11</sup> Official website of the Administration of the President of Russia. URL: <http://www.kremlin.ru/acts/bank/46794/page/1> (accessed 10 December 2022).

leads to the fact that the unique and promising potential of small towns and cities remains unutilized due to a lack of start-up resources. In order to eliminate this contradiction, it is necessary to develop and implement a mechanism for distributing investments from the oblast budget between regional budgets on the basis of their objective physical indicators. It is proposed to use the shares of the area and population of the municipality in the general indicators of the region, on the basis of which the investment distribution coefficient will be calculated:

$$K_{\text{распр}i} = (\text{УП}_i + \text{УН}_i)/2$$

$$И_i = K_{\text{распр}i} * И_{\text{об}}$$

where  $K_{\text{распр}i}$  — coefficient of distribution of investments between the municipalities of the region;

$\text{УП}_i$  — specific weight of the area of the  $i$ -th municipality in the total area of the region;

$\text{УН}_i$  — specific weight of the population of the  $i$ -th municipality in the total population of the region;

$И_i$  — amount of investments of the  $i$ -th municipal entity for the planned period;

$И_{\text{об}}$  — total amount of investments of the region for the planned period.

Further distribution of investment resources within each municipality should be made between specific investment projects based on program-targeted efficiency indicators for a particular territory.

In his Address to the Federal Assembly dated March 1, 2018, the President of the Russian Federation stated the following: “It is important that the development of cities becomes a driving force for the entire country... Large cities should spread their energy, serve as a support for a balanced, harmonious spatial development of all of Russia. For this purpose, modern infrastructure is extremely necessary... developed communications will allow residents of small towns and villages to conveniently use all the opportunities and modern services that are available in large centers, and small settlements themselves will be closely integrated into the general social and economic space of Russia. At the same time, we will also support initiatives that will allow our small towns and settlements to preserve their identity and reveal their unique potential in a new way”<sup>12</sup>. On the basis of this statement, we can conclude that the socio-economic development of the regions, and the Arkhangelsk Oblast in particular, should be planned in such a way as to take into account the interests of residents of all municipalities, not just large settlements.

### Conclusion

This article provides a comparative analysis of the distribution of funds from the Targeted investment program of the Arkhangelsk Oblast for the period 2017–2021 between four districts of the region that are similar in their parameters, as well as the distribution of budget investments

<sup>12</sup> Official website of the Administration of the President of Russia. URL: <http://www.kremlin.ru/acts/bank/46794/page/1> (accessed 10 December 2022).



within the framework of interbudgetary transfers to local budgets of the Arkhangelsk Oblast for the period 2021–2023.

The study revealed the uneven distribution of investment funds from the regional budget for the specified period, which does not allow municipalities to equally use budget resources for their socio-economic development.

A program-targeted approach to the planning of the budgetary process offers a wide range of opportunities to improve the efficiency of budgetary funds use, as well as the flexibility of the resource management process. However, existing approaches to the distribution of budget funds within the region are controversial and not entirely transparent, and there is still no effective mechanism for introducing program-targeted budgeting approaches into the budget process at the local and regional level. At the same time, the budget is the main instrument for managing and regulating the socio-economic processes of the region.

## References

1. Artemyeva S.S. Gosudarstvennye programmy kak instrument realizatsii strategii razvitiya regiona [Government Programmes as an Implementation Tool of a Development Strategy of the Region]. In: *Rossiyskaya ekonomika v usloviyakh novykh vyzovov: materialy Vserossiyskoy nauchno-prakticheskoy konferentsii* [Russian Economics in the Conditions of New Calls: Proc. All-Russ. Sci. and Pract. Conf.]. Saransk, Individual Entrepreneur Afanasyev V. Publ., 2018, pp. 231–234. (In Russ.)
2. Volkova E.Yu. Mesto programmno-tselevogo podkhoda v sisteme strategicheskogo upravleniya ekonomikoy RF [The Place of Program-Oriented Approach in the System of Strategic Management of Russian Economy]. *Nauchnye trudy. Institut narodnokhozyaystvennogo prognozirovaniya RAN* [Scientific Works: Institute of Economic Forecasting of the Russian Academy of Sciences], 2021, pp. 167–191. DOI: 10.47711/2076-318-2021-167-191
3. Stanovikhina A.M. Programmno-tselevoy metod planirovaniya byudzheta v Rossiyskoy Federatsii: plyusy i minusy [Programme-Targeted Method of Budget Planning in the Russian Federation: Pros and Cons]. *Molodoy uchenyy* [Young Scientist], 2017, no. 37 (171), pp. 66–67.
4. Masterov A.I. Programmno-tselevoe byudzhetrovanie kak instrument strategicheskogo planirovaniya [Performance Budgeting as a Tool of Strategic Planning]. *Ekonomika. Nalogi. Pravo* [Economics, Taxes & Law], 2015, no. 3, pp. 64–70.
5. Skorykh N.N., Gudim D.S. Problemy formirovaniya dokhodov mestnykh byudzhetrov [Problems of Formation of Local Budget Revenues]. *Nauchnyy zhurnal Diskurs* [Discourse], 2018, no. 5 (19), pp. 244–252.
6. Frolova I.V. Teoreticheskie aspekty i perspektivy ispol'zovaniya programmno-tselevogo podkhoda v byudzhetnom protsesse rossiyskikh regionov [Theoretical Aspects and Prospects Use of Program-Targeted Approach in the Budget Process of Russian Regions]. *Sovremennaya ekonomika: problemy i resheniya* [Modern Economics: Problems and Solutions], 2014, no. 8 (56), pp. 127–137.
7. Kuvaldina T.B. Gosudarstvennye programmy kak instrument programmno-go byudzhetrovaniya v sisteme upravleniya gosudarstvennymi finansami [State Programs as a Tool of Program Budgeting in the System of Government Financial Management]. *Innovatsionnaya ekonomika i obshchestvo* [Innovative Economics and Society], 2017, no. 3 (17), pp. 44–51.
8. Liberman T.I. *Programmno-tselevoe planirovanie: podkhody, instrumenty, tendentsii razvitiya: monografiya* [Targeted Policy Planning Method: Approaches, Tools and Development Trends]. Moscow, PRIMEC Publ., 2020, 162 p. (In Russ.)
9. Kolomyts O.N. Preimushchestva i nedostatki ispol'zovaniya programmno-tselevogo metoda planirovaniya pri reshenii sotsial'no-ekonomicheskikh problem territoriy [Advantages and Disadvantages of Using the Programme-Target Method of Planning in Solving Socio-Economic Problems

of Territories]. *Novaya nauka: opyt, traditsii, innovatsii* [Modern Science: Experience, Traditions, Innovations], 2016, no. 2 (65), pp. 213–218.

*The article was submitted 17.02.2023; approved after reviewing 06.03.2023; accepted for publication 10.03.2023.*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 87–102.

Original article

UDC 332.2(045)

doi: 10.37482/issn2221-2698.2023.52.100

## Integrated Processing of Mineral Raw Materials: Factors of Readiness and Resistance of Economic Entities

Ekaterina A. Bazhutova<sup>1</sup>, Cand. Sci. (Econ.), Researcher

Tatiana P. Skufina<sup>2</sup>✉, Dr. Sci. (Econ.), Professor, Chief Researcher

<sup>1,2</sup>Luzin Institute for Economic Studies — Subdivision of the Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”, ul. Fersmana, 24a, Apatity, Russia

<sup>1</sup>eabazhutova@mail.ru, ORCID: <https://orcid.org/0000-0002-7407-8084>

<sup>2</sup>skufina@gmail.com ✉, ORCID: <https://orcid.org/0000-0001-7382-3110>

**Abstract.** Ensuring the integrated processing of mineral raw materials remains a relevant topic of modern research due to its socio-economic, environmental and technological significance, as well as one of the key conditions for sustainable development of Russia, defined by the Strategy for the development of mineral resource base up to 2035. At the same time, the practical realization of this concept continues to be occasional and non-systemic. Under the new conditions of sanctions restrictions, the acute need for import substitution, taking into account the regional specifics of strategic mineral resources in the Arctic zone of the Russian Federation, it is necessary to change the paradigm of development of the resource and raw materials complex of Russia from extensive to intensive one and to shift the research context towards readiness of regional economic systems to such changes. Considering the accumulated scientific background, the article attempts to consolidate and systematize the research on the topic of integrated processing of mineral resources in relation to the factors that determine readiness and cause resistance to the practical implementation of the concept on the part of economic entities as key actors in this process. The scientific novelty of the study consists in the systematization of existing positions on the issue of transition to the implementation of the concept of integrated processing of mineral resources to develop a set of indicators as a tool for assessing the readiness and resistance of the regional economic system to the paradigm shift. The research method used is a review of publications on the topic of integrated processing of mineral resources. As a result of the study, 20 factors were identified and systematized into 5 groups. The obtained classification of factors can become the basis for further research of the question posed in this article, which will allow assessing the readiness for changes at the regional level, to identify obstacles that hinder their implementation, and to determine the directions of search for solutions to eliminating or levelling of the identified resistance factors.

**Keywords:** *environmental management, sustainable development, mineral resource base, complex processing of mineral resources, regional economic system*

### Acknowledgments and funding

The study was funded by a grant from the Russian Science Foundation (project No. 19-18-00025).

### Introduction

The problem of integrated use of mineral resources remains relevant in terms of searching for organizational and economic mechanisms for its practical implementation. The accumulation

---

\* © Bazhutova E.A., Skufina T.P., 2023

For citation: Bazhutova E.A., Skufina T.P. Integrated Processing of Mineral Raw Materials: Factors of Readiness and Resistance of Economic Entities. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 100–120. DOI: 10.37482/issn2221-2698.2023.52.100

of mining waste, which causes environmental problems in the regions, and the increasingly complex mining and geological conditions, leading to a decrease in production volumes and an increase in costs, cause concern on the part of all economic agents of the market: state, society, and business. Modern challenges of the Russian economy, expressed in tightening sanctions, and the aggravation against this background of the problem of import substitution, including in the provision of certain types of mineral raw materials, predetermine the increasing relevance of the issue of integrated processing and the need to find solutions for its practical feasibility.

The concept of integrated processing of mineral resources was first discussed in the 1930s. Academician A.E. Fersman can rightfully be called its founder. The principle he proposed, by analogy with nature, to locate production so as to extract not individual components, but the entire geochemical spectrum of chemical elements concentrated in a given territory, became the basis for the concept of integrated use of raw materials [1, Kalinnikov V.T., Grigoriev A.V.].

Since 1960, the accumulation of industry knowledge on the rational use of mineral resources continued. This period is associated with such scientists as S.G. Strumilin, A.A. Mintz, K.G. Goffman, A.A. Arbatov, A.S. Astakhov, M.I. Agoshkov, Yu.V. Yakovets, V.S. Nemchinov. The most important theoretical developments of this time include the development of the principles of optimal planning of mining production, the concept of systemic management of the industry, the theory of efficiency of production activities, the concept of economic assessment of mineral resources [2, p. 63].

In the 1990s, in the context of the transition to a market economy and the formation of the private ownership of natural resources, researchers have focused on determining the role and place of the state in solving problems of environmental management, developing measures that stimulate the integrated development of mineral resources and the use of waste from mining and processing industries, as well as the participation of the state in solving waste disposal problems. In scientific research of this period, the mining-technological, mining-ecological, economic (ecological-economic, geological-economic) directions of environmental management were more clearly identified. The mining-technological direction, based on the principles of intensification (low waste, comprehensive use of minerals), was developed in the works of V.N. Makarov, K.N. Trubetskoy, V.N. Umanets, N.B. Nikitin, L.A. Barskiy and others [2, p. 67]. The economic direction, covering ecological-economic and geological-economic aspects of rational nature management, was developed in the context of developing methods of economic evaluation of mineral resources and deposits, searching for approaches to stimulate the integrated use of minerals, waste processing, taking into account the peculiarities of the transition period. Ecological and economic issues of rational environmental management in that period were most reflected in the works of O.F. Balatskiy, L.G. Melnik, A.F. Yakovleva, A.A. Golub, E.B. Strukova, E.A. Solovyova, N.Ya. Lobanova, Yu.A. Cherenegova, A.A. Averchenko, A.S. Gumilevskiy. Scientific studies of anthropogenic deposits as complex geological objects with significant resource potential have been developed (K.N. Trubetskoy, V.N. Umanets, A.V. Kogut, O.E. Gorlova, A.B. Makarov). In addition, the need for eco-

economic evaluation of technogenic deposits as objects of investment activity has arisen (V.V. Chainikov, V.T. Borisovich, E.L. Goldman, etc.) [2, p. 68].

Since the early 2000s, changes in the system of state management of nature use have begun. These problems are reflected in the studies of L.Z. Bykhovskiy, E.A. Kamenev, Yu.A. Kiperman, M.A. Komarov, N.B. Karpenko, V.A. Kotkin, S.G. Seleznev. Researchers note the need to systematize information about waste and technogenic deposits, their resource potential, systemic environmental and economic assessment and government accounting [2, p. 71].

The transition since 2014 to a new paradigm of state environmental regulation, based on the principles of the best available technologies and focusing on the environmental and technological side of the problem of handling mining and processing waste, has pushed its economic and property aspects to the background. At the same time, the resource potential of accumulated waste from past activities and its negative impact on the environment in the absence of institutional conditions that would stimulate the effective involvement of waste in processing was a problem area of natural resources management, which was reflected in the Strategy for the Development of the Mineral Resources Base of the Russian Federation up to 2035 (hereinafter referred to as the Strategy). The implementation of the Strategy was to ensure the consolidation of efforts of legislative and executive bodies of state power, government bodies of the constituent entities of the Russian Federation, scientific, educational and business communities (including small and medium-sized businesses) to create a favorable legal, investment and business climate, provide the necessary technological and personnel potentials. The first stage, approved by the action plan for the period 2018–2024, envisaged the improvement of the main legal and economic mechanisms contributing to the growth of the investment attractiveness of Russian subsoil resources, optimization of the areas of work at the expense of the federal budget in accordance with the provisions of the Strategy. The results of the first stage were to be the necessary program and project documents that would ensure the concentration of financial resources, technological and human resources to achieve the development indicators of the mineral resource base of the Russian Federation. At the second stage (2025–2035), it was planned to carry out the entire range of work to achieve the goals and objectives of the Strategy, taking into account its updating, which requires the development of a new action plan during 2023<sup>1</sup>.

As part of the implementation of the first stage of the Strategy, significant work was carried out to improve the legal framework. Thus, in 2021, Federal Law No. 123-FZ was adopted, introducing the most extensive changes to the law “On subsoil” in the last 30 years. To implement the law, 9 resolutions of the Russian Government, 2 orders of the Russian Ministry of Natural Resources and 22 joint orders of the Russian Ministry of Natural Resources and Rosnedra were approved.

---

<sup>1</sup> Rasporyazhenie Pravitel'stva RF ot 22.12.2018 N 2914-r «Ob utverzhdenii Strategii razvitiya mineral'no-syr'evoy bazy Rossiyskoy Federatsii do 2035 goda» [Order of the Government of the Russian Federation dated December 22, 2018 N 2914-r “On approval of the Strategy for the development of the mineral resource base of the Russian Federation up to 2035”]. URL: <https://www.consultant.ru/law/hotdocs/56356.html?ysclid=lfr4bf9r110726943> (accessed 01 February 2023).

The changes carried out since 2015 have given a great impetus to the development of geological exploration.

At the same time, the way approved within the framework of the strategy to achieve the goal of a sustainable supply of mineral raw materials by increasing the investment attractiveness of geological exploration at all stages, increasing the quality of forecasting and searching for new deposits, as well as increasing the efficiency of development of known, including undeveloped deposits, through the introduction of modern processing technologies, enrichment and complex extraction of mineral resources is not carried out fully and in a balanced manner. At the current moment of the Strategy implementation, the greatest emphasis is placed on extensive methods, i.e. increasing the quality of forecasting and searching for new deposits. This is evidenced by the key indicators of the Strategy, by which its effectiveness is assessed, namely the increase in reserves of the most important types of minerals and the volume of extra-budgetary investments in geological exploration, which are achieved quite successfully (Table 1).

*Table 1*

*Indicators of implementation of the Strategy for the development of the mineral resource base of the Russian Federation up to 2035<sup>2</sup>*

Indicator	Unit	2015	2016	2017	2018	2019	2020	2021
Number of licenses issued on the "application" basis	un.	256	427	404	797	1244	1636	1685
Investment cost of projects for geological exploration of subsoil, carried out according to the "application" principle	bn rub.	9.1	17.8	25.5	23.3	38.8	65	83.4

At the same time, the part related to increasing the efficiency of development of known and undeveloped deposits through the introduction of modern technologies for processing, enrichment and integrated extraction of mineral resources remains the least covered. The consequences of this imbalance are the continued accumulation of mining waste, an increase in the volume of technogenic deposits, and the involvement of large areas of land in production processes (Table 2).

*Table 2*

*Dynamics of generation, use and accumulation of production and consumption waste<sup>3</sup>*

Indicator	2018	2019	2020
<b>Mineral extraction</b>			
Generation of production and consumption waste by type of activity: mining	6 850 485.40	7 257 022.10	6 367 335.60
Recycling and neutralization of production and consumption waste by type of activity: mining, thousand tons	3 585 213.50	3 561 595.40	2 970 827.40

<sup>2</sup> Source: compiled on the basis of the report of the Ministry of Natural Resources on the implementation of the Strategy for the Development of the Mineral Resources Base of the Russian Federation in 2021.

<sup>3</sup> Source: compiled on the basis of the statistical bulletin "Main indicators of environmental protection". URL: <http://www.gks.ru/> (accessed 01 February 2023).



The ratio of waste generation and disposal by type of activity: mining, %	52.3%	49.1%	46.7%
<b>Mineral processing</b>			
Generation of production and consumption waste by type of activity: mineral processing, thousand tons	204 190.60	214 818.70	201 332.60
Recycling and neutralization of production and consumption waste by type of activity mineral processing, thousand tons	103 395.7	113 678.3	99 668.5
The ratio of waste generation and disposal by type of activity: mineral processing, %	50.6%	52.9%	49.5%

In addition, the need in the near future to revise the subsoil use policy from extensive to intensive development methods, including through the involvement of accumulated technogenic deposits in circulation, is also evidenced by data on the number of discovered deposits (Table 3) and the risk of import dependence on strategic types of mineral raw materials, the reserves of which are presented in small volumes as associated elements that can be extracted, or as low-quality deposits, which necessitates their import from abroad (Table 4). In the current conditions of tightening sanctions policy and unstable geopolitical situation, the need to resolve the issue of self-sufficiency undoubtedly increases and this will become one of the goals of forming a new action plan for the second stage of implementation of the Strategy for the period 2024–2030.

*Table 3*

*Dynamics of the number of deposits registered with the state <sup>4</sup>*

Indicator	2019	2020	2021
Number of deposits registered with the state, units.	59	49	37

*Table 4*

*Strategic types of mineral raw materials with the greatest risk of import dependence <sup>5</sup>*

Raw materials	Volume of domestic production in Russia	Volume of domestic consumption in Russia	Import volume	Importing country	Application
Uranium	2 897 t	10 300 t	7 905 t	Kazakhstan, Ukraine, Canada	Nuclear power
Titanium	439 thousand tons	365 thousand tons (titanium concentrate) 82.6 thousand tons (pigment titanium dioxide) 11 thousand tons (titanium products)	207.4 thousand tons (titanium concentrate) 59.8 thousand tons (pigment titanium dioxide)	Kazakhstan, Ukraine, Japan, China, USA, Mexico, Germany, UK	Metallurgy, Aviation
Zirconium	19.5 thousand tons	10 thousand tons (zirconium concentrate)	7.9 thousand tons (zirconium concentrate)	Ukraine, Netherlands, Indonesia, USA, Spain, Ger-	Alloys for the production of nuclear reac-

<sup>4</sup> Source: compiled on the basis of Rosnedra data.

<sup>5</sup> Source: developed on the basis of data from the state report “On the state and use of mineral resources of the Russian Federation in 2020”.

			197.6 thousand tons (high purity zirconium dioxide) 119 thousand tons (metallic zirconium)	many, Italy, China, South Africa, India, France	tors, light alloys
Rare earth elements	114.8 thousand tons	1.1 thousand tons	1.1 thousand tons	China, Estonia	Electronics, production of magnet batteries

The results obtained from the Strategy do not allow us to fully assess the effectiveness of its implementation. This conclusion is also reflected in the analytical report of the Accounts Chamber “Subsoil use” No. 5 for 2020. One of the recommended activities of the report is the involvement in the recycling of waste from mining and processing industries, the introduction of cost-effective technologies for the enrichment of low-quality mineral raw materials through the development of a targeted project in the field of geological study and rational use of subsoil.

Modern research of recent years also indicates the need to change the paradigm for the development of the resource and raw materials complex of Russia. The paradigm shift is associated with the transition from an extensive to an intensive development trajectory [3, Eder L.V., Kontorovich A.E., pp. 16–18]. At the same time, the emphasis of the research problem is increasingly shifting towards taking into account the regional component, which includes conducting a broad interregional comparison of the current state of subsoil development in the resource-producing regions of Russia for the purpose of theoretical justification and practical development of new promising project forms of interaction between business and the state, as well as the development of an active regional policy on this basis, focused on solving the problems of innovation development, import substitution and sustainable socio-economic development [4, Kontorovich A.E.].

Taking into account the fact that most promising deposits of strategic types of mineral raw materials, which have the greatest risk of import dependence, are represented in the regions of the Arctic zone of the Russian Federation (Table 5), the importance of taking into account its regional specifics, due to complex natural and climatic conditions, non-standard social economic aspects of activity and the ecological fragility of the Arctic territories, as well as the changes occurring in it [5, Zaikov K.S., Kondratov N.A., Kudryashova E.V., Lipina S.A., Chistobaev A.I., pp. 10–12] becomes even more relevant.

*Table 5*

*Geographical distribution of existing and prospective deposits of import-dependent strategic mineral resources by regions of the Russian Federation<sup>6</sup>*

Mineral raw materials	Regions with active deposits		Regions with prospective deposits	
	<i>AZRF regions</i>	<i>Other regions</i>	<i>AZRF regions</i>	<i>Other regions</i>
Uranium	The Republic of Sakha (Ya-	Transbaikal Krai, Republic of		Amur Oblast, Jewish AO,

<sup>6</sup> Source: developed by the author on the basis of the data from the state report “On the state and use of mineral resources of the Russian Federation in 2020”.

	kutia)	Buryatia, Kurgan Oblast		Transbaikal Krai
Titanium	Murmansk Oblast, Komi Republic		Murmansk Oblast	Tomsk Oblast, Transbaikal Krai, Amur Oblast, Chelyabinsk Oblast
Zirconium	Murmansk Oblast		Komi Republic	Tomsk Oblast, Irkutsk Oblast
Rare earth elements	Murmansk Oblast		Republic of Sakha (Yakutia), Krasnoyarsk Krai, Komi Republic	

Most of the projects for the development of promising deposits in the Russian Arctic regions are included in the Strategy for the development of the Russian Arctic and ensuring national security for the period up to 2035, approved by Decree of the President of the Russian Federation of October 26, 2020 No. 645. This determines a high responsibility for ensuring the preservation of the fragile ecological balance in the territory of the Russian Arctic with an emphasis on intensive methods of mining and processing of minerals, including through the use of complex processing of mineral raw materials in existing and promising deposits.

The state of subsoil development in resource-producing regions is largely determined by the economic activity of entities engaged in the extraction and processing of mineral resources on its territory, and the corporate policy they implement regarding their production. In view of this, it becomes important to take into account their readiness to change the paradigm of their development towards the integrated processing of mineral resources, and to identify the factors causing resistance to such a transition. Forming a list of such factors and assessing the opinions of business entities regarding them is an urgent scientific task. Its solution will make it possible to clarify the implementation of the Strategies for the development of the mineral resource base of the Russian Federation and the Russian Arctic up to 2035 by taking into account the characteristics of the Arctic regional economic systems of resource regions and to develop substantive solutions to the most pressing problems that complicate the implementation of the Strategies.

Thus, the purpose of this study will be to form a list of factors of readiness and resistance of economic entities to implement complex processing of mineral raw materials and systematize them for further research on assessing the readiness for such a change in the regional economic system as a whole and developing measures that will help increase the level of its readiness and reducing resistance.

In order to achieve the set goal, it is proposed to solve the following tasks:

- review existing research on the implementation of integrated processing of mineral resources;
- identify factors that determine readiness to implement integrated processing of mineral resources, and risk factors that cause resistance and hinder such a transition;

- systematize the identified factors of readiness and resistance, presenting them as a set of indicators against which further research will be conducted to assess the readiness of the regional economic system for the transition to the concept of integrated processing of mineral raw materials.

The method of content analysis of scientific publications on the topic of integrated processing of mineral resources was chosen as the research methods. 100 publications of the last 10 years were analyzed regarding the factors, promoting and restraining the implementation of the concept of integrated processing of mineral resources (hereinafter referred to as CPMS). The factors identified in the works were systematized into subgroups and classified into opportunity factors and resistance factors.

### ***Results and discussion***

As a result of the content analysis, 20 factors were identified that researchers emphasize when considering the problem of complex processing of mineral resources. At the same time, the identified factors have both positive and negative emotional coloring: both creating opportunities and limiting the implementation of the concept of integrated processing of mineral resources.

The first and most common factor is the mineral reserves factor. It was mentioned in one way or another in all the publications reviewed and to a greater extent (67%) had a positive emotional connotation, due to Russia's significant supply of mineral resources, of both natural and technogenic nature. The conditions that created the possibility of implementing CPMS also included the deterioration of mining and geological conditions of work and the quality of deposits involved in development, as well as reduction in the volume of geological exploration work. From the point of view of a negative assessment of this factor, which hinders the implementation of CPMS, a deterioration over time in the qualitative and quantitative composition of previously formed old waste and a change in the physical and mechanical properties of rocks were indicated [2, pp. 27–28].

Along with reserves of mineral resources, publications highlight the factor of developed potential processing technologies. As a possibility, this factor is noted in 33% of publications where it is mentioned, and is characterized by the presence of a significant scientific foundation and accumulated experience in developed technologies for complex and advanced processing of mineral resources [6, Orekhova N.N., Shadrinova I.V., Zelinskaya E.V., Volkova N.A.; 7, Chanturia V.A., p. 568]. At the same time, in other cases, the technological factor has a rather negative connotation due to the lack of effective processing technologies ready for use on a large scale, and the need for further research on this issue. One of the key conditions in this direction is the need to create a unified information space for accounting for reserves of mineral resources: both natural and technogenic, in order to obtain reliable mineralogical information, which should be available to research institutes and production organizations of various departmental affiliations.

An important factor for the implementation of CPMS is the availability of the required production capacity. This includes both the availability of existing processing assets, the number of business entities that own them, and their category (small, medium, large businesses), as well as the equipment used in the processing process. The positive aspect of the publications reviewed was that Russia has significant potential for creating a complete production chain. However, inter-regional cooperation has not received proper distribution, and therefore, in most industries there is underutilization of production capacity. It is noted that organizing the production of CPMS is possible within one enterprise without the need to separate this activity into specialized production [8, Larichkin F.D., p. 12]. At the same time, there are limitations in terms of the adequacy of own material and technical base, expressed in the absence of R&D departments and the efficiency of existing equipment, in terms of productivity and environmental safety, as well as its wear and tear and the need for modernization [2, p. 233]. The latter requires large-scale investments from business entities in renovation, which is another factor in the implementation of the CPMS identified within the framework of the analysis [9, Litvinenko V.S., p. 62]. At the same time, investments are required not only to improve the material and technical base, but also to resolve the issue of staffing [10, Uskova T.V., Lukin E.V., Melnikov A.E., Leonidova E.G., pp. 73–74].

The success of the implementation of the CPMS, as well as the progress of the state of any branch of material production, is directly determined by the state of the personnel. The personnel factor in the reviewed publications positively characterizes the current system of personnel training in higher and secondary education for the mining industry in Russia, which has preserved the principles of traditional Russian education and a specialized form of training as the level of higher professional education. However, there is a need for its further improvement in order to bring it into line with the current needs of the business and to maintain a proactive attitude towards it. Some areas of training, such as geology and mineralogy, as well as the implementation of the concept of continuous education of mining engineers in cooperation with educational, scientific and business communities require strengthening [11; 12, Kazanin O.I., pp. 370–373; 13, Vercheba A.A., pp. 147–149].

The fifth factor in the reviewed publications was the factor of regulation by the state (legal field). To a greater extent (75%), this factor in the reviewed publications had a negative connotation, associated with the imperfection of the current regulatory framework in Russia and its insufficiency [14, p. 161]. This fact is fully reflected in the content of the first stage of the implementation of the Strategy for the development of the mineral resources complex of Russia up to 2035 as one of its key tasks. The restraining influence was also characterized by departmental disunity in terms of regulation of waste management activities (Rosprirodnadzor and Rosnedra); issues of establishing property rights; lack of a unified accounting system [15, Nevskaya M.A., Marinina O.A.; 16, Ponomarenko T.V., Nevskaya M.A., Marinina O.A., p. 2627]. The opportunity was determined by the emergence of new and updating of existing legislative regulations that strengthen the responsibility of subsoil users for the management of production waste [17, Mustafin S.K., Anisimova G.S., Trifonov A.N., Struchko K.K., p. 9], as well as the need to develop new approaches to

state management of processes working with deposits in general [18, Litvinenko V.S., Petrov E.I., Vasilevskaya D.V., Yakovenko A.V., Naumov I.A., Ratnikov M.A., p. 15].

The sixth factor — the factor of administrative barriers — became a derivative of the factor of regulation by the state. This factor was clearly considered negative. It was indicated that the activity of subsoil users on application (utilization) of wastes formed by them and their disposal becomes more complicated [2, p. 89]; access to accumulated technogenic waste is limited for organizations, including small mining businesses [2, p. 62]; there is a need to license waste management activities [19, Karpenko N.B., pp. 17–18]; the principle of “development of large deposits” applies when developing technogenic ones [2, p. 72]. The latter aspects were also singled out in separate factors — the factor of patents, licenses to carry out activities and the factor of permits to carry out a type of activity.

The marketing component of CPMS is directly related to the demand factor. In the reviewed publications, it is encountered when substantiating the relevance of CPMS in the analysis of the areas of application of extracted valuable components [20, Nikolaev A.I., Krivovichev S.V.; 21, Malyshevskiy V.A.]. As an opportunity to implement CPMS, the demand factor is conditioned by the development of areas of activity where valuable components of mineral raw materials, the content of which in the extracted ore, as a rule, is insignificant, become in demand. At the same time, their diversity becomes a deterrent, since most often the demand for them is differentiated and small in volume [22, Kryukov V.A., Yatsenko V.A., Kryukov Ya.V., pp. 82–83].

The profitability of CPMS is determined by the price factor for the valuable components being extracted. The key scientific issue in publications is the determination of the pricing methodology for CPMS, including the justification of prices for each valuable element that makes up multi-component mineral raw materials, and various products of its complex processing at different stages of production, including recyclable mining waste [23, Dadykin V.S.; 24, Larichkin F.D., Vorobyov A.G., Glushchenko Yu.G.; 7, Chanturia V.A.]. The presence of a scientific basis for pricing methodology is a positive aspect of the highlighted factor. The restraining nature of the price factor is expressed in the correlation between the dynamics of world prices for the final products of the mineral resource complex and the traditional primary processing technologies used, which necessitates the regulation of this issue by the state, as a support measure for subsidizing costs and the corresponding export policy [22, Kryukov V. A., Yatsenko V.A., Kryukov Ya.V., p. 83].

When studying the issue of CPMS, the authors do not ignore the energy factor. The possibility of organizing CPMS is justified by the sufficient energy supply of the Russian national economy. At the same time, in a market economy, maintaining the competitiveness and profitability of companies requires a constant search for new technological solutions to increase the energy efficiency of production due to rising energy prices on the market. Russia currently has efficient energy-saving technologies for complex and deep processing of hard-to-process ores of complex material composition and technogenic mineral raw materials, which makes it possible to obtain high-quality finished products that are competitive on the world market [6; 7, p. 568].



In addition to energy, the main production costs in the processing of mineral raw materials are associated with the purchase of chemical reagents used to obtain concentrates and isolate commercial products, in view of this, the factor of the components required to organize production was the next selected factor. The positive coloring of this factor, which determines the possibility of implementing CPMS, is associated with scientific achievements in the field of creating new effective reagents [25, Petrov I.M., p. 29]. It is noted that the reagents used have a number of disadvantages due to their environmental unsafety and economic inefficiency, therefore the topic of searching and creating new reagents is still a pressing scientific problem. In addition, this factor can be classified as a factor of resistance due to the shortage of own, domestic products noted in publications and the insufficiency of the technical base for their production in Russia [26, Ryaboy V.I.].

The mechanism for leveling all factors of resistance was identified by the authors of publications as the need for support from the state. Regarding the stimulation of CPMS by the state, the issue of tax regulation of this activity is most often raised in publications. The increase in the economic efficiency of CPMS by researchers is determined by the need to eliminate the causes and conditions that contribute to the unlawful formation of the tax base and the determination of taxable objects for organizations implementing CPMS [27, Bogatkina Yu.G., Eremin N.A., Lyndin V.N.; 28, Bloshenko T.A., Dambaeva R.D.]. However, this condition acts more as a deterrent due to its impracticability in Russia. The flat scale of the current mineral extraction tax does not allow differentiation of its collection depending on the stages of development, mining and geological conditions, degree of depletion and location of the deposit, which creates unequal conditions for mining organizations. Mining with significant operating costs becomes impractical for subsoil users (a negative indicator of the economic efficiency of a field development project), and the state (the owner of the subsoil) increases the number of unprofitable deposits [2; 29, Bloshenko T.A., p. 46]

Other government support measures include preferences related to subsidizing costs, stimulating demand for a new product, and price regulation. The insufficiency of the implementation of these mechanisms in Russia, compared to other countries, for example, China, in terms of rare earth elements [30, Wübbecke Jt.; 31, Goodenough K.M., Wall F., Merriman D.; 32, Binnemans K., Jones P.T.] classifies these factors as deterrents to the implementation of the CPMS.

The development of CPMS also depends on the level of interaction between economic entities in the industry. In the publications reviewed, this condition was reflected in the factors of competition and the availability of necessary suppliers (contractors) and partners. The competition factor is considered as a constraint regarding import supplies, which fully satisfy domestic demand for valuable components that are by-products in the production of the main product in Russian factories and are often inferior in quality to imported ones [33, Novikov N.I., Salikhov N.I., pp. 143–147]. The insufficiency of business entities willing to act as suppliers, and the low degree of cooperation and interaction of companies as partners to create a single production chain, also have a negative assessment in publications where they are mentioned, which classifies these factors as factors of resistance [34, Tverdov A.A.; 35, Sinkov L.S.].

The final overview of the identified factors is presented in table 6.

Table 6

*Review and systematization of articles regarding the plot and its emotional coloring (opportunity / resistance)<sup>7</sup>*

	Factor	Number of mentions, units.	Percentage of total publications reviewed	Resistance rating (% of publications on the topic)	Opportunity rating (% of publications on the topic)
1	Mineral reserves	10	25.6%	30%	70%
2	Potential processing technology developed	10	25.6%	70%	30%
3	Availability of production capacity	8	20.5%	75%	25%
4	Staff	8	20.5%	75%	25%
5	Government regulation (state of the legal field)	7	17.9%	71%	29%
6	Administrative barriers	7	17.9%	71%	29%
7	Demand	7	17.9%	71%	29%
8	Market price	7	17.9%	71%	29%
9	Energy	6	15.4%	33%	67%
10	Components for production (additives, reagents, materials, components, etc.)	6	15.4%	67%	33%
12	Competition	4	10.3%	100%	0%
11	State preferences in terms of subsidizing costs	3	7.7%	100%	0%
13	Tax preferences	3	7.7%	100%	0%
14	Patents, licenses to carry out activities	3	7.7%	100%	0%
15	State preferences in terms of stimulating demand for a new product	3	7.7%	100%	0%
16	Investments	2	5.1%	100%	0%
17	Permission to carry out the type of activity	2	5.1%	100%	0%
19	State preferences in terms of market regulation (prices)	2	5.1%	100%	0%
18	Suppliers/contractors	1	2.6%	100%	0%
20	Partners (their presence and willingness to cooperate)	1	2.6%	100%	0%

In order to optimize further analysis and assessment of the identified factors, since the list of factors is not exhaustive, the factors were systematized according to their general characteristics into five main groups.

The first group, “Resource component”, includes such factors as the availability of mineral reserves, the availability of production facilities, the number of personnel and their qualifications, investment opportunities, the sufficiency of components for production (additives, reagents, materials, components, etc.) and energy security.

<sup>7</sup> Source: developed by the authors.

The second group of factors, “Technological component”, consists of the developed potential technology for processing mineral raw materials, as well as patents and licenses to carry out activities.

The third group, “Institutional environment”, is represented by factors that determine the legalization of activities, namely the availability of permits to carry out the type of activity, the level of administrative barriers and state regulation of this activity from the point of view of the state of the legal field.

Market factors are included in the fourth group “Market component” and determine the level of prices, demand and competition in the market, entrepreneurial activity in the market in the form of the presence of the necessary suppliers and contractors to be attracted to organize activities for the integrated processing of mineral resources.

The fifth group of factors is designated as “Supporting environment” and is represented by measures to support the type of activity from the state, as well as the development of partnership relationships, the willingness to cooperate of business entities for the implementation of the CPMS.

The classification of factors can become the basis for the formation of expert survey sheets, on the basis of which it is planned to conduct further research to assess the readiness and resistance of business entities to the transition to the implementation of the CPMS concept.

Conducting a study of the expert opinion of the direct actors of this type of activity — business entities and experts of the scientific community — will make it possible to determine the general trend in the development of the Strategy at the level of regions of the Russian Federation, identify problems and bottlenecks in its implementation, establish the main directions and develop targeted regulators in relation to a specific region, which will be, in turn, promising directions for further study of the issue posed in this article and can become the basis for the formation of a regional management policy that clarifies the Strategy for the development of the mineral resource base of the Russian Federation up to 2035, expressed in a new action plan for the period from 2024 to 2030.

### **Conclusion**

Thus, an undoubted condition for the sustainable development of the Russian economy, taking into account its pronounced raw material orientation, is the need to maintain reserves at a level balanced with current consumption. The adopted Strategy for the development of the mineral resource base of the Russian Federation up to 2035 is aimed at achieving this goal; however, its implementation today requires adjustment due to the disproportionality of the measures taken and the need to strengthen them towards the integrated processing of mineral resources. Despite the long study of this problem, the integrated use of mineral raw materials and processing of mining waste is still not carried out at the proper level, which is due to many factors. Identification and systematization of these factors based on content analysis of publications devoted to the topic of integrated processing of mineral resources made it possible to identify 20 factors that were

systematized into 5 groups. Presenting them in the form of questionnaires for further research into the problem of transition to the implementation of the concept of CPMS and the application of a specific regional economic system will make it possible to identify region-specific obstacles and resistance factors that impede such changes, and to determine the directions for their leveling, which will be, in turn, promising directions for further study of the issue posed in this article, and can also become the basis for the development of regional programs for the implementation of the adopted Strategy for the development of the mineral resource base of the Russian Federation up to 2035.

## References

1. Kalinnikov V.T., Grigoryev A.V. Kompleksnaya pererabotka apatito-nefelinovykh rud: sostoyanie i perspektivy [Integrated Processing of Apatite-Nepheline Ores: Status and Prospects]. *Kompleksnaya pererabotka apatito-nefelinovykh rud: sostoyanie i perspektivy* [Integrated Processing of Apatite-Nepheline Ores: Status and Prospects]. Apatity, KNC RAS, 1999, pp. 5–15.
2. Nevskaya M.A., Fedoseev S.V., Bloshenko T.A., Melik-Gaykazov I.V., perein V.N., Novosel'tseva V.D., Goncharova L.I., Gilyarova A.A. *Ratsional'noe ispol'zovanie vtorichnykh mineral'nykh resursov v usloviyakh ekologizatsii i vnedreniya nailuchshikh dostupnykh tekhnologiy: monografiya* [Rational Use of Secondary Mineral Resources under Conditions of Ecologisation and Implementation of the Best Available Technologies]. Apatity, FIC KSC RAS Publ., 2019, 252 p. DOI: 10.37614/978.5.91137.417.4 (In Russ.)
3. Eder L.V., Kontorovich A.E. Neobkhodimost' smeny paradigmy razvitiya neftegazovogo kompleksa v Rossii [Paradigm Oil and Gas Complex of Russia at the Present Stage]. *Interesno Geo-Sibir'* [Interexpo GEO-Siberia], 2017, no. 1 (3), pp. 16–23.
4. Kontorovich A.E. *Kompleksnoe osvoenie nedr. Industriya 4.0. Gosudarstvenno-chastnoe partnerstvo biznesa v sfere kompleksnogo osvoeniya nedr* [Complex Development of Mineral Resources. Industry 4.0. Public-Private Partnership of Business in the Field of Integrated Development of Mineral Resources]. Sibirskaya izdatel'skaya gruppa Publ., 2018, 138 p.
5. Zaikov K.S., Kondratov N.A., Kudryashova E.V., Lipina S.A., Chistobaev A.I. Scenarios for the Development of the Arctic Region (2020–2035). *Arktika i Sever* [Arctic and North], 2019, no. 35, pp. 5–24. DOI: 10.17238/issn2221-2698.2019.35.5
6. Orekhova N.N., Shadrunkova I.V., Zelinskaya E.V., Volkova N.A. Resursy tekhnogennogo mineral'nogo syr'ya Urala i Sibiri: osnovnye rezul'taty issledovaniy, perspektivy ikh osvoeniya [Anthropogenic Mineral Resources in Urals and Siberia: Main Research Results and Prospects for Their Development]. In: *Materialy mezhdunarodnoy konferentsii «Innovatsionnye protsessy kompleksnoy pererabotki prirodnogo i tekhnogennogo mineral'nogo syr'ya»*. *Sbornik materialov Plaksinskiye chteniya — 2020* [Proc. Intern. Conf. "Innovative Processes of Complex Processing of Natural and Technogenic Mineral Raw Materials". Collection of Materials Plaksin Readings — 2020]. Apatity, KNC RAS Publ., 2020, pp. 24–28. (In Russ.)
7. Chanturiya V.A. Nauchnoe obosnovanie i razrabotka innovatsionnykh protsessov kompleksnoy pererabotki mineral'nogo syr'ya [Scientific Substantiation and Development of Innovative Approaches to Integrated Mineral Processing]. *Gornyy zhurnal* [Mining Journal], 2017, no. 11, pp. 7–13. DOI: 10.17580/gzh.2017.11.01
8. Larichkin F.D. Evolyutsiya i formirovanie sovremennoy paradigmy (modeli) kompleksnogo ispol'zovaniya mineral'nogo syr'ya [Evolution and Background of the Modern Paradigm (Model) of Rational Subsoil Use]. *Vestnik Kol'skogo nauchnogo tsentra RAN* [Herald of the Kola Science Centre of RAS], 2012, no. 4, pp. 8–14.
9. Litvinenko V.S., Sergeev I.B. Innovatsionnoe razvitie mineral'no-syr'evogo sektora [Innovations as a Factor in the Development of the Natural Resources Sector]. *Problemy prognozirovaniya* [Studies on Russian Economic Development], 2019, no. 6 (177), pp. 60–72.

10. Uskova T.V., Lukin E.V., Melnikov A.E., Leonidova E.G. Problemy razvitiya promyshlennogo sektora ekonomiki staropromyshlennykh regionov Rossii [Industrial Development Issues in the Economy of the Old Industrial Regions of Russia]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2017, vol. 10, no. 4, pp. 62–77. DOI: 10.15838/esc.2017.4.52.3
11. *Innovatsionnyy bazis strategii kompleksnogo osvoeniya resursov mineral'nogo syr'ya: monografiya* [The Innovative Basis of the Strategy of Integrated Development of Mineral Resources]. Ekaterinburg, KSC UB RAS Publ., 2018, 360 p. (In Russ.)
12. Kazanin O.I., Drebenshtedt K. Gornoe obrazovanie v XXI veke: global'nye vyzovy i perspektivy [Mining Education in the 21st Century: Global Challenges and Prospects]. *Zapiski Gornogo instituta* [Journal of Mining Institute], 2017, vol. 225, pp. 369–375. DOI: 10.18454/PMI.2017.3.369
13. Vercheba A.A. Podgotovka kadrov dlya gorno-geologicheskoy otrasli Rossii [Personnel Training for the Mining and Geological Sector of Russia]. *Gornye nauki i tekhnologii* [Mining Science and Technology (Russia)], 2021, vol. 6, no. 2, pp. 144–153. DOI: 10.17073/2500-0632-2021-2-144-153
14. *Tekhnogennyye mestorozhdeniya. Razrabotka i formirovanie: monografiya* [Technogenic Deposits. Development and Formation]. Apatity, KNC RAS Publ., 2017, 175 p.
15. Nevskaya M.A., Marinina O.A. Regulatory Aspects of Mining Waste Management in the Russian Federation. *Biosciences Biotechnology Research Asia*, 2015, no. 3 (12), pp. 2619–2628. DOI: 10.13005/bbra/1942
16. Ponomarenko T.V., Nevskaya M.A., Marinina O.A. Complex Use of Mineral Resources as a Factor of the Competitiveness of Mining Companies under the Conditions of the Global Economy. *International Journal of Mechanical Engineering and Technology*, 2018, vol. 9, iss. 12, pp. 1215–1223.
17. Mustafin S.K., Anisimova G.S., Trifonov A.N., Struchkov K.K. Tekhnogennoe mineral'noe syr'e regionov nedropol'zovaniya: priroda, sostav i perspektivy ratsional'nogo ispol'zovaniya [Technogenic Mineral Raw Materials of the Subsoil Use Regions: Nature, Composition and Prospects of Rational Development]. *Nauka i obrazovanie* [Science and Education], 2017, no. 4 (88), pp. 7–16.
18. Litvinenko V.S., Petrov E.I., Vasilevskaya D.V., Yakovenko A.V., Naumov I.A., Ratnikov M.A. Otsenka roli gosudarstva v upravlenii mineral'nymi resursami [Assessment of the Role of the State in the Management of Mineral Resources]. *Zapiski Gornogo instituta* [Journal of Mining Institute], 2023, vol. 259, pp. 95–111. DOI: 10.31897/PMI.2022.100
19. Karpenko N.B. Pravovye aspekty ucheta i pererabotki tekhnogennykh mestorozhdeniy [Legal Aspects of Accounting and Processing of Technogenic Deposits]. *Zolotodobycha*, 2010, no. 140, pp. 12–18.
20. Nikolaev A.I., Krivovichev S.V. Prirodnye mineraly i ikh sinteticheskie analogi kak prototipy funktsional'nykh materialov [Natural Materials and Their Synthetic Analogs: The Experience of the Kola Nanomaterials Research Centre]. *Vestnik Tomskogo gosudarstvennogo universiteta. Khimiya* [Bulletin of Tomsk State University. Chemistry], 2017, no. 8, pp. 7–20. DOI: 10.17223/24135542/8/1
21. Malyshevskiy V.A. Novye svarochnyye materialy dlya khladostoykikh staley magistral'nykh neftegazoprovodov i drugikh konstruksiy, rabotayushchikh v ekstremal'nykh usloviyakh, s ispol'zovaniem syr'ya Kol'skogo poluostrova [New Welding Materials for Cold-Resistant Steels of Main Oil and Gas Pipelines and Other Structures Operating in Extreme Conditions, Using Raw Materials from the Kola Peninsula]. In: *Materialy Vserossiyskoy konferentsii s mezhdunarodnym uchastiem «Issledovaniya i razrabotki v oblasti khimii i tekhnologii funktsional'nykh materialov»* [Proc. All-Russ. Conf. with Intern. Participation "Research and Development in the Field of Chemistry and Technology of Functional Materials"]. Apatity, 2010, pp. 69–71. (In Russ.)
22. Kryukov V.A., Yatsenko V.A., Kryukov Ya.V. Redkozemel'naya promyshlennost' — realizovat' imeyushchiesya vozmozhnosti [Rare Earth Industry - How to Take Advantage of Opportunities]. *Gornaya promyshlennost'* [Mining Industry Journal], 2020, no. 5, pp. 68–84. DOI: 10.30686/1609-9192-2020-5-68-84
23. Dadykin V.S. Problemy tsenoobrazovaniya i investitsionnoy privlekatel'nosti mineral'no-syr'evoy bazy v sisteme geologo-ekonomicheskogo monitoringa Tsentral'nogo federal'nogo okruga [Problems of Pricing and Investment Attractiveness of the Mineral and Raw Materials Base in the System of Geological and Economic Monitoring of the Central Federal District]. *Naukovedenie* [The Eurasian Scientific Journal], 2017, vol. 9, no. 5, p. 81.



24. Larichkin F.D., Vorob'ev A.G., Glushchenko Yu.G., Ibrokhim A., Perein V.N., Ivanov M.A. Teoriya i praktika tsenoobrazovaniya na produktsiyu kompleksnoy pererabotki mineral'nogo syr'ya [The Theory and Pricing Practice on Production of Complex Processing of Mineral Raw Materials]. *Natsional'nye interesy: priority i bezopasnost'* [National Interests: Priorities and Security], 2010, vol. 6, no. 32 (89), pp. 24–30.
25. Petrov I.M. Tekhnologo-ekonomicheskie aspekty pererabotki rud redkozemel'nogo syr'ya [Technological and Economic Aspects of Rare-Earth Ore Processing]. In: *Materialy mezhdunarodnoy konferentsii «Innovatsionnye protsessy kompleksnoy pererabotki prirodnogo i tekhnogennogo mineral'nogo syr'ya»*. Sbornik materialov Plaksinskie chteniya — 2020 [Proc. Intern. Conf. "Innovative Processes of Complex Processing of Natural and Technogenic Mineral Raw Materials". Collection of Materials of Plaksin Readings — 2020]. Apatity, KNC RAS Publ., 2020, p. 29. (In Russ.)
26. Ryaboy V.I. Problemy ispol'zovaniya i razrabotki novykh flotoreagentov v Rossii [The Problems of Usage and Development of New Flotation Reagents in Russia]. *Tsvetnye metally* [Non-Ferrous Metals Journal], 2011, no. 3, pp. 7–14.
27. Bogatkina Yu.G., Eremin N.A., Lyndin V.N. Problemy nalogooblozheniya v neftegazodobyche [Problems of Taxation in Oil and Gas Production]. *Problemy ekonomiki i upravleniya neftegazovym kompleksom* [Problems of Economics and Management of Oil and Gas Complex], 2018, no. 1, pp. 7–10.
28. Bloshenko T.A., Dambaeva R.D. Glubokaya pererabotka ugl'ya v Rossii: ekonomicheskie problemy i perspektivy razvitiya [Deep Coal Processing in Russia: Economic Problems and Development Prospects]. *Finansovaya zhizn'* [Financial Life], 2021, no. 3, pp. 12–15.
29. Bloshenko T.A. Metodologiya opredeleniya differentsirovannykh nalogovykh stavok po nalogu na dobychu poleznykh iskopaemykh dlya tverdykh poleznykh komponentov [Methodology of Determining Differentiated Met Rates for Solid Minerals]. *Sever i rynek: formirovanie ekonomicheskogo poryadka*, 2018, no. 3 (59), pp. 53–60. DOI: 10.25702/KSC.2220-802X.3.2018.59.53-60
30. Wübbeke Jt. Rare Earth Elements in China: Policies and Narratives of Reinventing an Industry. *Resources Policy*, 2013, no. 38 (3), pp. 384–394. DOI: 10.1016/j.resourpol.2013.05.005
31. Goodenough K.M., Wall F., Merriman D. The Rare Earth Elements: Demand, Global Resources, and Challenges for Resourcing Future Generations. *Natural Resources Research*, 2018, no. 27 (2), pp. 201–216. DOI: 10.1007/s11053-017-9336-5
32. Binnemans K., Jones P.T. Rare Earths and the Balance Problem. *Journal of Sustainable Metallurgy*, 2015, no. 1, pp. 29–38. DOI: 10.1007/s40831-014-0005-1
33. Novikov N.I., Salikhov N.I. Osnovnye napravleniya i perspektivy razvitiya mineral'no-syr'evoy bazy tsvetnykh i redkikh metallov v mire i Rossii [The Main Directions and Prospects for the Development of the Mineral Raw Material Base of Non-Ferrous and Rare Metals in the World and in Russia]. *Vestnik Tomskogo gosudarstvennogo universiteta. Ekonomika* [Tomsk State University Journal of Economics], 2015, no. 2 (30), pp. 138–150. DOI: 10.17223/19988648/30/13
34. Tverdov A.A., Nikishichev S.B., Zakharov V.N. Problemy i perspektivy importozameshcheniya v gornoy otrasli [Problems and Prospects of Import Substitution in the Mining Sector]. *Gornaya promyshlennost'* [Mining Industry Journal], 2015, no. 5, pp. 54–58.
35. Sin'kov L.S., Lebedeva O.Yu. Tekushchee sostoyanie i perspektivy razvitiya mineral'no-syr'evoy bazy dobyvayushchey promyshlennosti Rossii [Current Condition and Perspective Development of Mineral Resources Base of Mining Industry of Russia]. *Gornyy informatsionno-analiticheskiy byulleten' (nauchno-tekhnicheskiy zhurnal)* [Mining Informational and Analytical Bulletin (Scientific and Technical Journal)], 2015, no. S8, pp. 66–77.

*The article was submitted 26.03.2023; approved after reviewing 29.03.2023;  
 accepted for publication 30.03.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*



## POLITICAL PROCESSES AND INSTITUTIONS

Arctic and North. 2023. No. 52. Pp. 103–115.

Original article

UDC 327(985)(045)+323(985)(045)

doi: 10.37482/issn2221-2698.2023.52.121

### On the Outcomes and Lessons of Russia's Chairmanship of the Arctic Council (2021–2023)

Valery P. Zhuravel<sup>1</sup>✉, Cand. Sci. (Pedag.), Associate Professor, Leading Researcher

Diana S. Timoshenko<sup>2</sup>, Cand. Sci. (Econ.), Senior Researcher

<sup>1,2</sup> Institute of Europe, Russian Academy of Sciences, ul. Mokhovaya, 11-3, Moscow, Russia

<sup>1</sup> zhvalery@mail.ru ✉, ORCID: <https://orcid.org/0000-0002-1786-6754>

<sup>2</sup> artemideus@gmail.com, ORCID: <https://orcid.org/0000-0002-2780-6464>

**Abstract.** The article summarizes the results of Russia's chairmanship in the Arctic Council (AC, Council) in 2021–2023, analyzes the relationship with the state national and international policy, and systematizes the key results. The authors identify four main periods of Russian chairmanship. The article presents general logical, theoretical, and empirical research methods. It is noted that due to the boycott of a number of Western countries because of the events in Ukraine, the Russian Federation focused its efforts in the Arctic direction on the northern territories of the country and was able to achieve certain successes. Russia has carried out most of the planned activities related to economic and social development, climate change, ecology, human capital, indigenous peoples' activities, tourism, and prevention of emergency situations in the Arctic. The "Arctic Youth" direction well represented, and a large number of projects for youth events and career guidance were launched. The conclusion is made: during the 2-year period the government paid special attention to improving the functioning of the Northern Sea Route, socio-economic development of the Arctic regions of the Russian Federation, but due to the geopolitical situation Russia failed to fully realize its plans. The authors note that the course of the chairmanship was internally incomplete, especially during the recent periods. The remote transfer of the chairmanship of the Arctic Council to Norway raises many questions. It is hoped that the full status and composition of the AC will be restored. Russia still proceeds from the fact that the pressing problems of the Arctic region can be solved only through balanced and mutually beneficial international co-operation.

**Keywords:** *Russian Arctic, Arctic Council, Russian Chairmanship 2021–2023, sustainable development, sanctions, geopolitical instability, international cooperation*

### Introduction

On May 20, 2021, the chairmanship of the Council passed from Reykjavik to Moscow. The Minister for Foreign Affairs of Iceland, G. T. Thordarson, handed over the chairmanship of the AC for the next two-year period to the Minister for Foreign Affairs of Russia, S. V. Lavrov. Iceland's chairmanship was not easy due to COVID-19, a number of events had to be canceled or postponed, but despite the difficulties, the pandemic opened up opportunities for new ways of cooperation within the AC [1, Zhuravel V.P.].

Taking into account the above factors, the Russian chairmanship had a number of significant features:

---

\* © Zhuravel V.P., Timoshenko D.S., 2023

For citation: Zhuravel V.P., Timoshenko D.S. On the Outcomes and Lessons of Russia's Chairmanship of the Arctic Council (2021–2023). *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 121–135. DOI: 10.37482/issn2221-2698.2023.52.121

- it started in the year of the 25th anniversary of the AC (September 19, 2021), which imposed special responsibility for its results;
- Russia had high hopes for it in order to consolidate its leading role in the Arctic, including in further solving of the task of increasing the effectiveness of international Arctic cooperation;
- implementation of the chairmanship program should have become an important factor in reducing the conflict potential in the world, primarily in Europe.

Russia's chairmanship of the AC, in our opinion, covers four periods of varying degrees of effectiveness:

- preparatory stage (November 2020–May 2021), which was the most meaningful and systematic;
- beginning of the chairmanship (May 2021–March 2022);
- chairmanship under sanctions and boycott of the Russian chairmanship (March 2022–April 2023);
- final stage, search for the most acceptable form of ending the chairmanship (April–May 2023).

The periods are closely related to each other, but have different levels of efficiency.

### ***Conception of the Russian chairmanship of the Arctic Council and its boycott***

Speaking about Russia's chairmanship in the Arctic Council, it should be noted that the Organizational Committee for the preparation and provision of the Russian Federation's chairmanship of the Arctic Council in 2021–2023 was formed in advance by the Decree of the President of the Russian Federation of 25 November 2020, its Statute was approved, and the Deputy Chairman of the Government of the Russian Federation and Plenipotentiary Representative of the President of the Russian Federation in the Far Eastern Federal District, Yuri Trutnev, was appointed as its Chairman<sup>1</sup>. The composition of the Organizational Committee was formed and approved a month later, topical issues of the Russian Federation's chairmanship of the AC were widely discussed in a departmental format. Simultaneously, representatives of the scientific community tried to define the content of the chairmanship in their publications [2, Krasnopolskiy B.Kh.; 3, Krivorotov A.K.; 4, Korchunov N.V.; 5, Tishkov A.A.].

In addition to the adopted program, on April 30, 2021, the Chairman of the Government of the Russian Federation M.V. Mishustin approved the plan for its main activities, which included

---

<sup>1</sup> Ukaz Prezidenta RF ot 25.11.2020 g. № 740 «Ob Organizatsionnom komitete po podgotovke i obespecheniyu predsedatel'stva Rossiyskoy Federatsii v Arkticheskom sovete v 2021-2023 godakh» [Decree of the President of the Russian Federation dated November 25, 2020 No. 740 "On the Organizing Committee for the preparation and provision of the Chairmanship of the Russian Federation in the Arctic Council in 2021-2023"]. URL: <https://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=EXP&n=755222&dst=100001#C5iACYTGmHCfi1pZ1> (accessed 15 April 2021).

116 events grouped into 11 sections<sup>2</sup>. It is positive that these decisions were supported by funding by more than 15 billion rubles from the federal budget for Arctic projects for the period 2021–2024. The chairmanship's slogan was "Responsible Governance for a Sustainable Arctic". Russia decided to develop cooperation with the countries participating in the intergovernmental forum in four priority areas:

- population of the Arctic, including indigenous peoples of the North;
- protection of the Arctic environment, including climate change;
- socio-economic development of the region;
- strengthening the role of the Arctic Council as the main platform for multilateral cooperation in high latitudes [6].

These provisions were promptly communicated to the founding countries, observer states, and representatives of indigenous peoples. By doing this, Russia demonstrated the continuity of the Arctic agenda of its chairmanship, but also intended to demonstrate the leading role of the Russian Federation in the Arctic.

All these areas are reflected in the activities of the Center for Arctic Studies of the Department of Country Studies of the Institute of Europe of the Russian Academy of Sciences, which was established in 2018 [7, Zhuravel V.P.]. Employees of the Center for the Problems of the Russian Chairmanship held 2 conferences, prepared a monograph [8], published more than 20 articles on this topic, including in the Arctic and North journal, and made about 30 presentations at conferences and round tables. The Center analyzed the possible risks of chairmanship disruptions, including the COVID-19 coronavirus pandemic, ongoing political tensions with the West, increasing accusations of Russia's militarization of the Arctic, its violation of environmental requirements, oppression of the rights of indigenous peoples of the North, and increased sanctions pressure on Russia. All this could potentially affect the rhythm and regulation of the work.

From May 2021 to March 2022, everything planned was being fulfilled. Here we would like to mention the entry into force of the Agreement on the Prevention of Unregulated Fishing on the High Seas in the Central Arctic Ocean, signed in 2018. With the beginning of the Russian chairmanship, this document was signed by China. Despite the fact that this event was not included in the program of the Russian Federation's chairmanship, it can be noted as an achievement, which is another factor in the strengthening interaction between the Russian Federation and the PRC in the Arctic [1].

In March 2022, the seven Arctic Council countries (Denmark, Iceland, Canada, Norway, the USA, Finland and Sweden), in protest against Russia's special military operation in Ukraine, refused to take part in all meetings chaired and hosted by the Russian Federation<sup>3</sup>, despite the unified

---

<sup>2</sup> Plan osnovnykh meropriyatiy v svyazi predsedatel'stvom Rossii v AS 2021–2023 gg. ot 30 aprelya 2021 g., № 4161p-P2 [Plan of main events in connection with Russia's chairmanship of the AC 2021–2023 dated April 30, 2021, No. 4161p-P2].

<sup>3</sup> U.S. Department of State. Joint Statement on Arctic Council Cooperation Following Russia's Invasion of Ukraine. U.S. Department of State. 03.03.2022. URL: <https://www.state.gov/joint-statement-on-arctic-council-cooperation-following-russias-invasion-ofukraine/> (accessed 05 March 2022).

strategic plan of the AC, adopted a year ago in Reykjavik<sup>4</sup>. Later, on June 8, these states decided to resume AC activities on a limited basis, but without Russia's participation<sup>5</sup>. It should be noted that this information was initially published on the website of the US State Department, which indicates who was the initiator of these decisions. All this ultimately resulted in a large-scale boycott of the Russian Federation's chairmanship of the Arctic Council [9, Zhuravel V.P.].

At the same time, several large European and Asian transnational companies withdrew from Arctic projects or revised their plans to invest in them. Foreign companies left Russian projects despite significant financial and image losses. The European Commission has imposed sanctions on the Kolarctic program, which plays an important role in interregional cooperation. Members of the Barents Euro-Arctic Council announced the suspension of cooperation with the Russian Federation. Scientific cooperation with the International Council for Science and the International Arctic Science Committee has also been significantly limited. The activities of the Russian Federation in the Council of Ministers of the Nordic Countries were terminated [10, Zhuravel V.P., Timoshenko D.S.; 11, Timoshenko D.S.]. At the country level, Arctic cooperation was frozen, which began to acquire an unfriendly character.

### ***Chairmanship vector — the northern territories of Russia***

March–May 2022 was a difficult period during the Russian chairmanship, but, in our opinion, the right decision was made to continue it and to strengthen the development of the Arctic territories of the Russian Federation. The timely adoption of this decision was influenced, among other things, by an expert note from the Institute of Europe of the RAS to federal and regional authorities and administrations, which proposed measures to amend the program and regulations of the chairmanship plan.

A significant contribution to the analysis of current Arctic problems was made by the XXV St. Petersburg International Economic Forum, which was held in St. Petersburg from June 15 to 18, 2022 [12, Zhuravel V.P.], where a substantive analysis of the current situation in the Arctic space took place within the framework of the stand of the Ministry of Eastern Development of the Russian Federation “The Arctic: Territory of Dialogue”.

The decision taken to shift the focus of the chairmanship to the Russian problems of the northern regions made it possible to make serious progress in the Arctic direction already in 2022 — early 2023.

Thus, the volume of cargo transportation along the Northern Sea Route in 2022 amounted to 34 million 34 thousand tons, which is 2 million tons more than the target indicator of the federal project “Development of the Northern Sea Route”<sup>6</sup>. According to Glavsevmorput, cargo traffic

---

<sup>4</sup> Arctic Council Strategic Plan 2021 to 2030. Arctic Council. 20.05.2021. URL: [https://oaarchive.arctic-council.org/bitstream/handle/11374/2601/MMIS12\\_2021\\_REYKJAVIK\\_Strategic-Plan\\_2021-2030.pdf](https://oaarchive.arctic-council.org/bitstream/handle/11374/2601/MMIS12_2021_REYKJAVIK_Strategic-Plan_2021-2030.pdf) (accessed 05 January 2022).

<sup>5</sup> Joint Statement on Limited Resumption of AC Cooperation. U.S. Department of State. 08.06.2022. URL: <https://www.state.gov/joint-statement-onlimited-resumption-of-arcticcouncil-cooperation/> (accessed 19 June 2022).

<sup>6</sup> Soobshchenie Departamenta kommunikatsiy Goskorporatsii «Rosatom» [Message from the Communications Department of the State Corporation Rosatom]. 13.01.2022. URL: <https://www.rosatom.ru/journalist/news/obem->

increased primarily due to the transportation of liquefied natural gas. Its transportation exceeded the same figure for 2021 by 1.2 million tons (1.258 thousand tons), the transportation of container cargo increased by 226 thousand tons, bulk cargo — by 109 thousand tons. Novatek, Nornickel and Gazpromneft are among the leaders in terms of growing cargo traffic. Cargo traffic growth continued for the construction of infrastructure at Rosneft's Vostok Oil projects — Severnaya Zvezda, Baimskaya mining company and Arctic LNG-2. Severnaya Zvezda shipped the first three batches of coal produced at the Syrdasayskoe deposit. More than 100 thousand tons of products were shipped eastward through the Northern Sea Route<sup>7</sup>. At the same time, transit traffic decreased 10 times and amounted to 200 thousand tons<sup>8</sup>. This was the result of foreign trade activities of Western countries, which also affected Arctic oil and gas projects. Western companies have left even the already implemented projects and refused to invest further. In these conditions, a separate program is needed to establish interaction with major shipowners interested in fast cargo transportation, including the use of Russian icebreakers.

In July 2022, the Federal State Budget Institution “Main Directorate of the Northern Sea Route” was established within the structure of Rosatom State Corporation on the basis of the Marine Operations Headquarters. This solution has already proved its effectiveness in improving navigation management on the NSR route.

The government approved the NSR development plan up to 2035, which provides for the implementation of 152 measures. It is planned to allocate about 1.8 trillion rubles from various sources for their implementation<sup>9</sup>. The plan includes measures to build 10 icebreakers, 14 ports and terminals, 141 ice-class transport vessels, launch 12 satellites into orbit, and build 4 emergency rescue centers of the Ministry of Emergency Situations.

In 2022, the state expanded access to preferential loans for investors implementing projects in the Far East and the Arctic in industry, transport, and energy, which will significantly reduce the risks of failure of investment projects due to sanctions restrictions<sup>10</sup>.

The federal budget allocated more than 2.6 billion rubles for the development of social, communal and transport infrastructure of the Komi Republic, Arkhangelsk and Murmansk oblasts,

---

perevezennykh-gruzov-po-severnomu-morskomu-puti-v-2022-godu-sostavil-34-034-mln-tonn/ (accessed 06 November 2022).

<sup>7</sup> Kompaniya «Nornikel'» voshla v chislo liderov po rastushchemu gruzopotoku [The Norilsk Nickel company is among the leaders in growing cargo traffic]. 16.01.2023. URL: <https://www.ttelegraf.ru/news/kompaniya-nornikel-voshla-v-chislo-liderov-po-rastushhemu-gruzopotoku/> (accessed 15 February 2023).

<sup>8</sup> Inostrannyi tranzit po SMP udalos' kompensirovat' perevozkoy rossiyskikh gruzov v 2022 godu — Rosatom [Foreign transit along the NSR was compensated by the transportation of Russian goods in 2022 - Rosatom]. 16.02.2023. URL: <https://portnews.ru/news/343075> (accessed 25 February 2023).

<sup>9</sup> Mikhail Mishustin utverdil plan razvitiya Severnogo morskogo puti do 2035 goda. Pravitel'stvo Rossii [Mikhail Mishustin approved the development plan for the Northern Sea Route until 2035. Russian Government]. 04.08.2022. URL: <http://government.ru/news/46171/> (accessed 15 November 2022).

<sup>10</sup> Postanovlenie Pravitel'stva RF ot 14.07.2022 № 1261 «O vnesenii izmeneniya v prilozhenie № 19 k postanovleniyu Pravitel'stva Rossiyskoy Federatsii ot 12 marta 2022 g. № 353» [Decree of the Government of the Russian Federation dated July 14, 2022 No. 1261 “On introducing amendments to Appendix No. 19 to Decree of the Government of the Russian Federation dated March 12, 2022, No. 353”]. URL: [https://www.consultant.ru/document/cons\\_doc\\_LAW\\_422209/](https://www.consultant.ru/document/cons_doc_LAW_422209/) (accessed 25 September 2022).

as well as the Chukotka Autonomous Okrug, which will contribute to improving the socio-economic situation in the Arctic zone <sup>11</sup>.

Work on the development of the Murmansk Oblast's transport infrastructure was launched. The boundaries of the priority socio-economic development area "Capital of the Arctic" have been expanded, which will make it possible to build a transshipment complex for liquefied natural gas in the Murmansk port <sup>12</sup>. As part of the comprehensive development of the Murmansk transport hub, funding is provided for the construction of a 49.7 km railway to the port of Lavna, where a coal terminal with a capacity of 18 million tons per year is being built <sup>13</sup>.

On November 22, 2022, the hull of the nuclear-powered icebreaker "Yakutia" was launched at the Baltic Shipyard. The second serial nuclear icebreaker of the project 22220 "Ural" successfully completed the factory sea trials program and on December 3, 2022, set off from the port of Murmansk to the Kara Sea [13].

In 2022, the fleet of the Arctic and Antarctic Research Institute was supplemented with a new unique vessel — the ice-resistant self-propelled platform "North Pole". It is now drifting with polar explorers at the North Pole-41 station.

The Yamal LNG and Arctic LNG-2 projects are being successfully implemented.

Currently, over 630 investment projects are being implemented in the Arctic within the framework of the system of preferences, with the volume of investments under the agreements totaling 1.6 trillion rubles. The largest number of projects relates to such industries as service sector, construction, mining, logistics and tourism <sup>14</sup>.

During the remaining period of its chairmanship, Russia focused its efforts on promoting cooperation to improve the well-being and quality of life of the Arctic population, preserving Arctic biodiversity and unique ecosystems, ensuring socio-economic development, finding solutions in the field of

---

<sup>11</sup> Rasporyazhenie Pravitel'stva RF ot 24.11.2022 № 3603-r (red. ot 23.12.2022) «O raspredelenie inykh mezhbyudzhethnykh transfertov, predostavlyayemykh iz federal'nogo byudzheta byudzheta sub"ektov Rossiyskoy Federatsii na realizatsiyu meropriyatiy planov sotsial'nogo razvitiya tsentrov ekonomicheskogo rosta sub"ektov Rossiyskoy Federatsii, vkhodyashchikh v sostav Arkticheskoy zony Rossiyskoy Federatsii» [Order of the Government of the Russian Federation dated November 24, 2022 No. 3603-r (as amended on December 23, 2022) "On the distribution of other interbudgetary transfers provided from the federal budget to the budgets of the constituent entities of the Russian Federation for the implementation of social development plans for the economic growth centers of the constituent entities of the Russian Federation included into the Arctic zone of the Russian Federation"]. URL: [https://www.consultant.ru/document/cons\\_doc\\_LAW\\_432448/](https://www.consultant.ru/document/cons_doc_LAW_432448/) (accessed 18 January 2023).

<sup>12</sup> Pravitel'stvo odobrilo rasshirenie granits territorii operezhayushchego razvitiya «Stolitsa Arktiki» v Murmanskoy oblasti. Pravitel'stvo Rossii [The government approved the expansion of the boundaries of the priority development territory "Capital of the Arctic" in the Murmansk Oblast. Russian Government]. URL: <http://government.ru/news/44552/> (accessed 16 January 2023).

<sup>13</sup> Pravitel'stvo napravit investitsii v stroitel'stvo Murmanskogo transportnogo uzla. Pravitel'stvo Rossii [The government will invest in the construction of the Murmansk transport hub. Russian Government]. 16.12.2022. URL: <http://government.ru/docs/47344/> (accessed 17 February 2023).

<sup>14</sup> V ramkakh sistemy preferentsiy v Arktike realizuetsya syshe 630 investitsionnykh proektov [More than 630 investment projects are being implemented within the framework of the system of preferences in the Arctic]. URL: [http://www.energyland.info/analitic-show-239456?utm\\_source=yxnews&utm\\_medium=desktop&utm\\_referrer=https%3A%2F%2Fdzen.ru%2Fnews%2Fse](http://www.energyland.info/analitic-show-239456?utm_source=yxnews&utm_medium=desktop&utm_referrer=https%3A%2F%2Fdzen.ru%2Fnews%2Fse) (accessed 05 March 2023).



global energy and transport security, promoting scientific cooperation in high latitudes and strengthening Arctic cooperation<sup>15</sup>.

### ***Activities of Russia's Chairmanship of the Arctic Council: implementation***

According to the Ministry for Development of Russian Far East, 32 events were held in 2021<sup>16</sup>, and 43 events in 2022<sup>17</sup>. According to the press service of the Deputy Prime Minister of the Russian Federation, Plenipotentiary Representative of the President of the Russian Federation in the Far Eastern Federal District, Yu.P. Trutnev, over a two-year period, the Russian Federation held about 90 different events, including forums, conferences, round tables, championships, festivals and sports competitions. Chairmanship events took place in 24 cities and towns of Russia, including in all nine regions of the Arctic zone of the Russian Federation. The plan for chairmanship of the Arctic Council was calculated until August 2023, so Russia will hold a number of events designed to promote socio-economic development, preserve the ecology of northern latitudes and scientific study of the Arctic. About 20 events will take place in the coming months<sup>18</sup>. The organizer of the chairmanship events was the Roscongress Foundation.

It should be noted that after the boycott of the Russian chairmanship by unfriendly countries, interest within the country in this international event weakened.

In our opinion, the most interesting and productive events were held in the Arkhangelsk Oblast, Northern (Arctic) Federal University named after M.V. Lomonosov (NAFU) and the Republic of Sakha (Yakutia). The issues of indigenous peoples of the North and the involvement of young people in Arctic affairs were considered in a meaningful and innovative manner.

In accordance with the Plan of the Russian Federation's chairmanship of the Arctic Council in 2021–2023, many events were held in Arkhangelsk and the Oblast. The main organizer was NArFU.

Thus, on November 15–16, 2021 and November 10–11, 2022, two conferences were held on the problem of attracting and training personnel for the Arctic. The first conference discussed govern-

<sup>15</sup> Perspektivy mezhdunarodnogo vzaimodeystviya v Arktike obsudili na sessiyakh proekta Think Arctic — Think Global v ramkakh VEF [The prospects for international cooperation in the Arctic were discussed at sessions of the Think Arctic - Think Global project within the framework of the WEF]. URL: <https://roscongress.org/news/perspektivy-mezhdunarodnogo-vzaimodeystviya-v-arktike-obsudili-na-sessijah-proekta-think-arctic-thin/> (accessed 05 March 2023).

<sup>16</sup> 32 meropriyatiya sostoyalis' v 2021 godu v ramkakh predsedatel'stva Rossii v Arkticheskom sovete [32 events took place in 2021 as part of Russia's chairmanship of the Arctic Council]. 28.12.2021. URL: [https://arctic-council-rus-sia.ru/news/oficial/32\\_meropriyatiya\\_sostoyalis\\_v\\_2021\\_godu\\_v\\_ramkakh\\_predsedatelstva\\_rossii\\_v\\_arkticheskom\\_sovete/](https://arctic-council-rus-sia.ru/news/oficial/32_meropriyatiya_sostoyalis_v_2021_godu_v_ramkakh_predsedatelstva_rossii_v_arkticheskom_sovete/) (accessed 05 March 2023).

<sup>17</sup> Rossiya vo glave Arkticheskogo soveta provela v 2022 godu svyshe 40 meropriyatij po klyuchevym napravleniyam arkticheskoy povestki [Russia, at the head of the Arctic Council, held over 40 events in key areas of the Arctic agenda in 2022]. 23.12.2022. URL: [https://arctic-council-rus-sia.ru/news/oficial/rossiya\\_vo\\_glave\\_arkticheskogo\\_soveta\\_provela\\_v\\_2022\\_godu\\_svyshe\\_40\\_meropriyatij\\_po\\_klyuchevym\\_napra/](https://arctic-council-rus-sia.ru/news/oficial/rossiya_vo_glave_arkticheskogo_soveta_provela_v_2022_godu_svyshe_40_meropriyatij_po_klyuchevym_napra/) (accessed 15 February 2023).

<sup>18</sup> Rossiya zavershila predsedatel'stvo v Arkticheskom sovete [Russia has completed its chairmanship of the Arctic Council]. 12.05.2023. URL: [https://www.vedomosti.ru/press\\_releases/2023/05/12/rossiya-zavershila-predsedatelstvo-v-arkticheskom-sovete](https://www.vedomosti.ru/press_releases/2023/05/12/rossiya-zavershila-predsedatelstvo-v-arkticheskom-sovete) (accessed 05 March 2023).

ment policy on attracting personnel to work in the Arctic. The second scientific forum “The Arctic — a national megaproject: staffing and scientific support” was devoted to issues of information security in the digital economy, individualization in personnel training for the Arctic regions, labor market monitoring, as well as the transformation of urban space and robotics. The participants were interested in the report of the rector of NArFU E.V. Kudryashova, who spoke about Russia’s first large-scale study of the compliance of personnel training with the labor resources needs of employers operating in the Russian Arctic, in order to determine the prospects for the development of personnel policy in the Russian Arctic. Researchers surveyed more than 10 thousand employers of the Russian Arctic and collected detailed statistical data from all Arctic subjects, relevant ministries and departments. It was revealed that by 2035, 182.4 thousand new jobs will be created in the Russian Arctic, of which 140.4 thousand will be created as part of the implementation of 198 investment projects totaling 19 trillion rubles, and 42 thousand will be created within the framework of existing production facilities with 627 employers<sup>19</sup>.

A number of events were successfully held at NArFU as part of the implementation of the “Arctic Youth” direction: the international forum of young scientists “Russia in the Arctic Dialogue: Global and Local Contexts” (May 2022), a student summit on conservation and maintenance ecology of the Arctic region (June 2022), youth international model of the Arctic Council (November 2022), festival of youth creativity of the Arctic Council (November 2022). More than 100 people from 24 countries took part in the events, including from the countries of the Arctic Council and observer countries of the AC [14, Zarubina L.A., Popkova S.V., Kuznetsova S.Yu.].

On June 1–3, 2022, a conference on preserving human health in the Arctic was held. The conference participants — scientists and practicing doctors — discussed the prospects for the development of healthcare in the Arctic and issues of biological safety in the region, as well as problems associated with climate change. The event was organized by the Ministry of the Russian Federation for the Development of the Far East and the Arctic, the Ministry of Health of the Russian Federation, the Government of the Arkhangelsk Oblast and was held at the site of the Northern State Medical University. The visitors included more than three hundred participants from Russia, Belarus and Kazakhstan. An important task for the Arctic zone is the implementation of a program for the modernization of primary healthcare. In addition, as part of the event, on June 1, the All-Russian Scientific and Practical Conference on the History of Medicine, dedicated to the 350th anniversary of Peter the Great, was held<sup>20</sup>.

On July 20, 2022, a conference on the problems of waste and microplastics in the Arctic was held in Arkhangelsk. At sessions devoted to various aspects of environmental issues in the Arctic, the conference participants considered the problems of implementing the national project “Ecology”,

---

<sup>19</sup> V Arkhangel'ske nachal rabotu forum «Arktika— natsional'nyy megaproekt: kadrovoe obespechenie i nauchnoe so-provozhdenie» [The forum “The Arctic—a national megaproject: staffing and scientific support” was started in Arkhangelsk]. URL: <https://narfu.ru/life/news/university/373000/> (accessed 05 March 2023).

<sup>20</sup> Konferentsiya po sberezhениyu zdorov'ya cheloveka v Arktike [Conference on preserving human health in the Arctic]. URL: <https://arctic-council-russia.ru/events/razvitie-chelovecheskogo-kapitala-v-arktike/konferentsiya-po-sberezhениyu-zdorovya-cheloveka-v-arktike/> / (accessed 05 March 2023).

waste management in the Arctic region, the implementation of the provisions of international conventions and environmental protocols, the elimination of ocean pollution and other issues of the spread of synthetic particles polymers. More than a hundred experts, heads of specialized organizations and departments took part in the conference<sup>21</sup>. The conference was held at the Northern (Arctic) Federal University named after M.V. Lomonosov. The event was organized by the Ministry of Natural Resources and Environment of the Russian Federation<sup>22</sup>.

On May 11–12, 2023, a conference on biological resources and fisheries in the Arctic was held in the capital of Pomorie, where effective mechanisms for the development of the fisheries complex of the Arctic region and measures to preserve the ecosystem in high latitudes were discussed. The plenary session was devoted to the topic of aquatic biological resources in the Arctic and their conservation. Within the framework of the scientific forum, eight discussions took place in the format of round tables and seminars, as well as a seminar on the development of aquaculture in Russia. Deputy Chairman of the Government of the Russian Federation V.V. Abramchenko sent a greeting to the conference participants, in which she noted that “everything that the Arctic reveals to us requires a competent attitude towards its resources, a responsible approach to preserving the unique and vulnerable ecosystem of the region for future generations”.

In December 2022, the IV Northern Sustainable Development Forum was held in Yakutsk. Representatives of 10 countries took part in the forum, including Kazakhstan, India, China, Mongolia, Iceland, South Korea, the USA, Switzerland, Finland and Italy. The event was held under the motto “Arctic Energy: New Challenges — New Solutions and Technologies”. The 30-year experience of this organization is an example of how, under favorable circumstances, it is possible to quickly establish constructive cooperation between the regions of the global North and the Arctic, exchanges of best practices, accumulated experience and competencies [15, Vasiliev V.N., Krasnopol'sky B.Kh., Pilyasov A.N.].

On March 22–24, 2023, an international conference on climate change and permafrost thawing was successfully held in Yakutsk. Over 500 people from Russia, Kazakhstan, Kyrgyzstan, Mongolia, China, Brazil, the USA and Japan attended the event. The conference program included two plenary sessions. The Minister of Foreign Affairs of the Russian Federation S.V. Lavrov made a video address to the conference organisers and participants, noting that “a complex of scientific, economic and political factors leads to a constant increase in the attention of the international community to the Arctic region”<sup>23</sup>. Minister of Natural Resources and Ecology of the Russian Federation A.A. Kozlov stated that

---

<sup>21</sup> Konferentsiya po otkhodam i probleme mikroplastika v Arktike [Conference on waste and the problem of microplastics in the Arctic]. 20.07.2022. URL: <https://arctic-council-russia.ru/events/izmenenie-klimata-i-ekologiya-arktiki/konferentsiya-po-otkhodam-i-probleme-mikroplastika-v-arktike/>

<sup>22</sup> Problemu mikroplastika v Arktike obsudili uchastniki konferentsii v Arkhangel'ske [The problem of microplastics in the Arctic was discussed by participants of the conference in Arkhangelsk]. 21.07.2022. URL: [https://arctic-council-russia.ru/news/izmenenie\\_klimata\\_i\\_ekologiya\\_arktiki/problemu\\_mikroplastika\\_v\\_arktike\\_obsudili\\_uchastniki\\_konferentsii\\_v\\_arhangel'ske//](https://arctic-council-russia.ru/news/izmenenie_klimata_i_ekologiya_arktiki/problemu_mikroplastika_v_arktike_obsudili_uchastniki_konferentsii_v_arhangel'ske//) (accessed 05 March 2023).

<sup>23</sup> Video message from the Minister of Foreign Affairs S.V. Lavrov to the organizers and participants of the International Conference on Climate Change and Thawing Permafrost, Moscow, March 20, 2023. 22.03.2023. URL: [https://www.mid.ru/ru/foreign\\_policy/news/1859002/](https://www.mid.ru/ru/foreign_policy/news/1859002/) (accessed 05 March 2023).

by 2025, it is planned to create 140 observation points in Russia as part of a background monitoring system for permafrost, which will provide more accurate forecasts of climate change in Russia. In turn, Director of the Permafrost Institute of the Siberian Branch of the Russian Academy of Sciences M.N. Zheleznyak proposed introducing an interdepartmental system of state monitoring and management of the state of permafrost in the Arctic zone, which would include forecasting its changes and developing methods of regulation. According to him, if the current rate of change in climate conditions continues, the damage to residential and industrial structures is estimated at 5–7 trillion rubles by 2050. The Head of the Republic of Sakha (Yakutia) A.S. Nikolaev noted that 70–80% of construction projects in the republic have problems associated with thawing of permafrost soils<sup>24</sup>.

In addition, on March 15–19, 2023, the International Championship of Traditional Reindeer Herding was held in the Yakutian city of Neryungri and the village of Iengre. Competitions included sled jumping, lariat throwing among men and women, combined relay race, reindeer catching, and reindeer sled racing. The event also included an extraordinary meeting of the board of the association “Reindeer Herders of the World”, a presentation of the construction project of the ethno-tourist complex “Unique Iengra” and the international conference “Sustainable development of reindeer husbandry in the context of global changes in the Arctic”<sup>25</sup>. The international conference was attended by the Senator of the Russian Federation, President of the Association of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation G.P. Ledkov. In his speech, he noted: “Reindeer husbandry is one of the most important factors in the way of life of indigenous peoples. The urgent task today is to achieve recognition of the status of a nomad as a person leading a nomadic and semi-nomadic lifestyle and engaged in traditional types of economic activity. Enshrining the status of a nomad in legislation will improve the conditions for the sustainable development of the economy of traditional industries and increase the level and quality of life of nomads. With the recognition of this status, we will be able to receive additional measures of government support. Indigenous peoples of the Arctic should actively participate in educational processes in various areas and receive modern sectoral education, including in reindeer herding specialties”<sup>26</sup>. The event was attended by representatives of 14 regions of the Arctic and the Far East, China, Mongolia, Iceland and Greenland, as well as the Association of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation, legislative bodies and business, members of the Association “Reindeer Herders of the World”. In addition, during the conference, a decision was announced to create the eastern branch of the Association. In Russia, more than 52 thousand families of indigenous peoples are engaged in reindeer husbandry,

---

<sup>24</sup> A scientific and practical conference on climate change and permafrost thawing took place in Yakutsk. 24.03.2023. [https://arctic-council-](https://arctic-council-rus-)

[rus-sia.ru/news/izmenenie\\_klimata\\_i\\_ekologiya\\_arktiki/v\\_yakutske\\_sostoyalas\\_nauchno\\_prakticheskaya\\_konferentsiya\\_po\\_voprosam\\_izmeneniya\\_klimata\\_i\\_tayaniya/](https://arctic-council-rus-sia.ru/news/izmenenie_klimata_i_ekologiya_arktiki/v_yakutske_sostoyalas_nauchno_prakticheskaya_konferentsiya_po_voprosam_izmeneniya_klimata_i_tayaniya/) (accessed 05 March 2023).

<sup>25</sup> International Championship in Traditional Reindeer Herding. 15.03.2023-19.03.2023. URL: <https://arctic-council-russia.ru/events/korennye-malochislennye-narody-arktiki/mezhdunarodnyy-chempionat-po-traditsionnomu-olenevodstvu/> (accessed 05 March 2023).

<sup>26</sup> G. Ledkov discussed strategies for modernizing reindeer husbandry and the possibilities of public-private partnerships in this area. 17.03.2023. URL: <http://council.gov.ru/events/news/143418/> (accessed 05 March 2023).

many of which lead a nomadic lifestyle<sup>27</sup>. The event clearly demonstrated that Russia is making special efforts to support all key areas of life and development of the peoples of the Arctic, as well as to improve the well-being, education and health of the northerners.

### ***Results, conclusions and lessons of Russia's chairmanship of the Arctic Council***

The Russian Federation first chaired the AC in 2004–2006. Since then, the country has been actively engaged in developing its national Arctic strategy and policy, taking into account the steadily increasing role of the Arctic region in world politics and economy. On May 12, 2023, Russia officially ended its chairmanship of the Arctic Council in Salekhard by remotely handing it over to Norway, confirming the relevance of the organization despite all the difficulties and problems.

An assessment of the restrictions on the actions of the Russian Federation during the chairmanship of the AC (2021–2023) was given by the Minister of Foreign Affairs of the Russian Federation S.V. Lavrov in a video message to the participants of the thirteenth session of the Arctic Council on May 11, 2023. He noted: “Unfortunately, the full-fledged activities of the Council were “temporarily frozen” by Western member countries under an absolutely far-fetched pretext of the situation in Ukraine, which they provoked themselves. We consider such a step by our Western colleagues to be politicized and counterproductive, leading to the erosion of collective approaches to responsible management of the Arctic”<sup>28</sup>. It should be noted that, despite sanctions restrictions, representatives of more than 25 states took part in the events of the Russian chairmanship.

In our opinion, after the “freezing” of the Arctic Council in 2022, Russia needs to rely on the Northern Forum in the development of international cooperation in the Arctic.

Analyzing the activities of the AC, it should be noted that problems in its work arose during the Finnish chairmanship, when, following the results of 21 ministerial meetings in Rovaniemi, it was not possible to agree on and adopt a common joint Declaration due to the US position on climate change, which happened for the first time in the entire period existence of the Council.

The situation in the Arctic continues to develop dynamically, in some aspects it is associated with increased risk and uncertainty; transformational changes are taking place. Since 2022, an irreversible process of awareness and reassessment of previous approaches to the Arctic has begun. Strategic problems of relations with the United States and its NATO allies in the Arctic region and issues of the further functioning of the Arctic Council have become relevant.

Foreign states are increasing their military presence in the Arctic, especially in its western part [16]. Finland's accession to NATO has greatly complicated the situation in the Arctic region, which

---

<sup>27</sup> Representatives of 14 regions of the Arctic and Far East took part in the International Championship on Traditional Reindeer Herding in Yakutia. 21.03.2023. URL: [https://arctic-council-russia.ru/news/korennyye\\_malochislennyye\\_narody\\_arktiki/predstaviteli\\_14\\_regionov\\_arktiki\\_i\\_dalnego\\_vostoka\\_prinyali\\_uchastie\\_v\\_mezhdunarodnom\\_chempionate/](https://arctic-council-russia.ru/news/korennyye_malochislennyye_narody_arktiki/predstaviteli_14_regionov_arktiki_i_dalnego_vostoka_prinyali_uchastie_v_mezhdunarodnom_chempionate/) (accessed 05 March 2023).

<sup>28</sup> Video message from the Minister of Foreign Affairs S.V. Lavrov to the organizers and participants of the International Conference on Climate Change and Thawing Permafrost, Moscow, March 20, 2023. 22.03.2023. URL: [https://www.mid.ru/ru/foreign\\_policy/news/1859002/](https://www.mid.ru/ru/foreign_policy/news/1859002/) (accessed 05 March 2023).

strengthens the Arctic potential of the alliance and creates real threats to Russia in the northern direction. It is noteworthy that NATO is moving to form tools to deter Russia in the Arctic region, which was not the case before. From May 29 to June 9, 2023, the largest military exercise “Arctic Challenge 2023” was held in Finland, Norway and Sweden with the participation of 150 aircraft of the armed forces of 14 countries. At the same time, the real impact of a special military operation on the Arctic region can only be determined by its final results.

A powerful destabilizing factor for the entire system of international relations in the world has been the desire of some states to interfere in the internal affairs of sovereign countries, pursue a policy of unilateral economic sanctions, and replace international law with their own far-fetched rules. In a difficult international situation, it is necessary to have reserve options for the development and financing of Arctic projects and to solve the tasks of technological independence in an accelerated manner.

It is expedient for the State Commission for Arctic Development to summarize the results of the Russian Federation’s chairmanship in the AC more broadly, to instruct the Ministry of Eastern Development of the Russian Federation to request from ministries and departments all materials on the activities carried out for their analysis, use in work and archiving.

In the current conditions of increased sanctions pressure, the participation of the EAEU countries in Arctic projects should be strengthened. Within the framework of the Eurasian Economic Commission, it is advisable to develop a separate program for cooperation between Russia and Eurasian partners in the Arctic.

## References

1. Zhuravel V.P. O predsedatel'stve Rossii v Arkticheskom sovete: programma i pervye itogi [Russia’s Chairmanship in the Arctic Council: Programme and First Results]. *Nauchnye trudy Vol'nogo ekonomicheskogo obshchestva Rossii* [Scientific Works of the Free Economic Society of Russia], 2022, vol. 233, no. 1, pp. 147–167. DOI: 10.38197/2072-2060-2022-233-1-147-167
2. Krasnopol'skiy B.Kh. Coordination of International Organizations of the North-Arctic Regions: to the Program of the Presidency of the Russian Federation in the Arctic Council. *Arktika i Sever* [Arctic and North], 2020, no. 41, pp. 148–162. DOI: 10.37482/issn2221-2698.2020.41.148
3. Krivorotov A.K. Tri missii Rossii v Arkticheskom sovete (2021–2023 gg.) [Russia’s Three Arctic Council Missions for 2021–2023]. *Arktika 2035: aktual'nye voprosy, problemy, resheniya* [Arctic 2035: Challenges and Solutions], 2020, no. 4, pp. 4–9. DOI: 10.51823/74670\_2020\_4\_4
4. Korchunov N.V. O zadachakh Rossii v period ee predsedatel'stva v Arkticheskom sovete [On Russia’s Tasks in the Period of Its Chairmanship of the Arctic Council]. *Arkticheskie vedomosti* [The Arctic Herald], 2021, no. 1, pp. 8–11.
5. Tishkov A.A. Mezhdunarodnoe sotrudnichestvo v Rossiyskoy Arktike: voprosy nakanune predsedatel'stva nashey strany v Arkticheskom Sovete [International Cooperation in the Russian Arctic: Questions on the Eve of Our Country's Chairmanship in the Arctic Council]. *Ispol'zovanie i okhrana prirodnnykh resursov v Rossii* [Use and Protection of Natural Resources of Russia], 2020, no. 2, pp. 104–109.
6. Zhuravel V.P. Predsedatel'stvo Rossii v Arkticheskom sovete [The Russian Federation's Chairmanship at the Arctic Council]. *Sovremennaya Evropa* [Contemporary Europe], 2021, no. 5, pp. 90–99. DOI: 10.15211/soveurope520219099
7. Zhuravel V.P. Predsedatel'stvo RF v Arkticheskom sovete kak orientir dlya issledovaniy TsAI IE RAN [Russia’s Arctic Council Chairmanship as a Guideline for Center for Arctic Studies, IE RAS]. *Nauchno-analiticheskiy vestnik Instituta Evropy RAN* [Scientific and Analytical Herald of IE RAS], 2022, no. 1,



- pp. 120–124.
8. Van Ts., Yan' Ts., Vlasov B.E. *Politika, ekonomika i bezopasnost' sovremennoy Arktiki (k 25-letiyu Arkticheskogo soveta): monografiya* [Politics, Economics and Security of the Modern Arctic (To the 25th Anniversary of the Arctic Council)]. Moscow, IE RAS Publ., 2022, 150 p. (In Russ.)
  9. Zhuravel V.P. Chrezvychaynoe sobytie v Arkticheskom sovete. Est' li vykhod iz slozhivsheysya situatsii? [An Extraordinary Incident in the Arctic Council]. *Evropeyskaya analitika 2022* [European Analytics 2022], Moscow, IE RAS, 2022, pp. 27–37. DOI: 10.15211/978-5-98163-197-9
  10. Zhuravel V.P., Timoshenko D.S. The Russian Arctic, Sanctions Pressure and Geopolitical Instability. *Arktika i Sever* [Arctic and North], 2022, no. 49, pp. 105–124. DOI: 10.37482/issn2221-2698.2022.49.105
  11. Timoshenko D.S. Sovremennaya Arktika: global'naya bipolyarnost' ili bipolyarnoe rasstroystvo? [The Modern Arctic: Global Bipolarity or Bipolar Disorder?]. *Nauchno-analiticheskiy vestnik Instituta Evropy RAN* [Scientific and Analytical Herald of the Institute of Europe RAS], 2022, no. 4 (28), pp. 77–85. DOI: 10.15211/vestnikieran420227785
  12. Zhuravel V.P. The St. Petersburg International Economic Forum (SPIEF-2022) and Its Arctic Agenda. *Arktika i Sever* [Arctic and North], 2022, no. 48, pp. 244–260. DOI: 10.37482/issn2221-2698.2022.48.244
  13. Zhuravel V.P. Arktika v 2022 g.: itogi i perspektivy [The Arctic in 2022: Results and Perspectives]. *Nauchno-analiticheskiy vestnik Instituta Evropy RAN* [Scientific and Analytical Herald of the Institute of Europe RAS], 2023, no. 1 (31), pp. 95–102. DOI: 10.15211/vestnikieran1202395102
  14. Zarubina L.A., Popkova S.V., Kuznetsova S.Yu. Outcomes of the International Forum of Young Scientists “Russia in the Arctic Dialogue: Global and Local Contexts”. *Arktika i Sever* [Arctic and North], 2022, no. 49, pp. 252–262. DOI: 10.37482/issn2221-2698.2022.49.252
  15. Vasilyev V.N., Krasnopolskiy B.Kh., Pilyasov A.N. *Rozhdennyy ob"edinyat' (k 30-letiyu Severnogo Forumu)* [Born to Unite (30th Anniversary of the Northern Forum)]. Moscow, Smolensk, Universum Publ., 2023, 124 p. (In Russ.)
  16. Zhuravel V.P. Arktika v 2021–2022 gg.: ot mirnogo razvitiya k krizisnoy mezhdunarodnoy turbulentnosti [The Arctic in 2021–2022: From Peaceful Development to Crisis International Turbulence]. In: *Tsivilizatsionnye aspekty razvitiya Arkticheskikh regionov Rossii: Materialy IV nauchno-prakticheskoy konferentsii* [Civilisation Aspects of the Development of the Arctic Regions of Russia: Proc. 4th Sci. and Pract. Conf.]. Moscow, Zhirinovsky University of World Civilizations Publ., 2023, pp. 100–114. (In Russ.)

*The article was submitted 07.06.2023; approved after reviewing 13.06.2023;  
accepted for publication 27.06.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 116–129.

Original article

UDC 327.82(98+99)(045)

doi: 10.37482/issn2221-2698.2023.52.136

## Science Diplomacy in the Arctic and Antarctic

Valeriy N. Konyshhev <sup>1✉</sup>, Dr. Sci. (Polit.), Professor

<sup>1</sup> Saint Petersburg State University, Universitetskaya nab., 7/9, Saint Petersburg, Russia

<sup>1</sup> konyshhev06@mail.ru ✉, ORCID: <http://orcid.org/0000-0002-7257-6848>

**Abstract.** The article studies the phenomenon of science diplomacy with regard to the Arctic and Antarctic. These two polar regions are similar because of high importance of international scientific activity and science diplomacy based on it. Science diplomacy is understood as a kind of synthesis of scientific and political-diplomatic activities, in which state and non-state actors can take part. The conditions for science diplomacy in the Arctic and Antarctic are very different due to the history of development, legal status and established practice of international relations in these regions. The challenges faced by international scientific activity and science diplomacy in the two regions are considered. It is shown that in the Arctic and Antarctic, science diplomacy as a political tool is objectively in demand and cannot be “cancelled” due to the political context. In the current situation, science diplomacy can contribute to de-escalation of the conflict in relations between Russia and the West. At the same time, science diplomacy is not a panacea for creating international relations based on the principles of peace and cooperation. Like any political instrument, it protects national interests and not only serves to solve global problems arising in the Arctic and Antarctic.

**Keywords:** *Arctic, Antarctic, science diplomacy, international scientific cooperation, international relations*

### Acknowledgments and funding

The article was prepared with the financial support of the Russian Science Foundation within the framework of scientific project No. 22-28-01287.

### Introduction

In the modern world, the concept of science diplomacy attracts many scientists and politicians due to the fact that global development trends “narrow” all known spaces of interaction between states. On the one hand, competition for control of land territories, air, water, cyberspace, natural resources, and transport routes is intensifying; on the other hand, mechanisms of international cooperation are becoming in demand. Scientific activity is becoming increasingly involved in politics as the time between a scientific idea and production has been significantly reduced, and science has become part of the production cycle. At the same time, the impact of human activity on nature has devastating consequences and requires scientifically based solutions and technologies.

The role of scientific activity is especially pronounced in two polar regions: the Arctic and Antarctic. This is due to their special status, since international treaties have explicitly stated the need for coordinated and scientifically based human activity in all areas, primarily because of the uniqueness and vulnerability of natural-ecological complexes. In addition, no state can carry out

---

\* © Konyshhev V.N., 2023

For citation: Konyshhev V.N. Science Diplomacy in the Arctic and Antarctic. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 136–152. DOI: 10.37482/issn2221-2698.2023.52.136

scientific programs in the polar zone alone, if only because of the need to exchange data received from vast areas.

However, science serves not only as a tool for obtaining new knowledge, but also as a basis for other types of joint activities of states. In other words, science is directly involved in the political processes taking place in the two polar regions. This phenomenon is called “science diplomacy”. In a certain sense, international politics in Antarctica (and before the Ukrainian crisis — in the Arctic) served as an example for building international relations subordinated to the idea of peaceful coexistence [1, Yao J.; 2, Young O., Yang J., Zarogski A.]. What is science diplomacy, what is its specificity in the Arctic and Antarctic, what are its problems and prospects? The article is devoted to searching for answers to these questions.

### ***What is science diplomacy***

The concept of science diplomacy has not been fully established either in Russian or foreign scientific discourse. In its most general form, it refers to the interaction between diplomacy and scientific activity in order to influence other states and societies. Many researchers consider science diplomacy as a type of public diplomacy [3, Gutenev M.Yu.]. Some researchers believe that in Russia, science diplomacy as a practice has emerged since 1996 [4, Reinhardt R.O.].

The basis of science diplomacy is international scientific and technical activity, which is built for the mutual benefit of participants. Science diplomacy helps to develop general rules of interaction both in the scientific and political spheres, as well as to coordinate the interests of states [5, Ilyina I.E., Malenko S.V., Vasilyeva I.N., Rebrova T.P., p. 15]. However, the participants of science diplomacy can be both state and non-state policy actors.

There are several possible dimensions of science diplomacy as a symbiosis of science and diplomacy [6].

Firstly, “science within diplomacy”, which involves advising state authorities in order to help them make science-based decisions. For their part, scientists also begin to understand the mechanisms of political decision-making better and can convey to management the social significance of scientific projects more accurately.

Secondly, “diplomacy for science” means that diplomacy supports scientific research. This is especially important for global problems, such as studying the effects of climate change.

Thirdly, “science for diplomacy” means that scientific cooperation helps to strengthen trust in the political sphere. This phenomenon is especially evident in the activities of scientific conferences and forums.

In terms of content, science diplomacy is implemented within the framework of several approaches. Of course, it is hardly necessary to speak about them in a pure form; they are rather analytical constructs representing “ideal types.”

According to the “technical” approach, science diplomacy is a set of scientific cognitive practices that are organized according to a network principle and unite scientists from different

countries and scientific institutions. Then science diplomacy creates a mechanism of international scientific cooperation that has no political basis [7]. The cooperation of numerous scientific groups in the Arctic and Antarctic is interpreted in this way. The “technical” understanding of science diplomacy prevails among scientists-“naturalists”; it is universal in nature, but does not reflect the full potential of this phenomenon.

The second approach implies the use of science diplomacy as a political tool of the state, one of the “soft power” resources. In this case, scientific cooperation helps to create an attractive image of the state for its partners and strengthen its political status. This approach is typical for the policies of states in the Arctic and Antarctic, where scientific activity has a particularly high status, and in some cases is the only way of political self-affirmation of states.

Thus, mainly due to the development of scientific activities and the creation of the Polar Institute, Switzerland received observer status in the Arctic Council (AC) [8, Todorov A.A.]. China is rapidly increasing its political influence in the Antarctic, proving its inalienable rights not just to be there, but also to participate in the management of the continent. For this purpose, the tool of science diplomacy is used primarily. China ranks first in funding scientific activities, expecting to take leading political positions [9].

Within the third approach, science diplomacy becomes a type of public diplomacy, implying the involvement of both state and non-state political actors in the mechanisms of influence.

The use of science diplomacy as part of public diplomacy combines elements of the two previous approaches and echoes the practice of the Cold War, when science diplomacy was used to improve Russian-American relations with generally low levels of trust and cooperation in almost all other areas. It was then that the United States and the USSR established a bilateral Commission on Environmental Protection in the Arctic, and a number of experts see the usefulness of this approach in the context of a sharp deterioration in Russia-West relations after the start of the Special Military Operation in Ukraine in 2022 [7, p. 163].

Despite the obvious advantages of science diplomacy as a tool of cooperation, it should not be considered as an absolute and universal good. Like any instrument of influence in the field of international relations, science diplomacy serves the national interests of states [3, pp. 125–126]. In this capacity, it can have a destructive potential for international cooperation, since the interests of states do not coincide in everything, even within the existing cooperation. In this regard, an alternative view of the main dimensions of science diplomacy is indicative, opposed to the more common one (“science in diplomacy”, “science for diplomacy”, “diplomacy for science”). The alternative interpretation emphasizes the category of interest, linking science diplomacy to the protection of national, transboundary and global interest [10, Rogozhina K.A., p. 394].

Today, with regard to the Arctic, the concept of science diplomacy is mentioned in the government documents of the Russian Federation <sup>1</sup>. The importance of this area of cooperation is

---

<sup>1</sup> О стратегии научно-технологического развития Российской Федерации. Указ Президента России № 642 от 1 декабря 2016 [On the strategy of scientific and technological development of the Russian Federation. Decree of the President

emphasized by the Concept of Foreign Policy of the Russian Federation for 2023. The document states that in the conditions of destabilization of international relations, one of the Russian policy instruments will be the promotion of scientifically based, non-politicized international cooperation on the global agenda, including such areas as environmental protection and studying the consequences of climate change<sup>2</sup>. Science diplomacy is an important policy tool for almost all states involved in Arctic politics.

Among international instruments, the Agreement on Enhancing International Arctic Scientific Co-operation is a striking example<sup>3</sup>. This document provides for mutual measures by the signatory states to remove various bureaucratic barriers to international cooperation, exchange of scientific data and experience, development of education, cooperation between Arctic and non-Arctic states. The agreement does not establish any restrictions, but only fixes the conditions for the broadest dialogue with the participation of both state and non-state political actors.

In Antarctica, science diplomacy as part of public diplomacy is supported by the entire Antarctic Treaty System, created around the Antarctic Treaty of 1959. The latter laid the foundation for the provision of freedom of scientific research and the maintenance of international cooperation, as well as measures for monitoring and verifying compliance with these requirements. Despite the existing disagreements on legal, political and economic issues, the Antarctic regime for a long time ensured the modernization of legal norms in response to changing circumstances and challenges, which implies the achievement of agreement and unification of approaches of states [11, Savenkov A.N., Rednikova T.V.].

In the long-term and global perspective, the demand for science diplomacy as a tool for cooperation in the Arctic and Antarctic is associated with the need to study both global problems (climate change, environmental conservation, sustainable development) and fundamental scientific questions about the origin and evolution of the planet.

### ***Conditions for science diplomacy in the Arctic and Antarctic***

The specifics of science diplomacy in the polar regions are related to the history of their development, economic and geographical conditions, the existing international legal status and the practice of interaction between states.

In economic and geographical terms, the Arctic is mainly ice-covered water. Mineral resources are located on the shelf, as well as on the land territory, which has national borders. Un-

---

of Russia No. 642 of December 1, 2016]. URL: <http://www.kremlin.ru/acts/bank/41449>; Kontseptsiya mezhdunarodnogo nauchno-tekhnicheskogo sotrudnichestva Rossiyskoy Federatsii. Ministerstvo nauki i vysshego obrazovaniya Rossiyskoy Federatsii [Concept of international scientific and technical cooperation of the Russian Federation. Ministry of Science and Higher Education of the Russian Federation]. URL: <https://france.mid.ru/upload/iblock/7f8/7f8aadb5de45b3a58103046d70eabef2.Pdf> (accessed 12 December 2022).

<sup>2</sup> Kontseptsiya vneshney politiki Rossiyskoy Federatsii utverzhdena Prezidentom Rossiyskoy Federatsii V.V. Putinym 31 marta 2023 [The concept of foreign policy of the Russian Federation was approved by the President of the Russian Federation V.V. Putin. March 31, 2023]. URL: <https://www.mid.ru/ru/detail-material-page/1860586/#sel=164:2:ijj,164:16:Wca> (accessed 12 December 2022).

<sup>3</sup> Agreement on Enhancing International Arctic Scientific Cooperation. URL: <https://oarchive.arctic-council.org/handle/11374/1916> (accessed 30 December 2022).

like Antarctica, the economic development of the Arctic has already begun, since part of its spaces is a sovereign part of the coastal states. Extraction of bioresources within the Exclusive Economic Zones (EEZ) is regulated by national and partially international legislation, while in the central part of the Arctic Ocean such activities, with the exception of scientific ones, are prohibited. The basis for the legal regulation of territorial disputes and economic activities on the shelf is the 1982 UN Convention on the Law of the Sea. Military activities of coastal states are carried out in the Arctic, which imposes certain restrictions on international cooperation.

The AC plays a leading role in the international governance of Arctic policy, representing coastal states that have rights to economic activity in their areas of jurisdiction, and observer states that do not have such rights. Within the framework of the AC, international scientific activities are coordinated. The latter is the only tool for non-Arctic states to increase their political influence in the region.

Antarctica is the ice-covered continent with adjacent seas. Mineral resources are found both on Antarctica itself and in the bottom of the adjacent seas. Unlike the Arctic, economic activity on the land part is prohibited, and the extraction of biological resources in the adjacent seas is limited. The legal status of Antarctica is ensured not by treaties under the auspices of the UN, but by a special system of treaties. The main agreement, the 1959 Antarctic Treaty, does not grant sovereignty rights in Antarctica to any state and explicitly prohibits economic and military activities, allowing only scientific research and cooperation. This has led to a legal conflict between the 1982 UN Convention on the Law of the Sea, from which the right to the shelf follows, and the prohibition of sovereign rights under the 1959 Antarctic Treaty.

The situation is complicated by the fact that the 1959 Antarctic Treaty only “freezes” claims to sovereign rights, since it does not cancel states’ claims to sovereignty in Antarctica made before joining the Treaty. But the Treaty does not prohibit states from claiming sovereign rights over Antarctica. This duality of the document (neither recognizes nor denies sovereignty) creates uncertainty in the interpretation of sovereignty within the legal status of Antarctica [12, Sampaio D.]. This means that as natural reserves are depleted on a global scale, the question of sovereignty in Antarctica and the division of maritime spaces will be raised. Discussions and political processes in this direction have already been launched.

The main governing institution in Antarctica is the Consultative Meetings, but only those states, which have gained authority for their scientific research, have a casting vote. Science became an instrument of politics even before the signing of the Antarctic Treaty in 1959, when in the political struggle over the future status of Antarctica, Great Britain, Chile and Argentina pointed out the scientific inconsistency of India’s arguments to reduce its political influence [1, Yao J., p. 1009].

Thus, in Antarctica, scientific cooperation is the main sphere of activity of states, enshrined in legislation, while economic and military activities are prohibited, which creates the best conditions for science diplomacy as an instrument of state policy. Moreover, scientific activity is the only way of territorial presence in Antarctica, creating an unprecedented situation in terms of inter-



national law. At the same time, this uniqueness and the potential benefits from economic development could lead to the destruction of the legal status of Antarctica.

However, in the case of the Arctic, military and economic activities have been going on for a long time, and the development of scientific cooperation and the growing influence of science diplomacy are the result of a coordinated position of the coastal Arctic states, which was accepted by other Arctic policy actors. Behind this, there is an objective need for the involvement of science in politics to implement the concept of sustainable development of the region and preserve the extremely vulnerable natural environment.

The demand for science diplomacy in the Arctic and Antarctic is related to the fact that any human activity in remote and harsh conditions requires the development and implementation of unique high-tech technologies and huge investments, which is beyond the power of any one state. This gives rise to the need for international scientific and technical cooperation and, as a consequence, science diplomacy as a coordination mechanism.

### ***Problems and prospects of science diplomacy in the Arctic and Antarctic***

In the Arctic, science diplomacy has shown its high efficiency, and it is actively used by all Arctic policy actors as a necessary component of the development and management of the Arctic territories. Although the term itself is not necessarily present in official rhetoric, activities that fall under the concept of science diplomacy are in the doctrinal documents governing the Arctic policies of many states<sup>4</sup>.

Science diplomacy is of particular value for non-Arctic states that do not have direct rights to exploit Arctic shelf resources. International scientific cooperation is carried out by the most authoritative Arctic governance organization through AC working groups. Based on the recommendations of the working groups on issues of sustainable development and environmental protection, policy recommendations are made to the Council's member states in accordance with the rule of consensus. The 2017 Agreement on Enhancing International Arctic Scientific Cooperation was adopted under the auspices of the AC to create the most favorable conditions for scientific cooperation and science diplomacy.

Non-Arctic states that are good at the art of "soft power" have significantly strengthened their positions in the Arctic. Thanks to their success in scientific activity, they achieved observer status in the AC, and full members of this council (USA, Canada, Russia, Norway, Finland, Sweden, Denmark) are forced to take them into account when making political decisions. These include Japan, Germany, Great Britain, France, Switzerland. But science diplomacy as "soft power" is also relevant for the coastal Arctic states. In particular, Russian experts believe that, first of all, thanks

---

<sup>4</sup> See: The National Strategy for the Arctic Region. October 2022. URL: <https://www.whitehouse.gov/wp-content/uploads/2022/10/National-Strategy-for-the-Arctic-Region.pdf> (accessed 25 December 2022); Looking North: the UK and the Arctic. The United Kingdom's Arctic Policy Framework. February 2023. URL: <https://www.gov.uk/government/publications/looking-north-the-uk-and-the-arctic/looking-north-the-uk-and-the-arctic-the-united-kingdoms-arctic-policy-framework> (accessed 12 March 2023).

to science diplomacy, Russia can maintain control over its vast polar territories [7, Gutenev M.Yu., Sergunin A.A., pp. 161–162].

In the Arctic, problems for the development of scientific research and science diplomacy have their own specifics related to national security interests. Spatial restrictions on scientific activity are associated with the militarization of the region, especially in the Arctic zone of the Russian Federation and the American state of Alaska. Two-thirds of the Russian Federation's nuclear arsenal is located on the Kola Peninsula; the Sever strategic command and the 14th Army Corps, with two brigades at its core, are located here. Air bases, airfields, air/missile defense and coast guard forces are located along the northern coast and on island territories. The United States has NORAD infrastructure in Alaska, which provides air/missile defense solutions together with radars and air force bases in Canada and Greenland. It is quite natural that access for scientific research in these parts of the Arctic is closed. Other Arctic coastal states are also imposing similar restrictions. Citing national security considerations, they limit access not only to spaces, but also to some scientific data, from permafrost thawing dynamics to environmental pollution parameters [13, Sergunin A., Shibata A., pp. 49–50].

National jurisdiction over the Arctic space creates another obstacle for science diplomacy — bureaucratic procedures related to the issuance of visas, permits for research by foreign scientists and organizations, and the export of samples of natural resources. These procedures can take several months, especially in case of aggravation of political contradictions between states. The aforementioned 2017 Agreement on Enhancing International Arctic Scientific Cooperation helps to overcome these difficulties<sup>5</sup>. It encourages states to create conditions for mutually beneficial scientific cooperation on a bilateral basis, without restricting national legislation or security interests. The advantage of the agreement is its openness and flexibility, since it implies the interaction of states with the AC, international public organizations, indigenous organizations and non-Arctic states.

In the Arctic, science diplomacy of states can also lead to aggravation of political contradictions. This is primarily due to the sovereign rights of coastal states. Such risks are more typical for relations between Arctic and non-Arctic states because of their different legal status. Non-Arctic states, without direct rights to the extraction of Arctic resources, can increase their influence only through scientific activity and science diplomacy. Therefore, when China proposed in 2017 to build a permanent scientific station in Greenland, Denmark and the United States reacted negatively. The US perceived science diplomacy as a policy to strengthen the PRC's economic influence in Greenland, and Denmark worried that Beijing would begin to support Greenland's movement for autonomy [14, Ryzhova A.V., pp. 181–182].

The aggravation of the Ukrainian crisis and the start of the Special Military Operation in 2022 led to a sharp deterioration in relations between the Russian Federation and the West. There

---

<sup>5</sup> Agreement on Enhancing International Arctic Scientific Cooperation. URL: <https://oaarchive.arctic-council.org/handle/11374/1916> (accessed 01 February 2023).

was an effect of “spillover” of political tension into the Arctic, which until then was considered a zone of peace and cooperation. As a result, at the initiative of Western countries, scientific cooperation with the Russian Federation in the Arctic was practically paralyzed through bilateral projects with the Arctic states, as well as most international organizations, including AC working groups, the Barents Euro-Arctic Council, the International Arctic Scientific Committee, and the Network University Arctic, European Commission [15, Kornhuber K., Vinke K., Bloom E.]. The process of implementing the Agreement on Strengthening International Arctic Scientific Cooperation, which involves the conclusion of bilateral agreements, was also stopped. These steps by Western countries were artificially politicized and did not comply with the norms of international law. From a legal point of view, the activities of the Agreement are in no way limited by the emerging state of military conflict [13, Sergunin A., Shibata A., pp. 73–75]. Since the resumption of joint scientific activities at the state level is extremely difficult, only a narrow niche remains for science diplomacy — interaction at the level of professional scientific organizations and individual scientific groups or scientists.

The withdrawal of scientific cooperation with the Russian Federation caused a mixed reaction in the West, especially among representatives of scientific groups and organizations involved in specific international cooperation projects in the Arctic. This concerns projects to study weather, polar ice and permafrost melting dynamics, ocean acidification, environmental pollution, marine biodiversity, and the effects of climate change. In the field of science diplomacy, the line is drawn that the study of these global long-term processes occurring in the Arctic should not be influenced by the political situation associated with the regional security problem [16, Bisen A.; 17, Konyshchev V.]. Breaking off scientific co-operation with the Russian Federation does not meet the interests of many non-Arctic states, including India, China, and Brazil. Some of them, such as Japan and the Republic of Korea, joined the anti-Russian sanctions under strong pressure from the United States.

Under these circumstances, the conditions for resuming the activities of AC working groups and other organizations are being discussed at the expert level: with the participation of Russia, but if political conditions are met; formation/transformation of cooperation organizations without the participation of the Russian Federation; creation of new organizations with the participation of Russia and non-Arctic states that have not joined the sanctions. For example, this can be done on the basis of BRICS. The G-20 forum, where Western countries do not have an overwhelming advantage, can also contribute to restoring cooperation with Russia in the Arctic [18, Bisen A.]. Just as it happened during the Cold War, in modern international relations, science diplomacy can become a “bridge” for a return to political dialogue between Russia and the West. The Arctic and Antarctic regions, due to their specificity, can become the places where “political warming” begins.

Although scientific activity and environmental protection remain top priorities in Antarctica, which determines the high status of science diplomacy, experts believe that the situation may change. This is evidenced by the ongoing attempts to develop a regime for the exploration of Ant-

arctic resources under the auspices of the Consultative Meeting of the Parties to the Antarctic Treaty of 1959, or using the UN platform.

But even the existing legal regime in Antarctica has accumulated flaws that cause problems in regulating Antarctic policy in terms of scientific research. Due to the tendencies to “revise” the Antarctic regime towards territorial division, as well as to the evolution of the system of international law, discussions on spatial restrictions on scientific research have started. Since the 1988 Convention on the Regulation of Antarctic Mineral Resource Activities states that Antarctica has a shelf and deep seabed areas, the 1959 Antarctic Treaty is being interpreted differently. Some insist on complete freedom of marine and continental scientific research. Others, appealing to the 1982 UN Convention on the Law of the Sea, believe that the EEZ has a permitting regime for conducting research, in accordance with Article 246 of the Convention. For example, Australia believes that only participants of the 1959 Antarctic Treaty enjoy freedom of marine research in its EEZ, although the treaty speaks of freedom of research for all states [19, Gudev P.A., pp. 49–50].

A similar problem is emerging in prospective studies of Antarctic genetic resources. The fact is that the biological resources of the Southern Ocean (especially microorganisms), due to their characteristics, are considered promising raw materials for various industries. Then a question arises that has not yet been resolved in terms of its regulation: how to combine the established principle of freedom of research, exchange of genetic data and research results, on the one hand, and the study, extraction, patenting of technologies for the purpose of extracting private commercial profit, on the other hand [19, Gudev P.A., pp. 50–51].

Another problem is related to the fact that it is not always possible to separate scientific activities to study the Antarctic resource base from exploration of reserves of these resources, which already generates interstate conflicts. Such accusations against China are made by Australia, in the conditional sector of which there are several Chinese scientific stations [9, Balakin V.I., pp. 188–189]. The other side of the problem arises from the correlation of national and international legislation. In 1994, Great Britain adopted the Antarctic Act, in which Article 6 prohibits the exploration and extraction of mineral resources except cases when permission is given by the Minister of Foreign Affairs. This creates a loophole for performing other works under the guise of scientific one [20, Irkhin I.V.].

A controversial situation has also developed around the practice of creating marine protected areas (MPAs) in the high seas, under control of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). The first was the MPA in the Ross Sea, established in 2016. The problem arises due to the fact that these areas are proposed to be placed under the control of individual states. Therefore, some experts defend the critical point of view that the creation of an MPA violates the 1982 UN Convention on the Law of the Sea (Article 89), since in fact, sovereignty is established on the high seas.

The creation of MPAs is also unjustified due to the restrictions imposed on fishing, which contradicts the CCAMLR principle of economically necessary and “rational use” of biological re-

sources, consistent with the generally accepted concept of sustainable development of the UN (Goal 14.7) [19, Gudev P.A., p. 54]. The position of Russia, Japan and China, interested in fisheries, proceeds from the fact that the further introduction of MPAs with a tendency to a complete ban on fishing has no scientific justification and does not correspond to the principle of public accessibility of Arctic resources [21, Kukharev N.N., Zaitsev A.K.]. The practice of introducing MPAs has already led to the actual closure of 70% of fishing grounds [19, Gudev P.A., p. 54].

However, even in this case, there is a directly opposing interpretation of the link between the UN concept of sustainable development and the establishment of MPAs. According to this view, the rationale for establishing protected areas is consistent with the goal of conserving biodiversity and protecting the environment (Goal 14.5). Supporters of MPAs also believe that the introduced restrictions on fishing preserve Antarctica as a common heritage of humanity (global commons) [22, Brooks C., Crowder L., Osterblom H.]. Thus, opposing points of view address different subsections of the same goal 14, named in the UN concept of sustainable development.

The problems of science diplomacy as a tool of international cooperation are related to the fact that states can use it to achieve unilateral benefits. Then national interests do not necessarily coincide with the mechanisms and conditions of international cooperation. In such cases, science diplomacy acts not as a “soft power” based on attractiveness to partners, but, for example, as a means of preparing for the economic development of Antarctica in the interests of a particular state.

As an illustration, the PRC is often cited, which since the early 2000s began to rapidly develop Antarctic policy. It is believed that the impetus was Australia’s claim to sovereign rights to almost half of Antarctica’s territory. In addition, like other states, China also had in mind the prospect of developing mineral resources. Some experts believe that the assertive policy of the PRC is aimed at preparing the most advantageous positions (mastering technologies, gaining knowledge, favorable location of research bases) by the time when the issue of access to various resources of Antarctica and adjacent seas will be resolved. Russian experts believe that the main task of Chinese scientific centers is not to conduct scientific research, but to explore mineral resources on the shelf and in deep sea areas. So far, the centers are being provided with appropriate equipment and accumulating experience [23, Komleva N.A., pp. 275–276].

According to experts, the PRC currently ranks 3rd in influence after the USA and the Russian Federation and 5th in investments in scientific programs. The peculiarity of the PRC’s position is that it considers the existing restrictions on the development of resources to be temporary, and access to resources is its primary task. At the same time, Beijing views the 1959 Treaty positively, since it is beneficial for China, which is just beginning its scientific research and is interested in receiving information from states that have much more experience [9, Balakin V.I.].

Another version of the discrepancy between national and global interests is provided by the example of Chile and Argentina. Conducting active science diplomacy and cooperating in a South-South format with South Africa and Australia, they simultaneously defend their sovereign

rights in Antarctica, and prove that this does not contradict the Antarctic Treaty of 1959. For this purpose, Chile and Argentina appeal to the 1982 UN Convention on the Law of the Sea and consider that not only the seas of the Southern Ocean fall within their EEZ (with the right to develop the shelf), but they also have sovereign sectors in Antarctica. Argentina has adopted a law, in which it has established its own sovereignty in Antarctica, based on the decision of the UN Commission on the Limits of the Continental Shelf [24, Dyakova L.V.; 25, Andreev A.S.].

The Special Military Operation 2022 had a negative impact on the development of scientific cooperation. In this sense, a landmark event for Antarctic interaction was the Consultative Meeting in Berlin on May 23 – June 2, 2022, when the Ukrainian and American delegations accused the Russian Federation of aggressive policies and negative impact on the implementation of Ukrainian Antarctic activities, and then demonstratively left the meeting [26, Lukin V.V., p. 40]. The demarche was of a purely political nature, having no relation to the scientific co-operation in the Antarctic, which is what the Consultative Meeting is engaged in. Further development of this tendency could lead to a split in Antarctica, where one of the poles will be China and the Russian Federation, which, according to Western experts, will negatively affect international scientific cooperation [27, Liu N.]. This idea of opposing the PRC and Russia to the rest of the world as a source of conflict in future international relations has already been put into circulation in relation to the Arctic. At the doctrinal level, the United States considers the convergence of the Russian Federation and China as a military threat, which is enshrined in the National Strategy for the Arctic Region, published in October 2022<sup>6</sup>. One can only hope that the level of confrontation in the demilitarized Antarctica will not be as noticeable.

Assessing the general evolution of Antarctic policy, V.V. Lukin noted that scientific activity and the international cooperation based on it are gradually fading into the background, giving way to problems of environmental protection and climate change. Although these topics are important, in practice, some states use them to protect their political interests [28, p. 112], taking advantage of the gaps in international law. In particular, the concept of MPAs in combination with the 1982 Law of the Sea Convention is used to consolidate territorial claims despite their “freezing” by the 1959 Treaty. This became possible because the Treaty, which appeared earlier than the mentioned convention, did not define the legal status of the southern seas [11, Savenkov A.N., Rednikova T.V., p. 13]. Such conflicts are not new to international law (it is enough to recall the status of Spitsbergen and coastal waters in the Arctic), but their resolution requires mutual consent of the parties.

### ***Conclusion***

The importance of science diplomacy as a political tool is caused by the objective circumstances of global development. In this sense, it cannot be “cancelled” by political decisions. The

---

<sup>6</sup> The National Strategy for the Arctic Region. October 2022. URL: <https://www.whitehouse.gov/wp-content/uploads/2022/10/National-Strategy-for-the-Arctic-Region.pdf> (accessed 25 December 2022).



examples of the Arctic and Antarctic are only the most vivid examples of its opportunities, problems and prospects, which can be taken into account not only in the interests of regional policy, but also in the broader context of global development. In the polar regions, due to specific conditions, a unique synthesis of science and diplomacy occurs faster than in other regions of the world.

The tasks addressed by science diplomacy in the Arctic and Antarctic are quite similar, but the specifics of the problems are related to the status and history of the development of these spaces. Whereas in the Arctic, scientific activity and science diplomacy follow the economic and military development that has begun, in the Antarctic they are still on the exclusive priority positions. However, the growing temptation of economic development of the Antarctic in the near future will probably cause a serious revision of its legal status accompanied by the “battle of sovereignties.” The question arises: to what extent can the experience of science diplomacy in the Arctic be used in the Antarctic and vice versa? Of course, talking about direct transfer is not always advisable due to the difference in conditions of the two polar regions (legal, institutional, natural-geographical, as well as development).

Despite all the differences in the conditions for using science diplomacy in the Arctic and Antarctic, there is a common problem that ultimately rests on understanding the nature of this phenomenon. The problem lies in the internal contradiction inherent in science diplomacy: the coexistence of the national-state and global dimensions in the goal-setting of this activity. There is nothing unexpected in this; however, it can be noted that insufficient attention has been paid to this aspect in the scientific literature on the nature of science diplomacy. This gives rise to the illusion of science diplomacy as an absolute good with the inevitable prospect of international cooperation. But science, involved in politics as a tool, subsequently acquires ambiguity, which is reflected in the multiple paradigms of international relations theory: neorealism, neoliberalism and globalism. Accordingly, science diplomacy can be considered both as a tool for protecting national interests, and as a path to international cooperation, and as a way to resolve global problems.

## References

1. Yao J. An International Hierarchy of Science: Conquest, Cooperation, and the 1959 Antarctic Treaty System. *European Journal of International Relations*, 2021, vol. 27, no. 4, pp. 995–1019. DOI: 10.1177/135406612111033889
2. Young O., Yang J., Zarogski A. The “New” Arctic as a Zone of Peaceful Competition. *Polar Perspectives*, 2022, no. 11, 25 p.
3. Gutenev M. Nauchnaya diplomatiya kak instrument dostizheniya vneshnepoliticheskikh tseley [Science Diplomacy as a Tool for Achieving Foreign Policy Goals]. *Mirovaya ekonomika i mezhdunarodnye otnosheniya* [World Economy and International Relations], 2021, vol. 65, no. 6, pp. 119–127. DOI: 10.20542/0131-2227-2021-65-6-119-127
4. Reinhardt R.O. Evolyutsiya kontseptual'nykh osnov rossiyskoy nauchnoy diplomatii 1996–2016 godov [Evolution of the Conceptual Foundations of Russian Scientific Diplomacy 1996–2016]. *Nauchnyy dialog*, 2020, no. 3, pp. 385–401. DOI: 10.24224/2227-1295-2020-3-385-401
5. Ilina I.E., Malenko S.V., Vasileva I.N., Rebrova T.P. Model' realizatsii nauchnoy diplomatii: zarubezhnyy i rossiyskiy opyt [The Application of the Science Diplomacy Model: The Russian and International Experience]. *Upravlenie naukoy i naukometriya* [Science Governance and Scientometrics], 2021, vol. 16, no. 1, pp. 10–46. DOI: 10.33873/2686-6706.2021.16-1.10-46

6. *New Frontiers in Science Diplomacy: Navigating the Changing Balance of Power*. London, Royal Society, 2010, 74 p.
7. Gutenev M.Yu., Sergunin A.A. Arkticheskaya nauchnaya diplomatiya Rossii: teoriya i praktika [Russia's Arctic Science Diplomacy: Theory and Practice]. *Vestnik mezhdunarodnykh organizatsiy: obrazovanie, nauka, novaya ekonomika* [International Organisations Research Journal], 2022, vol. 17, no. 3, pp. 155–174. DOI: 10.17323/1996-7845-2022-03-06
8. Todorov A.A. Interesy Shveysarii v Arktike [Interests of Switzerland in the Arctic]. *Rossiyskaya Arktika* [Russian Arctic], 2018, no. 1, pp. 4–7.
9. Balakin V.I. Prodvizhenie Kitaya v Antarktidu v XXI veke [China's Advancement to the Antarctic in the 21st Century]. *Kitay v mirovoy i regional'noy politike. Istoriya i sovremennost'* [China in World and Regional Politics. History and Modernity], 2020, vol. 25, no. 25, pp. 184–197. DOI: 10/24411/2618-6888-2020-10011
10. Rogozhina K.A. Nauchnaya diplomatiya kak ob"ekt issledovaniy v sovremennoy politicheskoy nauke [Scientific Diplomacy as an Object of Research in Modern Political Science]. *Mozaichnoe pole mirovoy i rossiyskoy publichnoy politiki. Politicheskaya nauka: Ezhegodnik 2020–2021* [Mosaic field of world and Russian public policy. Political Science: Yearbook 2020–2021]. Tomsk, Tomsk State University, 2021, pp. 373–398.
11. Savenkov A.N., Rednikova T.V. Antarktida vchera, segodnya, zavtra: k 200-letiyu so dnya otkrytiya [Antarctica Yesterday, Today, Tomorrow: To the 200th Anniversary of the Discovery]. *Gosudarstvo i parvo* [State and Law], 2020, no. 7, pp. 7–24. DOI: 10.31857/S102694520010704-5
12. Sampaio D. The Antarctic Exception: How Science and Environmental Protection Provided Alternative Authority Deployment and Territoriality in Antarctica. *Australian Journal of Maritime & Ocean Affairs*, 2019, no. 11, pp. 1–13. DOI: 10.1080/18366503.2019.1589899
13. Sergunin A., Shibata A. Implementing the 2017 Arctic Science Cooperation Agreement: Challenges and Opportunities as Regards Russia and Japan. *The Yearbook of Polar Law*, 2022, vol. 14, pp. 45–75. DOI:10.1163/22116427\_014010004
14. Ryzhova A.V. Arkticheskiy vektor v otnosheniyakh Danii s SShA i Kitaem [The Arctic Vector in Denmark's Relations with the USA and China]. *Problemy natsional'noy strategii* [National Strategy Issues], 2021, no. 2 (65), pp. 169–186. DOI: 10.52311/2079-3359\_2021\_2\_169
15. Kornhuber K., Vinke K., Bloom E. The Disruption of Arctic Exceptionalism: Managing Environmental Change In Light of Russian Aggression. *DGAP Report № 2, Berlin, German Council on Foreign Relations*, 2023, 19 p.
16. Bisen A. India's G20 Presidency: Opportunity to Resume Engagement in the Arctic. *Strategic Security Analysis*, 2023, iss. 27, 14 p.
17. Konyshhev V. Can the Arctic Remain a Region of International Cooperation in the Context of the Ukrainian Crisis? In: *Arctic Yearbook 2022: The Russian Arctic: Economics, Politics and Peoples*. Iceland, Akureyri, 2022.
18. Bisen A. Melt This Arctic Cold War. *The Economic Times*, 18.03.2023.
19. Gudev P.A. Morekhozyaystvennyye aspekty sistemy dogovora ob Antarktike [Maritime Aspects of the Antarctic Treaty System]. *Obshchestvennye nauki i sovremennost'* [Social Sciences and Contemporary World], 2022, no. 2, pp. 48–62. DOI: 10.31857/S0869049922020046
20. Irkhin I.V. Konstitutsionnyy status Britanskoy antarkticheskoy territorii [The Constitutional Characteristics of the Status of the British Antarctic Territory as a Sector of Antarctica and the Subject of Partnership with the Kingdom of Great Britain and Northern Ireland]. *Zhurnal zarubezhnogo zakonodatel'stva i sravnitel'nogo pravovedeniya* [Journal of Foreign Legislation and Comparative Law], 2016, no. 6, pp. 24–28. DOI: 10.12737/23461
21. Kukharev N.N., Zaytsev A.K. Konventsiya o sokhranении morskikh zhivyykh resursov Antarktiki i problemy upravleniya [The Convention for the Conservation of Antarctic Marine Living Resources and Management Problems]. *Vodnye bioresursy i sreda obitaniya* [Aquatic Bioresources & Environment], 2018, vol. 1, no. 2, pp. 70–94. DOI: 10.47921/2619-1024\_2018\_1\_2\_70
22. Brooks C., Crowder L., Osterblom H., Strong A. Reaching Consensus for Conserving the Global Commons: The Case of the Ross Sea, Antarctica. *Conservation Letters*, 2019, vol. 13, no. 1, pp. 1–10. DOI:10.1111/conl.12676

23. Komleva N.A. Spetsifika tsirkumpolyarnoy ekspansii sovremennogo Kitaya [Specifics of the Circumpolar Expansion of the Modern China]. *Koinon*, 2020, vol. 1, no. 1–2, pp. 269–280. DOI:10.15826/koinon.2020.01.1–2.015
24. Diakova L.V. Na perekrestke global'nogo i lokal'nogo [At the Crossroads of Global and Local. Chile's Antarctic Policy at the Present Stage]. *Latinskaya Amerika* [Latin America], 2022, no. 6, pp. 57–68. DOI: 10.31857/S0044748X0020409-8
25. Andreev A.S. Antarktida vo vneshney politike stran Latinskoy Ameriki [Antarctica in the Foreign Policy of Latin American Countries]. *Latinskaya Amerika* [Latin America], 2020, no. 6, pp. 82–94. DOI: 10.31857/S0044748X0009594-2
26. Lukin V.V. Rossiya i SShA v Antarktike: obshchie interesy i proekty [Russia and the USA in the Antarctic: Common Interests and Projects]. *SShA & Kanada: ekonomika, politika, kul'tura* [USA & Canada: Economics, Politics, Culture], 2022, no. 9, pp. 23–42. DOI: 10.31857/S2686673022090024
27. Liu N. The Geopolitical Lessons from the Arctic to Antarctica. *United Service*, 2023, vol. 4, no. 1, pp. 12-15.
28. Lukin V.V. Predposylki sozdaniya i sovremennaya rol' Madridskogo protokola v Sisteme Dogovora ob Antarktike [Preconditions of Creation and Current Role of Madrid Protocol in the Antarctic Treaty System]. *Problemy Arktiki i Antarktiki* [Arctic and Antarctic Research], 2017, no. 2 (112), pp. 96–112.

*The article was submitted 04.04.2023; approved after reviewing 12.04.2023;  
accepted for publication 13.04.2023*

*The author declares no conflicts of interests*

## NORTHERN AND ARCTIC SOCIETIES

Arctic and North. 2023. No. 52. Pp. 130–140.

Original article

UDC 332.1(=511.2)](985)(045)

doi: 10.37482/issn2221-2698.2023.52.153

### Current Problems of Indigenous Minorities of the Russian Arctic in the Context of Climate Change

**Irina I. Matvienko**<sup>1✉</sup>, Cand. Sci. (Econ.), Associate Professor, Senior Researcher

<sup>1</sup> Laverov Federal Center for Integrated Arctic Research, Ural Branch of the Russian Academy of Sciences, pr. Nikolskiy, 20, Arkhangelsk, Russia

<sup>1</sup> iim1978@rambler.ru ✉, ORCID: <https://orcid.org/0000-0002-9324-0681>

**Abstract.** The article describes the current problems of small indigenous peoples of the Russian Arctic in the context of climate change, the main of which are: the food problem, the problem of transport accessibility, the problem of economic activity and the problem of health. Because of global warming due to the increase in the average annual temperature, there is a high probability that the above-mentioned problems will only increase and significantly affect all life support systems of small indigenous peoples of the Russian Arctic. The article uses analysis and synthesis, induction and deduction to show the interconnection and mutual influence of the existing problems on the economic activity and health of small indigenous peoples in the conditions of climate change in the Arctic. In order to solve the current problems of the Russian Arctic indigenous minorities in the context of climate change, the following is required: 1) development of laws, strategies and/or state programs for the protection of indigenous peoples to minimize the adverse effects of climate change by sectors (reindeer herding, fishing, hunting and gathering); 2) creation of a system for assessing the impact of climate change on the economic activity and health of indigenous peoples; 3) participation of indigenous peoples in environmental monitoring and implementation of environmental projects in the Arctic.

**Keywords:** *current problem, indigenous peoples, Arctic, Russian Arctic, climate change, climate*

#### Introduction

Any climatic changes affect life support systems of the small indigenous peoples of the North, Siberia and the Far East of the Russian Federation (hereinafter referred to as the SIPN): both traditional economic activities, traditional nature management, and living conditions. “According to Roshydromet data, the average rate of increase in the average annual air temperature in Russia in 1976–2018 was 0.47°C over 10 years, which is 2.5 times higher than the average rate of global indicators...”<sup>1</sup> In addition, “to date, it has been established that increase in the average temperature of the Earth’s surface (increase of 0.8°C since the middle of the 20th century) is accompanied by the melting of glaciers, the rise in the level of the world ocean, oxidation and heat-

---

\* © Matvienko I.I., 2023

For citation: Matvienko I.I. Current Problems of Indigenous Minorities of the Russian Arctic in the Context of Climate Change. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 153–166. DOI: 10.37482/issn2221-2698.2023.52.153

<sup>1</sup> Spetsproekt. Kak izmeneniya klimata povliyayut na ekonomiku Rossii [Special project. How climate change will affect the Russian economy]. URL: <https://sber.pro/publication/kak-izmeneniia-klimata-povliaiut-na-ekonomiku-rossii> (accessed 06 March 2023).

ing of sea water ..." <sup>2</sup>. Global warming poses a significant threat to indigenous peoples in the Russian Arctic.

Changes in climatic characteristics in the Arctic may lead to the loss of traditional knowledge of the indigenous peoples and threaten their way of life, and may also lead to the disruption of economic sustainability in their habitats. A fairly large number of indigenous peoples live in the Russian Arctic, and climate change will primarily affect all their life support systems, including their number. The website of the Ministry of the Russian Federation for the Development of the Far East and the Arctic stated in 2020 that "...the Russian Arctic is home to 19 small indigenous peoples and their heritage sites, which are of historical and cultural value of global significance. According to the All-Russian population census of 2010, the number of indigenous peoples in the Arctic zone of the Russian Federation is 102 thousand people..." <sup>3</sup>. The Clean Arctic website says that in 2023 "... out of 2.500.000 people living in the Arctic zone of the Russian Federation, 82.500 are representatives of the indigenous peoples of the North, Siberia and the Far East ..." <sup>4</sup>. We can already observe a negative trend in the number of indigenous minorities in the Arctic, which is also due to climate change.

As a result of global warming due to the increase in the average annual temperature, there is a high probability that transport and food security problems will arise in the Russian Arctic in the future. Both land (winter roads and crossings will become less reliable), water (melting ice in the Arctic creates icebergs that can be dangerous for ships), and air transport (unstable weather conditions with many snowstorms) are threatening the delivery of food to remote areas. As a result, reduction of sea ice, thawing of permafrost, changes in terrain and shifts in climatic seasons will make the transportation process more complicated. Consequently, the issues of food security and transport accessibility will become relevant in the future. The issue of food security of SIPN has already been raised in the scientific works of Russian scientists, for example, Tatarkin A.I. [1, pp. 573–587], Pilyasov A.N. [2, pp. 64–81], Ragulina M.V. [3, pp. 78–84], Kondrashev A.A. [4, pp. 61–69], Nikitenko M.E. [5, pp. 33–37], etc. The issue of transport accessibility for the indigenous peoples of the North was discussed by a large number of domestic authors, for example, Tatarkin A.I. [6, pp. 99–109], Filippova V.V. [7, pp. 36–42], Kuklina M.V. [8, pp. 453–466], Slipenchuk M.V. [9, pp. 7–27], Sviridov D.V. [10, pp. 46–48], Korobov V.B. [11, pp. 70–77], etc.

---

<sup>2</sup> Global'naya klimaticheskaya ugroza i ekonomika Rossii: v poiskakh osobogo puti [Global climate threat and the Russian economy: in search of a special path]. URL: [https://energy.skolkovo.ru/downloads/documents/SEneC/Research/SKOLKOVO\\_EneC\\_Climate\\_Primer\\_RU.pdf](https://energy.skolkovo.ru/downloads/documents/SEneC/Research/SKOLKOVO_EneC_Climate_Primer_RU.pdf) (accessed 06 March 2023).

<sup>3</sup> Podgotovlen proekt programmy podderzhki traditsionnoy deyatelnosti v Arktike korennykh malochislennykh narodov [A draft program to support traditional activities of indigenous peoples in the Arctic has been prepared]. URL: <https://minvr.gov.ru/press-center/news/podgotovlen-proekt-programmy-podderzhki-traditsionnoy-deyatelnosti-v-arktike-korennykh-malochislenny-28308/> (accessed 06 March 2023).

<sup>4</sup> Clean Arctic. Peoples of the Arctic. URL: <https://cleanarctic.ru/peoples-of-the-arctic> (accessed 06 March 2023).

***Problems of economic activities of indigenous peoples in the context of climate change***

Climate change in the Arctic leads to problems in the economic activities of indigenous peoples in such key sectors as reindeer herding, fishing, hunting and gathering (mushrooms, berries and medicinal plants).

Reindeer herding is one of the main types of traditional economic activities of SIPN, which plays a significant role in preserving their culture and identity. Reindeer breeding is the only branch of traditional nature management in which only indigenous peoples are engaged [12, Neustroeva A.B., Samsonova I.V., Malysheva M.S., Semenova L.A., pp. 220–245].

The Arctic territories with the leading reindeer population, according to the Ministry of Agriculture of the Russian Federation for 2016, are the Yamalo-Nenets Autonomous Okrug, the Nenets Autonomous Okrug, the Republic of Sakha (Yakutia) and the Chukotka Autonomous Okrug. They account for 76.7% of the total number of reindeer in the Russian Federation, with the Yamalo-Nenets Autonomous Okrug holding the leading position (46.5% of the total number of reindeer). Reindeer herding is less practiced in the Krasnoyarsk Krai, the Komi Republic and the Murmansk Oblast (16.7%)<sup>5</sup>. The total number of reindeer in the Arctic zone of the Russian Federation is 2.9 million species<sup>6</sup>.

Under the leadership of V.M. Makeev<sup>7</sup>, a study on the impact of climate change on the state and economic use of wild and domestic reindeer populations was conducted in 2011, as a result of which it was proved that significant losses in the number of domestic and wild reindeer were observed during abnormal weather events in the periods especially important for the population cycle: calving, graziery, cattle driving, migration. It is also noted that the number of animals decreases in the phases of climate warming. The study was conducted in the Yamal-Nenets Autonomous Okrug and Taimyr, since the number of deer is maximum there: domestic deer in Yamal, wild reindeer in Taimyr.

The negative trend in the number of domestic reindeer has continued for several consecutive years since 2017. “The average annual decrease in the number of reindeer in the Arctic zone, which accounts for 90% of the population, from 2017 to 2021 is 2.49%...”<sup>8</sup>. The reduction in the

<sup>5</sup> Proekt Strategii razvitiya olenevodstva Rossiyskoy Federatsii do 2030 goda. Tablitsa № 1 [Draft Strategy for the Development of Reindeer Husbandry in the Russian Federation up to 2030. Table No. 1]. URL: <https://dprea.admnao.ru/media/uploads/userfiles/2021/05/25/.pdf> (accessed 06 March 2023).

<sup>6</sup> Spetsialisty «Vostokgosplana» nazvali prichiny sokrashcheniya pogolov'ya severnykh oleney [Vostokgosplan specialists named the reasons for the reduction in the number of reindeer]. URL: <https://www.eastrussia.ru/news/spetsialisty-vostokgosplana-nazvali-prichiny-sokrashcheniya-pogolovya-severnykh-oleney/> (accessed 09 March 2023).

<sup>7</sup> Issledovanie vliyaniya izmeneniy klimata na sostoyanie i khozyaystvennye ispol'zovaniya populyatsii dikogo i domashnego severnogo olenya dlya realizatsii ustoychivogo razvitiya. Regional'nyy grant [Study of the impact of climate change on the state and economic use of wild and domestic reindeer populations for the implementation of sustainable development. Regional grant]. 2011. URL: <https://www.rgo.ru/ru/grant/issledovanie-vliyaniya-izmeneniy-klimata-na-sostoyanie-i-hozyaystvennye-ispolzovaniya> (accessed 20 December 2022).

<sup>8</sup> Spetsialisty «Vostokgosplana» nazvali prichiny sokrashcheniya pogolov'ya severnykh oleney [Vostokgosplan specialists named the reasons for the reduction in the number of reindeer]. URL: <https://www.eastrussia.ru/news/spetsialisty-vostokgosplana-nazvali-prichiny-sokrashcheniya-pogolovya-severnykh-oleney/> (accessed 09 March 2023).



number of domestic reindeer is due to various reasons, not only climate change, but also “... lack of personnel, degradation of pastures, diseases of various etiologies and injuries by predators (attacks by wolves, etc.) ...” [13, Kalitin R.R., pp. 28–39]. In order to preserve reindeer husbandry in the Arctic and ensure employment for indigenous peoples, it is necessary to develop a separate intersectoral program at the federal level to support reindeer husbandry in the Arctic in the context of climate change. Without state support, reindeer herders will lose their traditional source of food and traditional income from the sale of meat, which will negatively affect the economic sustainability of their livelihoods, because the state policy to support reindeer husbandry is one of the conditions for the sustainable development of indigenous peoples in the Arctic, as noted by P.A. Sofronov and Yu.G. Stepanova [14, pp. 96–103].

Climate change, due to the early ice debacle and late ice freeze-up, has also disrupted the traditional routes of reindeer herders; the formation of ice crusts, frequent thaws and freezing of lichens (reindeer moss, the main food for deer) have led to the problem of preserving the reindeer population, which ultimately affects the preservation of meat as a traditional food product and the income of the indigenous peoples when selling it. It is worth noting that reindeer herders have recently faced an urgent problem of choosing routes for nomadic migration, as it is increasingly difficult to predict the weather with cold winds and heavy snowfall. In addition, the transition of reindeer to winter pastures and the extraction of reindeer moss become more problematic due to the later onset of cold weather as a result of global warming. Consequently, the issue of food security (for reindeer meat) in the face of climate change is becoming more acute. The problem is especially urgent for those Arctic territories that have traditionally lived off reindeer herding — the Yamalo-Nenets Autonomous Okrug, the Nenets Autonomous Okrug, the Republic of Sakha (Yakutia) and the Chukotka Autonomous Okrug.

The issue of conservation is not only for deer meat, but also for fish. Fishing also ensures that indigenous peoples maintain their traditional way of life and traditional economic activities. In fact, fishing is the basis of existence for indigenous peoples, as fish is the basis of the diet of SIPN, rich in vitamins and minerals necessary for living in harsh conditions. However, due to global warming in the Arctic, the hydrological regime of rivers is changing, the timing of the summer and autumn fish runs is being disrupted, leading to a shift in the seasons for harvesting certain species of fish and the emergence of idle periods when fishing is not carried out by indigenous peoples. In addition, there are changes in the composition, abundance and species diversity of fish, as well as decrease in the number of marine animals, which deprive SIPN of their usual diet. Indigenous peoples from ancient times caught and harvested fish in a short summer period for the entire long winter, and in the context of global warming, due to fish migration, the timing and volumes of catch were significantly reduced.

According to Zilanov V.K., “climate change has already had a negative impact on the Arctic fishery” [15, pp. 56–70], and the warming of the water temperature led to the growth of boreal fish species. This fact was also confirmed by K.V. Drevetnyak, noting that “a sharp warming in the

Arctic and a decrease in the area of ice greatly affects resources”<sup>9</sup>. The above statements support the fact that climate change has already led to the situation, in which the indigenous peoples are experiencing great difficulties in their traditional way of life and diet in terms of fish.

In addition, there is a legal problem in the Arctic fishing for indigenous peoples, as the current legislation contains gaps and conflicts [16, Dorzheeva V.V., Sleptsova O.Yu., pp. 106–113] in implementation of the rights of SIPN in terms of issuing and obtaining permits for fishing. Indigenous peoples have the right to fish freely and free of charge only to meet their own needs within the framework of traditional fishing [17, Tortsev A.M., Studenov I.M., Semushin A.V., pp. 266–276], but for the purposes of selling fish resources within the commercial fishing, obtaining permits on a general basis is required. Due to gaps and conflicts, it is sometimes problematic for SIPN to obtain permits (quotas) necessary and sufficient for their livelihoods, which directly or indirectly affects their income and health.

Consequently, the problem of food security for fish is also relevant for indigenous peoples in the Arctic, which, due to further climate change, will lead to the consumption of their main food product in smaller volumes and will affect their health due to a lack of essential vitamins and minerals.

The reduction of traditional food products (deer meat and fish), necessary in the difficult climatic conditions of the Arctic, in the diet of the indigenous peoples worsens their immunity and increases heart and respiratory diseases. For example, a study of the diet of the indigenous peoples and its negative impact on immunity was carried out by a group of scientists on the basis of scientific and literary data of the past, as well as the results of modern research in 2013–2018. Scientists interviewed 985 people living in the villages and tundra of the Yamalo-Nenets Autonomous Okrug on the coast of the Ob, Taz and Gydan bays of the Kara Sea<sup>10</sup>. The study proved the negative impact on the immune system of a decrease in the diet of deer meat and fish.

The diet of the indigenous peoples of the North includes not only deer meat and fish, but also mushrooms with berries. Gathering and processing of berries, mushrooms and medicinal plants (wild plants) is a traditional type of economic activity of SIPN, carried out within the boundaries of the territories of their traditional nature management. Gathering provides habitual nutrition for indigenous people and allows them to earn money from the processing and sale of wild plants.

Climate change has a multidirectional effect on wild plants: on the one hand, warming has a positive effect on the diversity and productivity of wild resources [18, Mikhailova G.V., pp. 95–106], on the other hand, fires and droughts have become more frequent due to the increase in the

---

<sup>9</sup> Drevetnyak K.V. II mezhdunarodnaya konferentsiya «Rybolovstvo v Arktike: sovremennye vyzovy, mezhdunarodnye praktiki, perspektivy». *Izmenenie klimata negativno vliyaet na arkticheskoe rybolovstvo* [The 2nd international conference “Fishing in the Arctic: modern challenges, international practices, prospects”. Climate change is negatively impacting Arctic fisheries]. URL: <https://bellona.ru/2015/03/18/1426690150-77/> (accessed 06 December 2022).

<sup>10</sup> Uchenye rasskazali o vliyanii izmeneniy klimata v Arktike na zdorov'e korennykh narodov [Scientists spoke about the impact of climate change in the Arctic on the health of indigenous peoples]. URL: <https://nauka.tass.ru/nauka/12097081> (accessed 15 December 2022).

average annual temperature, which destroy wild plant harvests. Besides, large areas with wild plants are trampled down by domestic and wild deer, forced to migrate due to the loss of their habitual territories as a result of climate warming. In addition, the diversity and productivity of wild resources adversely affects the health of mushroom and berry pickers, as physical activity increases due to an increase in the volume of wild plants.

Consequently, in the future, the issue of food security will also arise for wild plants. Gathering, processing and sale of wild plants are a type of entrepreneurial activity that also requires state support, like reindeer herding and fishing [19, Loginov V.G., Ignatieva M.N., Balashenko V.V., pp. 763–779].

Hunting is a traditional form of wildlife use for the indigenous peoples and an established way of life support in the harsh natural and climatic conditions of the Arctic. In recent years, most indigenous hunters have been hunting animals for family consumption. Climate change in the Arctic leads to a deterioration in the availability of hunting resources and a shortening of the hunting period in the spring, while natural changes are not taken into account when regulating hunting, first of all, when setting its timing [18, Mikhailova G.V., pp. 95–106]. The negative results of hunters are affected by the change of routes and the timing of migration of animals and birds, due to which the commercial catch is lost. Late ice freezing also prevents hunters from gaining timely access to fishing grounds. Consequently, the indigenous peoples of the North have less and less opportunities to feed themselves and earn money by selling the results of their hunting.

Fishing, hunting and gathering are branches of economic activity of the indigenous peoples, climate problems in which are traced in all Arctic territories, but they are especially relevant for the Yamalo-Nenets Autonomous Okrug, the Nenets Autonomous Okrug, the Republic of Sakha (Yakutia), the Chukotka Autonomous Okrug and the Krasnoyarsk Krai, where the majority of Nenets, Evenk, Chukchi and Khanty live; there are less problems in the Republic of Karelia, the Republic of Komi, the Arkhangelsk Oblast and the Murmansk Oblast due to the small number of other SIPN.

Thawing permafrost may force the indigenous peoples to move, as the landscape and terrain are changing dramatically, which leads to subsidence of house foundations. Thus, scientists from NEFU Svinoboev A.N. and Neustroeva A.B. conducted a study in which they noted strong subsidence of house foundations in the in the river regions of Central Yakutia due to climate change [20, pp. 28–38]. The scientists came to this conclusion on the basis of a formalized interview with household members and a survey of their residential buildings, houses and courtyards in 2017. House foundation subsidence is primarily relevant for the indigenous peoples of the Republic of Sakha (Yakutia), where more than 300 buildings in the city of Yakutsk have suffered serious damage due to frozen ground subsidence over the past 30 years<sup>11</sup>. The problem with building

---

<sup>11</sup> Vozdeystvie izmeneniya klimata na rossiyskuyu Arktiku: analiz i puti resheniya problemy. WWF Rossii [Impact of climate change on the Russian Arctic: analysis and solutions to the problem. WWF Russia]. URL: [http://www.arcticandnorth.ru/upload/medialibrary/2af/vozdeistvie\\_na\\_arcticu.pdf](http://www.arcticandnorth.ru/upload/medialibrary/2af/vozdeistvie_na_arcticu.pdf) (accessed 09 March 2023).

foundations is also critical in the Yamalo-Nenets Autonomous Okrug (Tiksi), Krasnoyarsk Krai (Dudinka, Norilsk), Chukotka Autonomous Okrug (Pevek) and Nenets Autonomous Okrug (Amderma).

Not only the problem of house foundations subsidence is a consequence of permafrost thawing, roads also suffer from summer thawing, as the ground surface is not perfectly flat and the ground subsides unevenly. Consequently, the maintenance and construction of roads and buildings in the future will become quite costly and will contribute to the migration of the indigenous peoples to more comfortable places to live, which will affect the economic sustainability of the territories.

Thus, the traditional economic activities of indigenous peoples are the most important basis for their livelihood and a significant factor influencing the preservation of their traditional way of life, language and culture. Changes in the traditional way of life of the indigenous peoples of the Russian Arctic are primarily influenced by:

- shift of climatic seasons;
- terrain changes;
- "... change in the area of settlement and migration of commercial animals;
- changes in snow cover and river ice parameters, availability and structure of pastures;
- increase in the infection of animals, birds and fish, displacement of northern species by representatives of the fauna and flora of other regions, etc." <sup>12</sup>

In the context of climate change, the economic activity and living conditions of the indigenous peoples of the North are under threat, which requires immediate support from the state in relation to the indigenous peoples for further sustainable development of all life support systems.

### ***Health problems of indigenous peoples in the context of climate change***

Negative changes in all sectors (reindeer herding, fishing, hunting and gathering) in the future will affect not only the economic activity of the indigenous peoples of the Russian Arctic, but also their health. Because of climate warming, traditional ways of life and nutrition have to be changed. The health of the Nenets, Evenk, Chukchi and Khanty is at risk, as they are the most numerous peoples of the Russian Arctic. According to the 2020 All-Russian Population Census, about 47.000 Nenets predominantly live in the Yamalo-Nenets Autonomous Okrug, the Nenets Autonomous Okrug, the Krasnoyarsk Krai and the Arkhangelsk Oblast. About 28.000 Evenk live in the Republic of Sakha (Yakutia) and the Krasnoyarsk Krai, about 13.000 Chukchi live in the Chukotka Autonomous Okrug, and about 10.000 Khanty — in the Yamalo-Nenets Autonomous Okrug <sup>13</sup>.

<sup>12</sup> Boyakova S.I. Vliyaniye izmeneniya klimata na vedeniye traditsionnogo obraza zhizni i traditsionnoy khozyaystvennoy deyatel'nosti v mestakh traditsionnogo prozhivaniya korennykh malochislennykh narodov Severa [The impact of climate change on the traditional way of life and traditional economic activities in the places of traditional residence of indigenous peoples of the North]. URL: [https://www.s-vfu.ru/universitet/rukovodstvo-i-struktura/instituty/unesco/news\\_detail.php?SECTION\\_ID=&ELEMENT\\_ID=101173](https://www.s-vfu.ru/universitet/rukovodstvo-i-struktura/instituty/unesco/news_detail.php?SECTION_ID=&ELEMENT_ID=101173) (accessed 08 December 2022).

<sup>13</sup> Rosstat. Itogi Vserossiyskoy perepisi naseleniya 2020 goda. Tablitsa 17 [Rosstat. Results of the 2020 All-Russian Population Census. Table 17]. URL: [https://rosstat.gov.ru/vpn\\_popul](https://rosstat.gov.ru/vpn_popul) (accessed 09 March 2023).

Due to problems with transport accessibility, the SIPN have problems not only with food security, but also with obtaining qualified medical care, and with the delivery of medical goods [21, Revich B.A., pp. 395–408]. It does not contribute to a decrease in mortality and morbidity of the indigenous peoples, but, on the contrary, provokes their increase. In addition, one should not forget that the life expectancy of the indigenous peoples of the North is lower than the all-Russian indicator throughout the country [22, Bogoyavlenskiy D.D., pp. 14–17].

The indigenous peoples, whose mortality significantly exceeds the average level in Russia, may get additional injuries due to ice thinning [23, Revich B.A., pp. 11–16]. Traumatic injuries are the cause of a significant number of deaths among indigenous peoples as a consequence of untimely receipt of medical and drug assistance due to problems with transport accessibility. The increase in accidents associated with a decrease in the safety of movement due to changes in the parameters of ice and weather conditions is a medical threat in the new reality for SIPN. The availability of healthcare facilities, the provision of hospitals with modern diagnostic equipment, the level of qualifications and the number of doctors and paramedical personnel in the Arctic settlements directly affect the health of the indigenous peoples. A decrease in the number of doctors, a reduction in medical facilities, outdated medical equipment and difficult transport accessibility of qualified medical care adversely affect the health of people living in difficult natural and climatic conditions of the Arctic. This situation is especially relevant for the indigenous peoples of the Yamalo-Nenets Autonomous Okrug, the Republic of Sakha (Yakutia) and the Chukotka Autonomous Okrug. The problem of health is aggravated by the long distances and difficulties of traveling in these Arctic territories, since it is very difficult for residents of remote Arctic settlements to reach a medical facility at any time of year, especially in the off-season.

Climate warming in the Arctic has a direct impact on the level of infectious morbidity of indigenous peoples and natural focal diseases. The risk of infectious diseases is increasing: tick-borne encephalitis, tick-borne borreliosis, tuberculosis, viral hepatitis, parasitosis, etc. There is already a significant increase in tick-borne encephalitis in the Arkhangelsk Oblast and the Komi Republic due to climate warming<sup>14</sup>. The growth of especially dangerous natural focal diseases (tularemia, anthrax, cholera, smallpox, plague, West Nile fever, etc.) significantly increases the mortality rate of indigenous peoples. Clear examples are a large-scale anthrax epidemic in 2016 in the Yamal-Nenets Autonomous Okrug<sup>15</sup> and an outbreak of tularemia in 2017 in the Republic of Karelia<sup>16</sup>.

It is also worth noting that climate change is increasing the risk of natural disasters (floods and forest fires), which provoke certain infectious diseases (for example, intestinal infections and

<sup>14</sup> Sluchaev kleshchevogo entsefalita v Komi i Pomor'e stalo bol'she [Cases of tick-borne encephalitis in Komi and Pomorie have increased]. URL: <https://tass.ru/obschestvo/4155577> (accessed 09 March 2023).

<sup>15</sup> Ochag sibirskoy yazvy na Yamale lokalizovan [The outbreak of anthrax in Yamal has been localized]. URL: <https://www.interfax.ru/russia/521600> (accessed 09 March 2023).

<sup>16</sup> V Karelii za dva goda rezko vyroslo chislo zaboлевshikh tulyaremiy [In Karelia, the number of cases of tularemia has increased sharply in two years]. URL: <https://ptzgovorit.ru/shortread/v-karelii-za-dva-goda-rezko-vyroslo-chislo-zaboлевshih-tulyaremiy> (accessed 09 March 2023).

tick-borne diseases). All of the above diseases do not contribute to reducing mortality among the indigenous peoples and increasing their life expectancy.

### **Conclusion**

The food problem, the problem of transport accessibility, the problem of economic activity and the problem of health are a tangle of modern problems of the indigenous peoples of the Russian Arctic in the context of climate change, which need to be addressed immediately. But these are not all the problems. Changes in all life support systems of SIPN due to climate warming also give rise to interpersonal conflicts, depression and other forms of social stress that affect the socio-psychological adaptation of the indigenous peoples to modern realities. Conflicts and stress among indigenous peoples have a negative effect not only on their psychological state, but also on their physical health. We should not forget about the state of the environment, which is the territory of the traditional nature management of SIPN. Environmental pollution and climate changes are interrelated, which directly affects the economic activity and health of the indigenous peoples.

As noted previously, the situation with the economic activities of the indigenous peoples and their health is very different in different Arctic regions in the context of climate change. The health of the Nenets, Evenk, Chukchi and Khanty in the Yamalo-Nenets Autonomous Okrug, the Republic of Sakha (Yakutia), the Chukotka Autonomous Okrug, the Nenets Autonomous Okrug and the Krasnoyarsk Krai is under threat. Infectious and natural focal diseases due to climate warming are already observed in the Yamalo-Nenets Autonomous Okrug, the Arkhangelsk Oblast, the Republic of Karelia and the Komi Republic. There is a huge problem with building foundations due to frozen ground subsidence in the Republic of Sakha (Yakutia), the Yamalo-Nenets Autonomous Okrug, the Krasnoyarsk Krai, the Chukotka Autonomous Okrug and the Nenets Autonomous Okrug. The development of reindeer breeding in the Yamalo-Nenets Autonomous Okrug, the Nenets Autonomous Okrug, the Republic of Sakha (Yakutia) and the Chukotka Autonomous Okrug, where reindeer breeding is the basis of traditional economic activity, causes difficulties. Fishing, hunting and gathering are branches of economic activity of the indigenous peoples of the North, subject to climate change, which can be observed in all territories of the Arctic zone of the Russian Federation to a greater or lesser extent.

In order to solve modern problems, it is necessary:

- firstly, to develop laws, strategies and/or state programs for the protection of the indigenous peoples of the Russian Arctic, required to minimize the adverse effects of climate change by sectors (reindeer herding, fishing, hunting and gathering);
- secondly, to create a system for assessing the impact of climate change on the economic activity and health of the indigenous peoples of the North;
- thirdly, to involve indigenous peoples in monitoring the state of the environment and implementing environmental projects in the Arctic.



Without government support, the livelihood of the SIPN is under threat, since the sustainable development of the indigenous peoples directly depends on the solution of existing problems.

## References

1. Tatarkin A.I., Litovsky V.V. Rossiya v Arktike: strategicheskie priority kompleksnogo osvoeniya i infrastrukturnoy politiki [Russia in Arctic: Strategic Priorities of Integrated Development and Infrastructure Policy]. *Vestnik MGTU. Trudy Murmanskogo gosudarstvennogo tekhnicheskogo universiteta* [Vestnik of MSTU. Scientific Journal of Murmansk State Technical University], 2014, vol. 17, no. 3, pp. 573–587.
2. Zamyatina N.Yu., Pilyasov A.N. Sem' proektov effektivnogo razvitiya Arktiki [Seven Projects of Effective Development of the Arctic Region]. *Ekonomika Vostoka Rossii* [Economics of Russian East], 2018, no. 2 (10), pp. 64–81. DOI: 10.25801/SRC.2019.10.2.009
3. Ragulina M.V. Prodovol'stvennaya bezopasnost' i zhizneobespechenie korennykh narodov Severa: integratsiya teoreticheskikh podkhodov [Food Security and Life Sustenance of the Northern Indigenous Peoples: Integration of Theoretical Approaches]. *Voprosy bezopasnosti* [Security Issues], 2018, no. 4, pp. 78–85. DOI: 10.25136/2409-7543.2018.4.27243
4. Kondrashev A.A., Nikitenko M.E., Trofimova S.A., Trofimova I.B., Gotsko L.G. Prodovol'stvennaya bezopasnost' Arkticheskikh territoriy: problemy vovlecheniya naseleniya i korennykh narodov Kraynego Severa [Food Security of the Arctic Territories: Problems of the Population and Indigenous Peoples of the Far North Involvement]. *European Social Science Journal*, 2016, no. 10, pp. 61–69.
5. Nikitenko M.E., Trofimova I.B. Prodovol'stvennaya bezopasnost' v Arkticheskoy zone Rossiyskoy Federatsii [Food Security in the Arctic Territories of the Russian Federation]. *Obshchestvo: politika, ekonomika, pravo* [Society: Politics, Economics, Law], 2016, no. 9, pp. 33–37.
6. Tatarkin A.I., Loginov V.G., Zakharchuk E.A. Sotsial'no-ekonomicheskie problemy osvoeniya i razvitiya Rossiyskoy Arkticheskoy zony [Socioeconomic Problems in Development of the Russian Arctic Zone]. *Vestnik Rossiyskoy akademii nauk* [Herald of the Russian Academy of Sciences], 2017, vol. 87, no. 2, pp. 99–109. DOI: 10.7868/S086958731701011X
7. Filippova V.V. Dostup k territoriyam traditsionnogo prirodopol'zovaniya: mobil'nost' lokal'nykh soobshchestv v usloviyakh promyshlennogo osvoeniya [Access to the Territories of Traditional Natural Resource Management: Mobility of Local Communities in the Conditions of Industrial Development]. *Kunstkamera*, 2020, no. 1 (7), pp. 36–42. DOI: 10.31250/2618-8619-2020-1(7)-36-42
8. Kuklina M.V., Gordt M.V., Savvinova A.N., Krasnoshtanova N.E., Filippova V.V. Vliyanie transportnoy dostupnosti na razvitie otdalennykh territoriy [Influence of Transportation Accessibility on the Development of Remote Areas]. *Upravlencheskiy uchët* [Management Accounting], 2021, no. 12–2, pp. 453–466. DOI: 10.25806/uu12-22021453-466
9. Slipenchuk M.V. «Dorozhnaya karta» arkticheskogo khab-klastera ["Road Map" of the Arctic Hub-Cluster]. *ETAP: ekonomicheskaya teoriya, analiz, praktika* [ETAP: Economic Theory, Analysis, and Practice], 2019, no. 2, pp. 7–27. DOI: 10.24411/2071-6435-2019-10077
10. Sviridov D.V. Infrastruktura transporta i logistiki: kak obespechit' bezopasnost' v usloviyakh vechnoy merzloty [Transport and Logistics Network: How to Maintain Security in Permafrost]. *Ekonomika Vostoka Rossii* [Economics of Russian East], 2020, no. 1(12), pp. 46–48. DOI: 10.25801/SRC.2020.68.39.016
11. Korobov V.B., Tutygin A.G., Chizhova L.A. Posledovatel'nost' prinyatiya strategicheskikh resheniy v zadachakh proektirovaniya transportnoy infrastruktury v Arktike [The Sequence of Strategic Decisions in the Design of Transport Infrastructure in the Arctic]. *Problemy regional'noy ekologii* [Regional Environmental Issues], 2018, no. 5, pp. 70–77. DOI: 10.24411/1728-323X-2019-15070
12. Neustroeva A.B., Samsonova I.V., Malysheva M.S., Semenova L.A. Sovremennoe polozhenie traditsionnykh khozyaystv korennykh malochislennykh severnykh narodov v respublike Sakha (Yakutiya) [The Current Situation of Traditional Farms of the Indigenous Northern Peoples in the Republic of Sakha (Yakutia)]. *Zhurnal sotsiologii i sotsial'noy antropologii* [The Journal of Sociology and Social Anthropology], 2020, no. 3, pp. 220–245. DOI: 10.31119/jssa.2020.23.3.9

13. Kalitin R.R. Sovremennoe sostoyanie, problemy severnogo domashnego olenevodstva i puti ikh resheniya [Current State, Problems of Northern Domestic Reindeer Husbandry and Ways to Solve Them]. *Rossiyskaya Arktika* [Russian Arctic], 2021, no. 4 (15), pp. 28–39. DOI: 10.24412/2658-4255-20214-28-39
14. Sofronov P.A., Stepanova Yu.G. Gosudarstvennaya politika podderzhki olenevodstva kak uslovie ustoychivogo razvitiya korennykh malochislennykh narodov severa v respublike Sakha (Yakutiya) (na materialakh Aldanskogo rayona) [State Policy of Support of Reindeer Herding as a Condition for Sustainable Development of Indigenous Peoples of the North in Republic of Sakha (Yakutia) (On Materials of the Aldan Area)]. *Arkhot*, 2020, no. 4 (19), pp. 96–103.
15. Zilanov V.K. Dugi rybolovnoy napryazhennosti v Rossiyskoy Arktike [Fishing Tension Arcs in the Russian Arctic]. *Arktika i Sever* [Arctic and North], 2015, no. 19, pp. 56–70. DOI: 10.17238/issn2221-2698.2015.19.56
16. Dorzheeva V.V., Sleptsova O.Yu. Pravo korennykh malochislennykh narodov severa na traditsionnoe rybolovstvo i problemy ego realizatsii (na primere Magadanskoj oblasti) [The Right of Small Indigenous Minorities of the North to Traditional Fishery and Problems of Its Implementation (Case Study of the Magadan Oblast)]. *Teoriya i praktika obshchestvennogo razvitiya* [Theory and Practice of Social Development], 2022, no. 9, pp. 106–113. DOI: 10.24158/tipor.2022.9.14
17. Tortsev A.M., Studenov I.I., Semushin A.V. Ispol'zovanie korennyimi malochislennymi narodami rybnnykh resursov Nenetskogo avtonomnogo okruga [Use of Fish Resources by Indigenous Peoples of the Nenets Autonomous Area]. *Arktika: ekologiya i ekonomika* [Arctic: Ecology and Economy], 2021, vol. 11, no. 2, pp. 266–276. DOI: 10.25283/2223-4594-2021-2-266-276
18. Mikhaylova G.V. The Arctic Society under the Environmental and Climate Change (Based on Survey Results). *Arktika i Sever* [Arctic and North], 2018, no. 32, pp. 95–106. DOI: 10.17238/issn2221-2698.2018.32.95
19. Loginov V.G., Ignatyeva M.N., Balashenko V.V. Razvitie predprinimatel'skoy deyatel'nosti korennykh etnosov kak faktora sokhraneniya traditsionnoy ekonomiki v usloviyakh promyshlennogo osvoeniya Severa [Development of the Entrepreneurial Activities of the Indigenous Ethnic Groups as a Factor for Preserving the Traditional Economy in the Context of the North's Industrial Development]. *Ekonomika regiona* [Economy of Regions], 2019, vol. 15, no. 3, pp. 763–779. DOI: 10.17059/2019-3-11
20. Svinoboev A.N., Neustroeva A.B. Izmenenie klimata i usloviy zhizni na Severe v vospriyatii korenno go naseleniya [Climate Change and Living Conditions in the North in the Perception of the Indigenous Population]. *Urbanistika* [Urban Studies], 2017, no. 4, pp. 28–39. DOI: 10.7256/2310-8673.2017.4.24619
21. Revitch B.A. Riski zdorov'ya naseleniya pri izmenenii klimata arkticheskogo makroregiona [Health Risks Induced by Climate Change in Arctic Macroregion]. *Nauchnye trudy: Institut narodnokhozyaystvennogo prognozirovaniya RAN* [Scientific Works: Institute of Economic Forecasting of the Russian Academy of Sciences], 2020, no. 18, pp. 395–408. DOI: 10.47711/2076-318-2020-395-408
22. Bogoyavlensky D.D. Narody Severa Rossii: demograficheskiy profil' na rubezhe vekov [Demography of Northern Indigenous People]. In: *Vliyanie global'nykh klimaticheskikh izmeneniy na zdorov'e naseleniya rossiyskoy Arktiki* [Climate Change Impact on Public Health in the Russian Arctic]. Moscow, UN Office in the Russian Federation Publ., 2008, pp. 14–17. (In Russ.)
23. Revitch B.A. Klimaticheskie izmeneniya kak novyy faktor riska dlya zdorov'ya naseleniya rossiyskogo Severa [Climatic Changes as New Risk Factor for Population Health in Russian North]. *Ekologiya cheloveka* [Human Ecology], 2009, no. 6, pp. 11–16.

*The article was submitted 18.01.2023; approved after reviewing 04.03.2023;  
accepted for publication 13.03.2023*

*The author declares no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 141–151.

Original article

UDC 331.5(985+470.21)(045)+004

doi: 10.37482/issn2221-2698.2023.52.167

## Artificial Intelligence Technologies in the Russian Arctic: The Case of the Murmansk Oblast

**Maria A. Pitukhina**<sup>1✉</sup>, Dr. Sci. (Polit.), Leading Researcher

**Anastasiya D. Belykh**<sup>2</sup>, Research Assistant

<sup>1,2</sup> Institute of Economics, Karelian Research Centre, Russian Academy of Sciences (IE KRC RAS), pr. Aleksandra Nevskogo, 50, Petrozavodsk, Russia

<sup>1</sup> maria.pitukhina@gmail.com ✉, ORCID: <https://orcid.org/0000-0001-7012-2079>

<sup>2</sup> anastasiya.belykh098@gmail.com, ORCID: <https://orcid.org/0000-0002-7361-6696>

**Abstract.** Russian Arctic is a positive example of the introduction of information technologies (Industry 4.0.) as well as artificial intelligence technologies (Industry 5.0.). In the 21st century, IT-technologies have significantly improved quality of life in the Russian Arctic — development of IT camps, access to the Internet from the tundra. Arctic projects related to the AI technologies implementation are becoming increasingly popular: the article provides a list of such Arctic AI projects. An analysis of IT and AI vacancies in all subjects of the Russian Arctic on the website of the headhunter recruitment agency showed that the largest number of IT vacancies was posted directly in the Murmansk Oblast (74 vacancies). The study also analyzed job seekers' resumes in the Murmansk Oblast, posted in the Artificial Intelligence section. The study shows that knowledge of Python programming language, SQL databases and English language is a prerequisite for all AI specialists. It was also determined that the salary of AI specialists is significantly higher than that of IT specialists. The Murmansk Oblast is becoming a leader in the development and implementation of both IT and AI technologies; this is primarily due to the development of logistics and the Northern Sea Route as an alternative to existing sea routes.

**Keywords:** artificial intelligence, Arctic, Murmansk Oblast, digitalization, Industry 5.0

### Acknowledgments and funding

The work was supported by the Russian Science Foundation under grant No. 21-18-00500 “Institutional engineering of single-industry towns in the Arctic zone — modernization and sustainable development”.

### Introduction

Currently, the change of technological mode is taking place at a tremendous speed. In his Christmas lecture “Results of 2022 and prospects for the future”, Dmitriy Peskov emphasizes that “on the horizon of 2030, a fundamentally different model of the Internet will appear — many servers, search links and emails will disappear in the coming years, Yandex and Google understand this”<sup>1</sup>. Digitalization is the main driver of the production development in the 21st century; prod-

\* © Pitukhina M.A., Belykh A.D., 2023

For citation: Pitukhina M.A., Belykh A.D. Artificial Intelligence Technologies in the Russian Arctic: The Case of the Murmansk Oblast. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 167–179. DOI: 10.37482/issn2221-2698.2023.52.167

<sup>1</sup> Christmas lecture by D. Peskov “Results of 22 years and prospects for the future”. URL: [https://vk.com/university2035?z=video-164984229\\_456239598%2Fbe08644ec94969df9c%2Fpl\\_wall\\_-164984229&bx\\_sender\\_conversion\\_id=118956348](https://vk.com/university2035?z=video-164984229_456239598%2Fbe08644ec94969df9c%2Fpl_wall_-164984229&bx_sender_conversion_id=118956348) (accessed 23 December 2022).

ucts, production processes and business models are changing. Digitalization “Industry 4.0” has become a well-established concept among politicians, business leaders and scientists [1; 2; 3]. At the same time, Chinese researchers are already writing about the development of “Industry 5.0”, which consists of using the unique creativity of human specialists in collaboration with powerful, intelligent and precise machines [4].

In July 2021, the Russian Public Opinion Research Center (VCIOM) and the National Priorities ANO presented data from a survey of Russians on the attitude towards artificial intelligence, conducted as part of the implementation of the federal project “Artificial Intelligence” of the national project “Digital Economy”<sup>2</sup>. The vast majority of Russians (81%) are familiar with the term “artificial intelligence” (AI), while 32% declare that they can explain its meaning; 18% are not familiar with this term.

There is no doubt that new artificial intelligence technologies (machine learning, computer vision, speech recognition, business analytics, process automation, drones, machine translation, intelligent data analysis, etc.) are rapidly changing human life all over the world, including Russia and the Russian Arctic. It is expected that the use of artificial intelligence technologies in the Arctic will increase the volume of maritime traffic along the NSR, residents of remote Arctic villages will receive high-quality mobile communications, and constant Internet access will provide the opportunity for distance learning.

The Russian Arctic is a positive example of the implementation of IT and AI technologies. The purpose of introducing such technologies is to improve the quality of life of northerners. Thus, the IT camps of the Khanty and Mansi are known throughout the world — the indigenous peoples of the North connect to UN conferences there<sup>3</sup>. In 2022, Rostelecom announced that it had completed the construction of an underwater fiber-optic communication line in Chukotka — this region was the last one not connected by terrestrial fiber-optic lines to the general communication network of the Russian Federation. In 2022, Norilsk organized the first regular Arctic IT festival with the participation of experts from Russian and foreign companies<sup>4</sup>.

Projects in the Arctic related to the implementation of AI technologies are also becoming increasingly popular, with the Murmansk Oblast becoming the leader in the implementation of such projects. The impetus for such breakthrough innovative development of the region was given by the Governor of the Murmansk Oblast A. Chibis, who headed the working group of the State Council to ensure transport, logistics and socio-economic development of the Russian Arctic in November 2022. In February 2023, a meeting of the presidium of the State Commission for Arctic Development was held, at which it was decided to recognize the project for the construction of a

---

<sup>2</sup> *Iskusstvennyy intellekt: blago ili ugroza?* VTsIOM [Artificial intelligence: benefit or threat? RPORC]. URL: <https://wciom.ru/analytical-reviews/analiticheskii-obzor/iskusstvennyi-intellekt-blago-ili-ugroza> (accessed 13 December 2022).

<sup>3</sup> *Proekt IT-stoybishcha okhvatit okolo 123 Territoriy Prirodopol'zovaniya v Yugre k kontsu goda.* FGBU “FIRYA” [The IT camp project will cover about 123 Nature Management Territories in Ugra by the end of the year. FSBI “FIRYA”], 22.06.2021. URL: <https://clck.ru/33KQcg> (accessed 13 December 2022).

<sup>4</sup> *IT-Weekend Norilsk.* URL: <http://itweekend.ru/> (accessed 10 December 2022).

modern coal transshipment complex “Lavna” in the seaport of Murmansk as a priority for financing. Also in February 2023, it became known that the “Capital of the Arctic” TAD will be expanded to implement the project “Construction of the Western transport and logistics hub”. It is planned to build a container terminal for international transit sea freight in the Kola region. The terminal will be used for transshipment of cargo to ice-class vessels operating on the Northern Sea Route.

### *Literature review*

The development of artificial intelligence technologies in the Arctic has received a lot of attention in the works of Russian scientists. Thus, according to the HSE “Rating of innovative development of the subjects of the Russian Federation for 2021”, prepared by the Institute for Statistical Studies and Economics of Knowledge, the leaders in the availability of ready-made technological solutions developed in-house were Moscow, St. Petersburg, Lipetsk, Penza and Murmansk oblasts. These regions turned out to be the most technologically independent. From 8 to 9% of enterprises were developing innovations independently with minimal participation of other organizations and individuals, which is more than twice higher than the all-Russian value. Most regions are characterized by a decrease in this indicator [5].

The concept of a smart sustainable city is quite popular and is used for the development of cities in the Arctic zone; it is based on the application of artificial intelligence technologies. This approach has become widespread in the Nordic countries in the context of solving socio-economic problems (cities in Denmark, Sweden, Norway, Iceland and Finland). In the article “Smart Cities in the High North: A Comparative Analysis of Arkhangelsk, Bodø, Murmansk and Tromsø”, authors I. Khodachek, K. Delva, K. Galustov note promising human-centered urban practices with the use of AI technologies — “citizen labs”, combining the possibilities of online and offline involvement, as well as gamification practices (game involvement) in transport application (practices of the city of Bodø). As the authors note, there is no universal definition of a smart city, but it is often described as a city where investments in human and social capital, as well as traditional (transport) and modern ICT infrastructure contribute to sustainable economic growth and high quality of life with smart management of natural resources through the involvement of citizens [6; 7].

The analytical review “Application of artificial intelligence systems in the conditions of a new stage of Arctic exploration”, edited by the Union of Industrialists and Entrepreneurs of the Arctic, presents the results of a survey of experts in the field of AI. Two-thirds of experts believe that artificial intelligence technologies are universal and do not depend on the areas of application. Thus, one of the experts responded that there are no Arctic specifics to the use of mathematical analysis methods or database technologies, but there are a number of tasks specific to Arctic conditions. Artificial intelligence in the Arctic can take on issues in all areas related to routine technological processes: extraction or use of natural resources, logistics, life support systems, telecommunications and information management, observation and analysis of the situation. The



review also deals with the remote assessment and correction of health of northerners in telemedicine mode using AI technologies [8].

A. Pilyasov and V. Tsukerman have defined the chronology of the new technological mode deployment in the Russian Arctic in the last three decades in their article “Development of a new technological paradigm in the Arctic regions in 1990–2021”. The authors emphasize that the Nenets Autonomous Okrug has become a pilot site for the deployment of a new technological structure in the Russian Arctic; they explain the reasons for the promotion of the Nenets Autonomous Okrug to the role of a pilot site for technological, organizational, institutional experiments and innovations for the Arctic zone. The NAO became an area of pioneering economic development in the Russian Arctic and a place for the introduction of technological, organizational, institutional innovations, methods of socially responsible and environmentally balanced environmental management, which were associated with the formation of a new technical and economic paradigm in the Arctic [9].

O. Pichkov, A. Ulanov and K. Patrulina in their work “Digitalization of the Arctic” note that the digital transformation of the Arctic in Russia is a strategic priority of the state; it should contribute to the development of the Far North, which remains partially cut off from broadband connections and basic Internet services. Another role of digitalization is the development of logistics and the Northern Sea Route as an alternative to existing sea routes [10]. A number of initiatives have been introduced in recent years, such as the “Capitan” system, which uses various data sources such as oil production volumes and reserves, ship locations, ice and weather conditions. The capabilities of the Capitan AI system allow real-time analysis of operational efficiency, speed, loading volumes and fuel consumption<sup>5</sup>.

A. Fedotovskikh writes about the creation of conditions, development and implementation of ready-made artificial intelligence systems for their practical use in the activities of AZRF economic entities. In the context of the ongoing outflow of population from the regions of the Far North and the Arctic, artificial intelligence and the introduction of robotics can partially replace (in some cases completely eliminate) humans in economic processes. The author believes that it is necessary to create automated industrial complexes in the Arctic that will eliminate the need for a significant part of human labor [11].

### ***Methods and results***

The Murmansk Oblast was chosen for the analysis for a number of reasons. Firstly, this region is the most populated in the Arctic zone of the Russian Federation, so the number of vacancies in the field of IT and AI is significantly higher there than in other regions of the Russian Arctic, as shown by the analysis of vacancies by the leading Russian recruiting agency “HeadHunter”. Murmansk is the center of socio-economic, cultural and intellectual life of the Murmansk Oblast; it

---

<sup>5</sup> Sistema tsifrovoy logistiki «Gazprom nefti» vyigrala prestizhnyuyu premiyu IoT Awards 2022 [Gazprom Neft's digital logistics system wins the prestigious IoT Awards 2022]. URL: <https://www.gazprom-neft.ru/press-center/news/sistema-tsifrovoy-logistiki-gazprom-nefti-vyigrala-prestizhnyuyu-premiyu-iot-awards-2022/> (accessed 03 December 2022).



is no coincidence that there are only 2 registered TADs in the Russian Federation — “Capital of the Arctic” in the Murmansk Oblast and “Chukotka”. Murmansk has several regional universities, health care and cultural institutions. The city is an important logistics center of the Far North. The Northern Sea Route of Russia, or more precisely, its Pomor sector, begins in Murmansk [12]. The administration of seaports of the Western Arctic is located in Murmansk <sup>6</sup>. The largest international airports in the Far North are also located in Apatity and Murmansk. The peculiarities of the Murmansk Oblast also include its favorable territorial location in the Arctic Zone of the Russian Federation, a relatively warm climate and favorable transport accessibility.

Table 1 presents a list of the most popular projects in the Russian Arctic, where AI technologies are being actively introduced. The range of these AI technologies is quite extensive and includes process automation, drones, machine translation, and intelligent data analysis. Some of the projects include several areas of AI technologies at once, for example, Botkin.AI is a platform based on artificial intelligence technologies, such as computer vision, process automation, intellectual analysis of data and processes, and pattern understanding <sup>7</sup>.

Table 1

*List of projects in the Russian Arctic using artificial intelligence technologies*

Region	Project name	AI technology	Impact on regional economy
Murmansk Oblast	Smart Drilling Rig <sup>8</sup>	Process automation	Monitoring and transmission of data from hard-to-reach subsoil
	Machine Vision at Kola MMC <sup>9</sup>	Predictive analytics	Forecast of the technological process at the enterprise
	Methodology of three-dimensional mapping of mineral deposits <sup>10</sup>	Data mining, Process Mining	Forecast of the mineral composition of rocks by chemical composition
	Data centre <sup>11</sup>	Process automation	Data processing, storage and distribution
	Botkin.AI platform <sup>12</sup>	Computer vision	Detecting cancer in the early stages
Arkhangelsk Oblast	Technological IT “Digital Arctic” <sup>13</sup>	Process automation	Unmanned aerial vehicles and vessels along the NSR

<sup>6</sup> Federal State Budgetary Institution Administration of Sea Ports of the Western Arctic. URL: <https://www.mapm.ru/> (accessed 18 December 2022).

<sup>7</sup> Botkin A.I. URL: <https://botkin.ai/> (accessed 24 December 2022).

<sup>8</sup> «Messoyakhaneftegaz» vnedryaet iskusstvennyy intellekt v burenie skvazhin [Messoyakhaneftegaz is introducing artificial intelligence into well drilling], 19.10.2022. URL: <https://mesng.ru/press-center/news/messoyakhaneftegaz-vnedryaet-iskusstvennyy-intellekt-v-burenie-skvazhin> (accessed 24 December 2022).

<sup>9</sup> Kol'skaya GMK vnedryaet iskusstvennyy intellekt [Kola MMC is introducing artificial intelligence]. URL: <https://www.nornickel.ru/news-and-media/press-releases-and-news/kolskaya-gmk-vnedryaet-iskusstvennyy-intellekt/> (accessed 24 December 2022).

<sup>10</sup> Iskusstvennyy intellekt budet stroit' karty mestorozhdeniy vmesto geologov. Rossiyskiy nauchnyy fond [Artificial intelligence will build maps of deposits instead of geologists. Russian Science Foundation]. URL: [https://rscf.ru/news/media/iskusstvennyy\\_intellekt\\_budet\\_stroit\\_karty\\_mestorozhdeniy\\_vmesto\\_geologov/](https://rscf.ru/news/media/iskusstvennyy_intellekt_budet_stroit_karty_mestorozhdeniy_vmesto_geologov/) (accessed 24 December 2022).

<sup>11</sup> «Nornikel'» moderniziroval sobstvennye data-tsenry [Norilsk Nickel has modernized its own data centers], 03.12.2018. URL: <https://www.nornickel.ru/news-and-media/press-releases-and-news/nornikel-moderniziroval-sobstvennye-data-tsenry/> (accessed 24 December 2022).

<sup>12</sup> Murmanskaya oblast' vnedryaet rossiyskuyu sistemu iskusstvennogo intellekta dlya vrachey [The Murmansk region is implementing a Russian artificial intelligence system for doctors]. URL: <https://zdrav.expert/a/404017> (accessed 24 December 2022).

Republic of Sakha (Yakutia)	Online machine translators from indigenous languages of the North <sup>14</sup>	Machine translation, natural language dialogue	Online machine translator among the languages of the peoples of the North in the Dolgan language
	ArcticXpert <sup>15</sup>	Predictive analytics	Modeling the behavior of foundations taking into account changing climatic conditions (NEFU)
	AITA digital assistant <sup>16</sup>	Software agents	Building feedback with the population
Yamalo-Nenets Autonomous Okrug	Botkin. AI <sup>17</sup>	Computer vision	Detecting cancer in the early stages
Republic of Karelia	Data centre <sup>18</sup>	Process automation	Data processing, storage and distribution
Krasnoyarsk Krai	ArcticZone platform <sup>19</sup>	Process automation	Single platform for tourists and management platform of the Arctic tourist cluster
	Digital Nornickel <sup>20</sup>	Human-Machine Interaction, recommender systems	Training program for employees of Norilsk Nickel MMC in the field of digitalization
	Nornickel's digital laboratory <sup>21</sup>	Process automation	Study of the applicability and testing of new technologies in production processes
	Data centre <sup>22</sup>	Process automation	Data processing, storage and distribution
AZRF	Captain system <sup>23</sup>	Data mining, Process Mining	Selecting the optimal route for ships from more than 66.5 million options
	Polar Express <sup>24</sup>	Process automation	Ensuring year-round navigation along the NSR

<sup>13</sup> IT-park Digital Arctic URL: <https://arctic.narf.ru/main/news/1641-proekt-digital-arctic-predstavili-gubernatoru-arkhangelskoj-oblasti> (accessed 24 December 2022).

<sup>14</sup> Eksperty sozdayut onlayn-perevodchik dlya korennykh malochislennykh narodov [Experts are creating an online translator for indigenous peoples]. URL: <https://tass.ru/obschestvo/10909651> (accessed 24 December 2022).

<sup>15</sup> Programma ArcticXpert rasschitaet ustoychivost' fundamentov v Arktike [ArcticXpert program will calculate the stability of foundations in the Arctic]. URL: <https://ru.arctic.ru/infrastructure/20220412/1000547.html> (accessed 15 March 2023).

<sup>16</sup> Kak rabotaet tsifrovoy pomoshchnik AITA [How the AITA digital assistant works]. URL: <https://yakutia-daily.ru/kak-rabotaet-czifrovoy-pomoshchnik-aita/> (accessed 15 March 2022).

<sup>17</sup> Botkin.AI. Yamalo-Nenets Autonomous Okrug. URL: <https://botkin.ai/yamal> (accessed 24 December 2022).

<sup>18</sup> Novyy data-tsentr v Nadvoitsakh nachnet rabotu v noyabre [The new data center in Nadvoitsy will begin operation in November]. URL: <https://gov.karelia.ru/news/16-10-2020-novyy-data-tsentr-v-nadvoitsakh-nachnet-rabotu-v-noyabre/> (accessed 24 December 2022).

<sup>19</sup> Agentstvo razvitiya Noril'ska prezentovalo tsifrovuyu platformu Arctic Zone na mezhdunarodnoy konferentsii [The Norilsk Development Agency presented the Arctic Zone digital platform at an international conference]. URL: <https://24rus.ru/news/society/189657.html> (accessed 15 March 2022).

<sup>20</sup> Tsifrovoy Nornikel' [Digital Nornickel]. URL: <https://nornickel.digital/> (accessed 15 March 2022).

<sup>21</sup> Tsifrovaya laboratoriya [Digital laboratory]. URL: <https://www.nornickel.ru/innovation/laboratory/> (accessed 15 March 2022).

<sup>22</sup> Samyy severnyy v mire data-tsentr otkryli v Noril'ske [The world's northernmost data center was opened in Norilsk]. URL: <https://www.ttelegraf.ru/news/samyy-severnyiy-v-mire-data-tsentr-otkryili-v-norilske/> (accessed 15 March 2022).

<sup>23</sup> Tsifrovaya sistema «Kapitan» pomogla «Gazprom nefti» na 12% sokratit' raskhody na morskuyu logistiku arkticheskoy nefti [The Captain digital system helped Gazprom Neft reduce costs for maritime logistics of Arctic oil by 12%]. URL: [https://www.gazprom-neft.ru/press-center/news/tsifrovaya\\_sistema\\_kapitan\\_pomogla\\_gazprom\\_nefti\\_na\\_12\\_sokratit\\_raskhody\\_na\\_morskuyu\\_logistiku\\_ar](https://www.gazprom-neft.ru/press-center/news/tsifrovaya_sistema_kapitan_pomogla_gazprom_nefti_na_12_sokratit_raskhody_na_morskuyu_logistiku_ar)

kti/ (accessed 18 December 2022).

<sup>24</sup> Polar Express. URL: <https://xn--e1ahdckegffejda6k5a1a.xn--p1ai/> (accessed 24 December 2022).

	Unmanned cargo delivery to hard-to-reach areas of the Arctic and the Far East <sup>25</sup>	Uncrewed (unmanned) vehicle and autonomous robot, Swarm intelligence	Delivery of cargo to remote villages by unmanned aerial vehicle
	Northern Zavoz <sup>26</sup>	Data mining, Process Mining	Optimal logistics solutions for entrepreneurs and cost reduction
	Supercomputer of the Russian Ministry of Emergency Situations <sup>27</sup>	Predictive analytics	Forecast of possible disasters – floods and fires
	Oculus small spacecraft <sup>28</sup>	Predictive analytics	Forecast of the NSR ice conditions
	Russian autonomous unmanned underwater vehicle Sarma <sup>29</sup>	Uncrewed (unmanned) vehicle and autonomous robot, Swarm intelligence	Search, inspection and maintenance of underwater objects in the Arctic

It is worth noting that the Murmansk Oblast is becoming the main Arctic territory for the implementation of AI projects. The analysis of IT and AI vacancies in all regions of the Russian Arctic, which are posted on the website of the recruiting agency HeadHunter <sup>30</sup>, showed that the largest number of vacancies in the IT field are posted in the most populated territories of the Russian Arctic: Murmansk Oblast (74 vacancies), Arkhangelsk Oblast (60 vacancies), Yamalo-Nenets Autonomous Okrug (53 vacancies), in the Arctic territories of the Krasnoyarsk Krai (38 vacancies) (Table 2). There are practically no posted AI vacancies in the Russian Arctic; they are concentrated mainly in large Russian cities — Moscow and St. Petersburg.

Table 2

Top 5 IT vacancies in the Murmansk Oblast, 2023

Vacancy	Number of vacancies	Average salary
Engineer	8	~ 49 000
System Administrator	6	~ 80 000
Software Engineer	5	~ 52 500
IT Specialist	5	~ 79 200
Technical Support Engineer	4	~ 50 000

<sup>25</sup> Zasedanie Soveta po strategicheskomu razvitiyu i natsional'nym proektam [Meeting of the Council for Strategic Development and National Projects]. URL: <http://www.kremlin.ru/events/president/news/66217> (accessed 24 December 2022).

<sup>26</sup> Edinyy operator sevzavoza pomozhet predprinimatel'nyam regionov optimizirovat' logistiku [A single sowing truck operator will help regional entrepreneurs optimize logistics], 22.11.2022. URL: <https://tass.ru/ekonomika/16395549> (accessed 24 December 2022).

<sup>27</sup> Iskusstvennyy intellekt pomog MChS smodelirovat' vozmozhnye stikhiynye bedstviya [Artificial intelligence helped the Ministry of Emergency Situations simulate possible natural disasters]. URL: [https://rg.ru/2022/11/10/stihii-po-prognozu.html?utm\\_source=yxnews&utm\\_medium=mobile&utm\\_referrer=https%3A%2F%2Fdzen.ru%2Fnews%2Fsearch%3Ftext%3D](https://rg.ru/2022/11/10/stihii-po-prognozu.html?utm_source=yxnews&utm_medium=mobile&utm_referrer=https%3A%2F%2Fdzen.ru%2Fnews%2Fsearch%3Ftext%3D) (accessed 24 December 2022).

<sup>28</sup> Pobeditel' «Liderov Rossii» proektiruet pervyy otechestvennyy sputnik dlya monitoringa Sevmorputi i Arktiki [The winner of “Leaders of Russia” is designing the first domestic satellite for monitoring the Northern Sea Route and the Arctic]. URL: <https://xn--d1achcanykala0j.xn--p1ai/tpost/s2ol7a0f61-pobeditel-liderov-rossii-proektiruet-per> (accessed 24 December 2022).

<sup>29</sup> Zhen'min' zhibao (KNR): Rossiya prodolzhaet prodvigat' strategiyu razvitiya Arkticheskoy zony posredstvom razrabotki podvodnykh bespilotnikov. Fond perspektivnykh issledovaniy [People's Daily (PRC): Russia continues to promote its strategy for the development of the Arctic zone through the development of underwater drones. Advanced Research Foundation]. URL: [https://fpi.gov.ru/press/media/zhenmin-zhibao-rossiya-prodolzhaet-prodvigat-strategiyu-razvitiya-arkticheskoy-zony-posredstvom-razr/?sphrase\\_id=131285](https://fpi.gov.ru/press/media/zhenmin-zhibao-rossiya-prodolzhaet-prodvigat-strategiyu-razvitiya-arkticheskoy-zony-posredstvom-razr/?sphrase_id=131285) (accessed 24 December 2022).

<sup>30</sup> HeadHunter. URL: <https://hh.ru/> (accessed 20 December 2022).

In addition to vacancies, we also analyzed the number of CVs posted in the Murmansk Oblast on the HeadHunter portal — 70 CVs in the Artificial Intelligence section. Basically, these resumes were posted by applicants within the framework of one AI technology — “Intellectual analysis of data and processes, understanding of patterns / Data mining, Process Mining”. The study showed that the salary of AI specialists is significantly higher than that of IT specialists. The average salary for a specialist in the Murmansk Oblast in the field of AI is 87.500 rubles.

Table 3

*Number of CVs for AI specializations in the Murmansk Oblast, 2023*

AI specialization	Number of CVs	Requested salary	AI competencies
BI Analyst, Data Analyst	2	100 000	PowerQuery; English at level B2 (Upper-Intermediate); experience in analytical research; Power BI; jupyter; pandas; Visual Studio, OOP; C#; C++; .NET Framework; MS Visual Studio; MS SQL Server; ASP.NET; MySQL; JavaScript
Data scientist	1	105 000	Python 3; Microsoft SQL; libraries and frameworks: Pandas, Numpy, Matplotlib, Tensorflow, Keras; knowledge: Pytorch, LightGBM, XGBoost, CatBoost, Scikit-learn, Seaborn, SciPy, BS4, MongoDB, SQL, Scrapy, Xpath, Git, Java, Linux, Airflow
Python Developer	2	120 000	Python; SQL; ClickHouse; Hadoop; Apache Spark; airflow; SparkML; BI; Git; HTML; Linux; MySQL; PostgreSQL; OOP; English language; XML; SQLAlchemy; Docker; Flask; FastAPI; Alembic; Cassandra; Architecture; Development; PyCord; JavaScript

Research shows that knowledge of the Python programming language, SQL databases and English is a requirement for all AI professionals. The Murmansk Oblast is becoming a leader in the development and implementation of IT and AI technologies. This is primarily due to the development of logistics and the Northern Sea Route as an alternative to existing sea routes.

### **Conclusion**

Currently, trends in economic development are shifting in the Russian Arctic. On February 21, 2023, the President of the Russian Federation introduced long-awaited changes to the “Fundamentals of state policy of the Russian Federation in the Arctic for the period up to 2035”<sup>31</sup>, in the new edition of which the concept of “innovative development” appeared. The necessary skills in the field of artificial intelligence and intelligent information systems are becoming in demand to solve technological problems specifically in the Arctic territories of the Russian Federation, and therefore the state policy of the Arctic is reoriented towards innovative development.

<sup>31</sup> Vneseny izmeneniya v Osnovy gosudarstvennoy politiki v Arktike na period do 2035 goda [Changes have been made to the Fundamentals of State Policy in the Arctic for the period up to 2035], 21.03.2023. URL: <http://www.kremlin.ru/acts/news/70570> (accessed 15 March 2023).

The “Atlas of future occupations”, developed by the National Research University Higher School of Economics in 2021, presents 50 promising occupations using AI, identified on the basis of an analysis of global trends in technological development, forecasts, and assessments of employers and experts. Researchers predict that the key factor will soon be the widespread implementation of the Internet of Things (smart containers, unmanned vehicles, etc.) [13]. In practice, it turns out (Table 1) that the list of various AI projects in the Russian Arctic is constantly being improved, expanded and already includes not only new developments in the field of mining and optimization of production costs, but also process automation, drones, machine translation, intelligent data analysis, machine learning, computer vision, etc. Our research shows that about 50 projects in the field of artificial intelligence technologies have already been launched in the Russian Arctic. New projects are at the stage of creation and design: creating digital twins of territories and enterprises, introducing neural networks on board drones, creating smart cities (Murmansk and Norilsk), transportation along the NSR using blockchain, etc.

An analysis of vacancies in the IT and AI fields in all regions of the Russian Arctic on the website of the HeadHunter recruiting agency showed that the largest number of vacancies in the IT field are posted directly in the Murmansk Oblast (74 vacancies). The study analyzed not only vacancies, but also CVs of applicants in the Murmansk Oblast, posted in the Artificial Intelligence section (subsection “Intellectual analysis of data and processes, understanding patterns / Data mining, Process Mining”). It was determined that the salary of AI specialists is significantly higher than that of IT specialists. The experience of the Murmansk Oblast as a positive example of the development of artificial intelligence in the Arctic is extremely important in the context of understanding the current trends in the Russian high-tech segment in the labor market, as well as the prospects for the socio-economic development of the entire Arctic macroregion and the Murmansk Oblast as its driver.

It is noteworthy that in 2023, the master’s program “Artificial Intelligence and Data Science” was launched at St. Petersburg State University. A distinctive feature of the program is the block of disciplines “Artificial Intelligence for the Arctic Region”<sup>32</sup>. Graduates of the program can choose a wide range of areas, for example, analytics, architecture and development of special systems for the global transport industry and mobile telemedicine in remote communities in the Arctic; implementation of digital solutions in metallurgy, oil, gas and chemical industries; creation of control systems for electrical grid and generating infrastructure; formation of the basis for “smart houses” and “smart cities” in the field of construction and housing and communal services; automated processing of information from satellite sensing and technological video surveillance. The launch of such an educational program once again proves

---

<sup>32</sup> Artificial intelligence and data science: new master's program at St. Petersburg State University. URL: <https://spbu.ru/news-events/novosti/iskusstvennyy-intellekt-i-nauka-o-dannyh-novaya-programma-magistratury-spbgu> (accessed 15 March 2023).

the fact that skills in the field of artificial intelligence are becoming extremely in demand for solving technological problems in the Arctic territories of the Russian Federation.

Based on the analysis of vacancies in the IT and AI areas, as well as the list of AI projects of the AZRF, it can be emphasized that AI technologies in the Murmansk Oblast will be developed in the following key areas: intelligent computer vision, analysis and processing of texts in natural language and images, transport infrastructure management, data processing of large industrial enterprises, data-based health technologies in the Far North, software development technologies for applied tasks.

## References

1. Barzotto M., Corradini C., Fai F., Labory S., Tomlinson P.R. Smart Specialisation, Industry 4.0 and Lagging Regions: Some Directions for Policy. *Regional Studies, Regional Science*, 2020, vol. 7, no. 1, pp. 318–332. DOI: 10.1080/21681376.2020.1803124
2. Hanna N. A Role for the State in the Digital Age. *Journal of Innovation and Entrepreneurship*, 2018, vol. 7, no. 1, pp. 1–16. DOI: 10.1186/s13731-018-0086-3
3. Lund H.B., Vildåsen S.S. The Influence of Industry 4.0 Narratives on Regional Path Development. *Regional Studies, Regional Science*, 2022, vol. 9, no. 1, pp. 82–92. DOI: 10.1080/21681376.2022.2029552
4. Lv Z., Wang N., Ma X., Sun Y., Meng Y., Tian Y. Evaluation Standards of Intelligent Technology Based on Financial Alternative Data. *Journal of Innovation & Knowledge*, 2022, vol. 7, no. 4. DOI: 10.1016/j.jik.2022.100229
5. Gokhberg L.M., ed. *Reyting innovatsionnogo razvitiya sub'ektov Rossiyskoy Federatsii* [Russian Regional Innovation Development Rating]. Moscow, HSE University Publ., 2021, iss. 7, 274 p. (In Russ.)
6. Khodachek I.A., Delva K.I., Galustov K.A. Umnye goroda na Kraynem Severe: sravnitel'nyy analiz Arkhangel'ska, Bude, Murmanska i Tromse [Smart Cities in the High North: A Comparative Analysis of Arkhangel'sk, Bodø, Murmansk and Tromsø]. *Gorodskie issledovaniya i praktiki* [Urban Studies and Practices], 2020, vol. 5, no. 1, pp. 57–79. DOI: 10.17323/usp51202057-79
7. Khodachek I., Aleksandrov E., Nazarova N., Grossi G., Bourmistrov A. Smartocracy: Context Entanglement of the Smart City Idea and Bureaucracy in Russia. *Organization Studies*, 2022, pp. 1–3. DOI: 10.1177/01708406221123373
8. Fedotovskikh A.V. *Primenenie sistem iskusstvennogo intellekta v usloviyakh novogo etapa osvoeniya Arktiki. Analiticheskiy obzor* [Application of Artificial Intelligence Systems in the Conditions of a New Stage of Arctic Exploration. Analytical Review]. Moscow, Soyuz promyshlennikov i predprinimateley zapolyar'ya Publ., 2018, 52 p. (In Russ.)
9. Pilyasov A.N., Tsukerman V.A. Stanovlenie novogo tekhnologicheskogo uklada v Arktike za period 1990–2021 gg.: regional'nyy razrez [Development of a New Technological Paradigm in the Arctic Regions In 1990-2021]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2022, vol. 15, no. 5, pp. 95–117. DOI: 10.15838/esc.2022.5.83.5
10. Pichkov O.B., Ulanov A.A., Patrunina K.A. Digitalization of the Arctic. In: *The Handbook of the Arctic: A Broad and Comprehensive Overview*. Singapore, Springer Nature Singapore, 2022, pp. 1–21. DOI: 10.1007/978-981-16-9250-5\_22-1
11. Fedotovskikh A.V. Ispol'zovanie robototekhniki i iskusstvennogo intellekta na Kraynem Severe i v Arkticheskoy zone RF [Use of Robotics and Artificial Intelligence in the Far North and Arctic Zone of Russia]. *Rossiya: tendentsii i perspektivy razvitiya* [Russia: Trends and Prospects for Development], 2019, no. 14–1, pp. 560–563.
12. Grigoryev M.N. Rzvitiye tranzitnogo potentsiala Severnogo Morskogo Puti [Development of Transit Potential of the Northern Sea Route]. *Kontury global'nykh transformatsiy: politika, ekonomika, pravo* [Outlines of Global Transformations: Politics, Economics, Law], 2019, vol. 12, no. 5, pp. 109–129. DOI: 10.23932/2542-0240-2019-12-5-109-129



13. *Atlas professiy budushchego* [Atlas of Professions of the Future]. Moscow, HSE Publ., 2021, iss. 2, 240 p. (In Russ.)

*The article was submitted 01.03.2023; approved after reviewing 13.03.2023;  
accepted for publication 15.03.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 152–167.

Original article

UDC 338.48(985+470.13)(045)

doi: 10.37482/issn2221-2698.2023.52.180

## Arctic Tourism as a Driver of Sustainable Development of the Territory: Research of the Interest of Local Stakeholders in the Komi Republic

Galina A. Knyazeva<sup>1</sup>, Dr. Sci. (Econ.), Professor

Natalya A. Porotnikova<sup>2</sup>✉, Cand. Sci. (Econ.), Associate Professor

Vitaliy V. Antipov<sup>3</sup>

Vsevolod V. Makukha<sup>4</sup>, Master

<sup>1</sup> Pitirim Sorokin Syktyvkar State University, pr. Oktyabrskiy, 55, Syktyvkar, Russia

<sup>2</sup> Institute of Ecology, National Research University Higher School of Economics, ul. Myasnitskaya, 20, Moscow, Russia

<sup>3</sup> Non-commercial partnership Technological platform “Technologies of ecological development”, ul. Novaya ploshchad, 10, Moscow, Russia

<sup>4</sup> Graduate School of Business, National Research University Higher School of Economics, ul. Myasnitskaya, 20, Moscow, Russia

<sup>1</sup> gknyazeva@mail.ru, ORCID: <https://orcid.org/0000-0002-0372-3269>

<sup>2</sup> porotnikova@hse.ru ✉, ORCID: <https://orcid.org/0000-0001-9696-2543>

<sup>3</sup> VitalyAntipov@yandex.ru, ORCID: <https://orcid.org/0000-0003-4111-4162>

<sup>4</sup> vvmakukha@edu.hse.ru, ORCID: <https://orcid.org/0000-0001-7625-2886>

**Abstract.** In recent decades, interest in Arctic tourism has been growing at a high rate all over the world. The relevance of this area is also increasing against the background of global climate change and the development of so-called “last chance tourism”. The Russian Arctic has unique competitive advantages in the Arctic tourism market, preserving vulnerable Arctic and tundra landscapes under various anthropogenic activities, a large number of national parks and historical and ethnographic heritage. At the same time, a number of single-industry towns are also concentrated there, which have practically no revenue base. According to many researchers, Arctic tourism can become a driver for the sustainable development of the territory and local communities of these towns. But to realize this scenario, the interest of local stakeholders — representatives of government, business and the population — is necessary. This article is devoted to the analysis of the results of a study of local communities’ interest in tourism development as a driver of sustainable development of the territory. The Arctic zone of the Komi Republic, namely the former mining town of Inta, was chosen as the area of study. The results of desk and field studies carried out within the framework of the research expedition in the Arctic zone of the Komi Republic are described. A comparative analysis of international studies on the topic has been carried out, a conceptual model of the attitude of local communities in the Arctic to the development of tourism in the region and the results of in-depth research and focus groups with key stakeholders of tourism in the Komi Republic have been described, limiting factors and potential for the development of Arctic tourism have been identified on the example of the selected territories.

**Keywords:** *sustainable development, sustainable tourism, Arctic tourism, ecological tourism, nature tourism, monotown, local community, sustainability of community, Northern Urals, Komi Republic, Inta*

\* © Knyazeva G.A., Porotnikova N.A., Antipov V.V., Makukha V.V., 2023

For citation: Knyazeva G.A., Porotnikova N.A., Antipov V.V., Makukha V.V. Arctic Tourism as a Driver of Sustainable Development of the Territory: Research of the Interest of Local Stakeholders in the Komi Republic. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 180–198. DOI: 10.37482/issn2221-2698.2023.52.180

### ***Acknowledgments and funding***

The authors thank the Educational Innovation Fund Program of the National Research University Higher School of Economics for supporting the research expedition “Rediscovering Russia” “Arctic specially protected natural areas of the Komi Republic: development potential, limiting factors and interest of local communities”, within the framework of which this research was conducted <sup>1</sup>.

### ***Introduction. Problem formulation***

Sustainability is defined as an organized network of adaptive capacities related to the ability of people to function and adapt after disturbance [1, Norris F., Stevens S., Pfefferbaum B., Wyche K.], including social and environmental changes. We focus on the understanding of community sustainability proposed by McLennan and Moyle [2] as “the ability of a community to use its resources to adapt to change” [2, p. 432].

A large number of works related to tourism and community sustainability appeared in the late 1990s and early 2000s, including early conceptual work by Farrell and Twining-Ward [3], [4] as well as more recent work by Cochrane [5] and Strickland-Munroe, Allison and Moore [6].

Later, there have been a number of works that have explored the relationship between tourism, sustainability and the ability of communities to adapt to environmental changes, especially climate changes [7, Lew A., Cheer J.], [8, Hall C., Prayag G., Amore A.], [9, Lew A., Ng P., Ni Ch., Wu T.]. The authors note that the difficulty in understanding and assessing community sustainability and resilience is due to confusion, especially due to insufficient conceptual definitions and lack of distinction between the two terms [9]. In addition, the concept of sustainability is often applied using environmental sustainability theory. However, it is necessary to take into account the social causes and consequences of these changes. The Arctic should be considered as a socio-ecological system, since people simultaneously receive ecosystem services from the natural environment, and also influence this natural environment [8].

Polar regions are characterized by ice sheets, sea ice, glaciers, tundra and other cryospheric landscapes and associated cultural features of the indigenous people. This polar landscape contrasts sharply with the current human habitat and is attractive for tourists [10, Shijin W., Yaqiong M., Xueyan Z., Jia X.]. Arctic tourism has developed rapidly over the past decades. New parts of the Arctic are opening up for tourism due to sea ice melting, new airports and the promotion of the Arctic as a “last chance to see” it [11, Runge C.A., Daigle R.M., Hausner V.H.]. Tourism in the polar regions is a rapidly growing industry in terms of visitors, research and political interests [12, Lemelin R., Dawson J., Stewart E., Maher P., Lück M.].

---

<sup>1</sup> Арктические особо охраняемые природные территории Республики Коми: потенциал развития, ограничивающие факторы и заинтересованность местного сообщества [Arctic specially protected natural areas of the Komi Republic: development potential, limiting factors and interest of local communities]. URL: <https://pf.hse.ru/494617617.html> (accessed 15 February 2023).

Tourists are increasingly eager to visit the world's most vulnerable places before they disappear or will be irrevocably transformed. In the media, this is called "last chance" tourism or "doom" [12]. The desire of tourists to see disappearing landscapes and endangered species can have important implications for tourism management.

Public concern about climate change in the polar regions has provided tour operators with the opportunity to promote their products as a last-chance tourism opportunity [12]. Indeed, the warming of the Arctic has contributed to a mini-boom in tourism as curious travelers rush to explore the regions before polar ecosystems are irreversibly transformed. This desire to visit the Arctic provides opportunities for communities in the polar north and tour operators to benefit economically from last-chance tourism, at least in the short to medium term.

The Russian Arctic is a single physical and geographical system of land and sea territories of Northern Eurasia, within which unique natural, historical and cultural objects are concentrated. The system of specially protected natural areas of the Russian Arctic preserves vulnerable Arctic, tundra landscapes under the conditions of various anthropogenic activities [13, Sevastyanov D.V.].

Russia has competitive advantages in the Arctic tourism market: the diversity of flora and fauna, a large number of national parks, historical and ethnographic heritage. The Arctic regional authorities are interested in the development of tourism; however, the development of Arctic tourism in Russia is complicated by the problems of infrastructure, logistics and high cost of the tourism product [14, Kikkas K., Sosnina M., Rubtsova A.].

From the point of view of state interests, Arctic tourism occupies an important place in the system of political, economic tasks and strategic priorities due to the fact that there have been rapid changes in the practice of developing high-latitude regions in recent decades: expeditions, tourism, cultural and environmental projects are types of socio-economic activities confirming the rights and opportunities of states to manage the sustainable development of territories [15, Golovacheva T.A., Tsvetkova Yu.S.]. In 2020, a system of documents was formed that outlined fundamentally new grounds and conditions for achieving the strategic goals and objectives of the development of the Arctic Zone of the Russian Federation. The basic principle was changed — from the state as the main investor in the socio-economic development of the Russian Arctic to the state as the creator of institutional conditions that provide support for investors (from small businesses to corporations), including a series of preferences and tax incentives, which will ensure the development of the economy of the territory, then provide social development, increasing the level and quality of life of the population [16, Skufyina T.P., Korchak E.A., Baranov S.V.]. Arctic tourism of the Komi Republic was chosen as the object of research for several reasons.

Firstly, this region has a rich natural potential. There are 233 specially protected natural areas in the Komi Republic, two of which are of federal significance — the Yugyd Va National Park and the Pechoro-Ilychskiy Natural Biosphere Reserve, included in the UNESCO Natural Heritage List under the general name "Virgin Komi Forests".

Yugyd Va National Park is the largest national park in Russia. The largest peaks of the Urals are also located here: Narodnaya and Manaraga mountains, the purest mountain rivers, 16 types of ecosystems are represented in the vast territories of the park.

Secondly, the region has a high cultural potential. Currently, the ethnic composition of the population of the Komi Republic is represented by more than 120 nationalities. The indigenous population is the Komi, as well as the Komi-Izhemians — residents of the Izhma region, which is located in the northwestern part of the Republic, in the basin of the middle reaches of the Pechora River and its tributary — the Izhma River, and the Komi-Permyaks in the regions of the Komi-Permyak Okrug. The traditions, language and way of life of indigenous peoples can become a topic of attraction for tourists. Ethnographic tours aimed at learning the elements of folk culture, life and traditions of the people are relevant for both Russian and foreign tourists. Reindeer herders are a separate group, extremely interesting for tourism. Reindeer herding is a traditional occupation for the tundra and, in particular, for the Komi people. However, there are almost no tours related to it. Komi folk art, folklore: cosmogonic myths, epic tales and legends (about bogatyrs, heroes, famous sorcerers), ritual poetry, fairy tales, songs, proverbs and sayings, which can be very attractive for tourists, are not sufficiently reflected in tourism.

Nature tourism is a major driver of local community and economic development in many Arctic countries. For example, the community of Churchill, Manitoba (Canada), known for decades as the “Polar Bear Capital of the World”, is largely dependent on the income received as a result of tourists watching polar bears [17, Lemelin R., Fennell D., Smale B.], while residents of Nunavut in Canada rely on the population of polar bears both for food and for income from sport hunting [18, Schmidt J., Dowsley M.].

In Finnish Lapland, including the communities of Saariselkä and Kilpisjärvi, the development of tourism has led to tensions with Sami reindeer herders and local residents.

The above mentioned works emphasize the importance of researching the attitudes of local communities towards tourism development in the region.

Thirdly, tourism, in addition to the extraction and processing of raw materials and production, is one of the promising economic specializations for the Komi Republic.

The nearest town of the Komi Republic, located on the territory of the Russian Arctic near the Yugyd Va National Park, is the former mining monotown of Inta, the main source of income of which for a long time was coal mining. Coal reserves in the Pechora basin on the territory of the Komi Republic are in second place in terms of production in Russia. The gross value of all mineral resources is estimated at more than 660 trillion rubles. Currently, coal mining is frozen and the city is fully subsidized.

Today, Inta is a town with a population that has more than halved from 1990 to 2020 (from 60 thousand to 27 thousand people), and there is a further downward trend. More than 10% of the population is on the waiting list for resettlement from the Far North. According to forecasts,

the population will decrease to 20 thousand people in the next five years<sup>2</sup>. The “dying out” town of Inta, due to the closure of the city-forming enterprises and the increased outflow of the population, every year needs to find economic and social solutions for further existence.

However, the search for a solution has long been carried out in terms of exploration of new places for mining. Repeated attempts were made to change the boundaries of the Yugyd Va National Park for the extraction of gold on its territory, the first explored reserves of which were estimated at 2.3 tons, with exploration potential at 80.3 tons<sup>3</sup>. The conflict involved the commercial organization Gold Minerals, which has a license to develop a gold deposit, regional and federal authorities, public organizations and UNESCO. After many years of litigation, the Supreme Court of the Russian Federation ruled that the Chudnoe deposit is part of a national park, and accordingly, gold mining cannot be carried out there<sup>4</sup>. Thus, environmentalists and local residents managed to defend the preservation of the park’s nature.

*This fact confirms that there are sustainable communities in the region, capable of acting together, which, according to research, is a necessary condition for the development of tourism.*

In addition to the natural riches, it is also possible to get acquainted with various ethnic features of the local population — the life of reindeer herders, including reindeer sledding, tasting venison dishes, local berries and drinks; with Komi folk art and folklore, including cosmogonic myths, epic tales and legends (about bogatyrs, heroes, famous sorcerers), ritual poetry, fairy tales, songs, proverbs and sayings, which can also be extremely attractive for tourists.

In addition, due to its geographical location and cultural and historical significance, Inta can be considered the capital of the Subpolar Urals. Some mountain peaks located here are a kind of “places of power”, objects of worship for the peoples of the Far North. The Arctic Circle begins 60 km from Inta, in the Subpolar Urals one can reach the border of Europe and Asia, since the Ural Mountains are this border.

The authors of the article have already made a research expedition to this territory. As we noted previously<sup>5</sup>, a branch of the Yugyd Va National Park is also located here, and the most convenient logistics are provided through Inta (about 100 km of dirt road by URALS or TREKOLs or by helicopter, with comfortable recreation centers along the way) for tourism in the Subpolar

<sup>2</sup> Porotnikova N.A., Antipov V.V. Issledovanie vliyaniya razvitiya turizma v osobo okhranyaemoy prirodnoy territorii na sotsial'no-ekonomicheskoe razvitie monogoroda na Pripolyarnom Urale [Study of the influence of tourism development in a specially protected natural area on the socio-economic development of a single-industry town in the Subpolar Urals]. Otchet po nauchno-issledovatel'skoy ekspeditsii [Report on a scientific research expedition]. Moscow, NRU HSE, 2020, p. 3. URL: <https://foi.hse.ru/mirror/pubs/share/448129260.pdf> (accessed 24 February 2023).

<sup>3</sup> U zapovednika izymayut zoloto [Gold is being confiscated from the reserve]. Kommersant, no. 111 of 28.06.2019, p. 4. URL: <https://www.kommersant.ru/doc/4013457> (accessed 06 January 2023).

<sup>4</sup> Yagodina V. Sever pomnit. Poiski zolota v natsional'nom parke «Yugyd va» [Sever remembers. Searching for gold in the Yugyd Va National Park]. URL: <https://greenpeace.ru/stories/2019/08/29/sever-pomnit> (accessed 06 January 2023).

<sup>5</sup> Porotnikova N.A., Antipov V.V. Issledovanie vliyaniya razvitiya turizma v osobo okhranyaemoy prirodnoy territorii na sotsial'no-ekonomicheskoe razvitie monogoroda na Pripolyarnom Urale [Study of the influence of tourism development in a specially protected natural area on the socio-economic development of a single-industry town in the Subpolar Urals]. Otchet po nauchno-issledovatel'skoy ekspeditsii [Report on a scientific research expedition]. Moscow, NRU HSE, 2020, p. 3. URL: <https://foi.hse.ru/mirror/pubs/share/448129260.pdf> (accessed 24 February 2023).



Urals (for climbing Narodnaya and Manaraga, rafting on the rivers Kozhim, Kosya and others). More southern Pechora and Vuktyl are far away from the mentioned peaks without the possibility of access by road. All this creates the potential for the development of not only natural and ecological, but also sports, winter, ethno-cultural tourism. Thus, Inta is practically the only logistics center for traveling through the Subpolar Urals, through the territory of the Yugyd Va National Park, which has been unaffected by humans for many thousands of years.

It can be expected that the development of tourism in the paradigm of sustainable development in this region will ensure the preservation of cultural heritage and an increase in the income of the population.

### ***Review of research on sustainable development of Arctic communities and tourism, development of research methodology***

According to Richard Butler's life cycle model of a tourist destination [19, Butler R.; 20, Goncharova N.A., Kiryanova L.G.], we can refer tourism development in Inta and the nearby part of the Yugyd Va National Park to the "exploration" stage, when tourism development is just beginning, social and economic benefits from tourism in the region are small, tourist attractions are nature-oriented.

The exploration stage is the main phase when governments and local people begin to think about tourism and how to maximize opportunities in this industry. During the exploration phase, a small number of tourists arrive, they do not have a significant impact on the environment and are treated favorably by local people.

Studies on this topic indicate that the outcome of tourism development in any destination depends largely on the local people's perception of the impacts of this development and their attitudes towards tourism [21, Lepp A.]. Attitudes play an important role in human behavior as a decisive link between person's thoughts and actions [22, Ajzen I., Fishbein M.].

That is why, we take the attitude of local stakeholders towards tourism development as indicators of the prospects for tourism development in the Komi Republic and directly in the Arctic single-industry towns.

As a general conceptual framework, we focused on research of the sustainability and impact of tourism on protected areas and society [6], as well as on methodology for studying the relationship between tourism and local communities [23, Kaján E.].

The approach of measuring the sustainability or vulnerability of Arctic communities depending on tourism development was chosen as the most relevant research model [24, Sisneros-Kidd A.M., Monz C., Hausner V., Schmidt J., Clark D.].

In previous studies on the attitude of local communities towards tourism, the following groups of stakeholders were identified: 1) residents (local residents); 2) entrepreneurs; 3) officials; 4) tourists [25, Byrd E.T., Bosley H.E., Dronberger M.G.]. As entrepreneurs, we will consider representatives of the service sector: tour operators, owners of guest houses and hotels, local cafes and restaurants, souvenir manufacturers, etc. It makes sense to divide the public sector into

several levels: regional authorities, who have the greatest strategic power in terms of tourism development, local (municipal) authorities and state budgetary organizations.

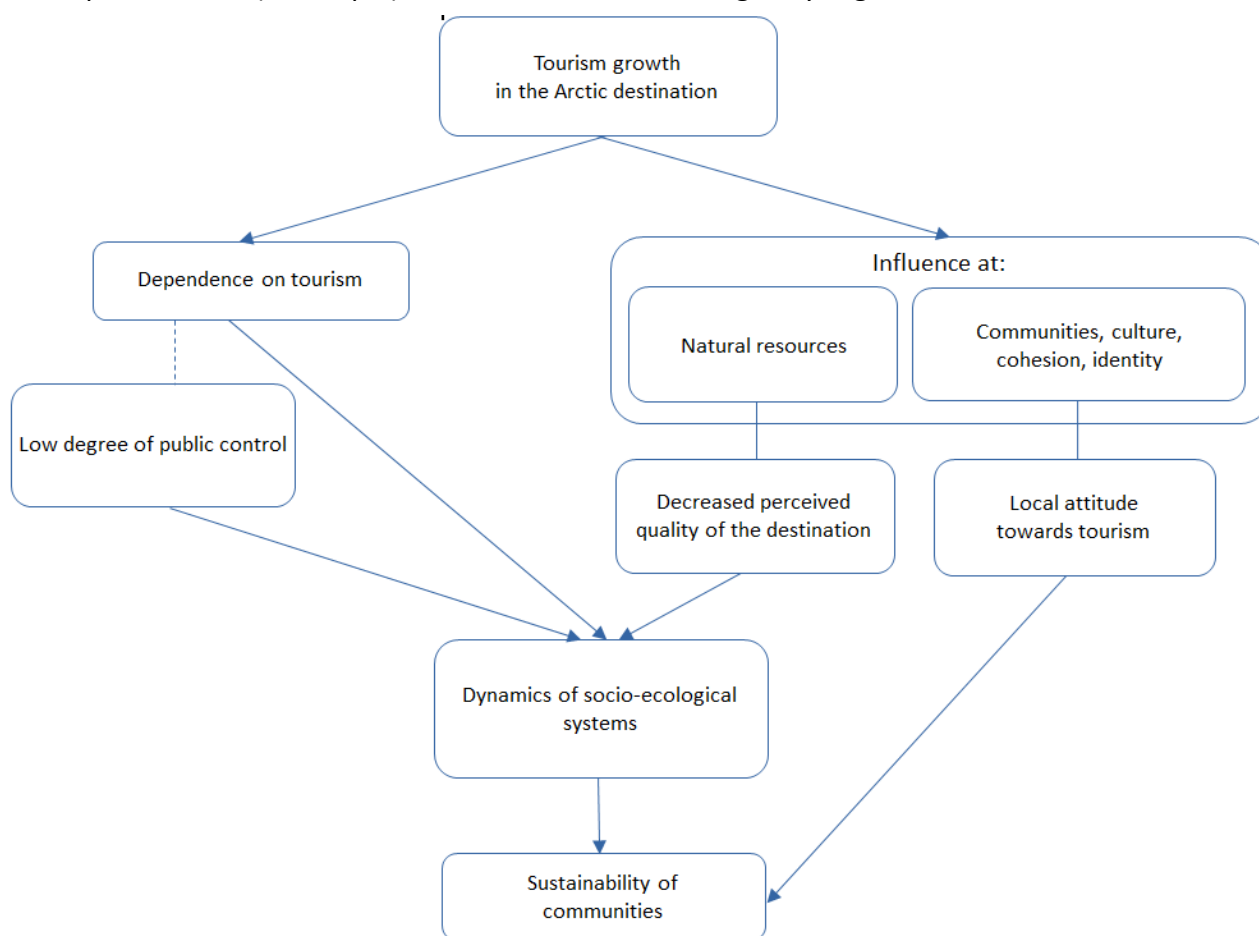


Fig. 1. Nature tourism and sustainability factors of Arctic communities [24].

Each group of stakeholders has its own set of needs and expectations [26, Getz D.], which can lead to different perceptions of the region's development and even conflicts between stakeholders. Thus, for effective tourism development, it is necessary to reach a compromise between stakeholders [27, Sautter E.T., Brigit L.]. Now we gradually approach the topic of relationships between the main stakeholders. Relationship networking is a useful framework for studying the management of public-private relations and understanding tourism management structures [28, Palmer A.; 29, Tyler D., Dinan C.; 30, Pforr C.].

The study, analyzing stakeholder networks in tourism, identifies three types of potential benefits from stakeholder cooperation [31, Presenza A., Cipollina M.]:

- Reducing the costs of resolving conflicts between stakeholders,
- Legitimization of collective actions when making strategic decisions,
- Improving coordination of policies and related activities.

Thus, this concept reflects in detail the network of relationships (collaboration) of stakeholders, and, therefore, allows us to understand which relationships could contribute to tourism development by establishing or strengthening them. In addition, these relationships between stakeholders directly influence their activities and perceptions of tourism and, therefore,

should also be taken into account when developing a conceptual model for the sustainable development of Arctic communities.

In a number of studies of Arctic tourism, the authors identify the following aspects that should be taken into account when calculating its impact on the development of the region: *accessibility, destination image, human resources, indigenous culture, marketing, policy, tourist experience, Arctic specifics and others* [32, Chen J., Wang W., Jensen O., Kim H., Liu W.].

We also examined the attitudes of stakeholders towards the above-mentioned aspects of tourism development by forming relevant blocks of questions in the research guides. Additionally, we planned to study the image of destinations from the perspective of the local population by creating a kind of mental map of local sightseeing and attractions. This will allow us to understand the vision of local stakeholders regarding the development of tourism in the region, and will also create a base of certain visual images for further tourism development in the region.

### ***Development of a conceptual model for sustainable development of Arctic communities***

Developing the ideas of the above studies, we supplement the conceptual framework for understanding the factors influencing the sustainability of Arctic communities dependent on nature-based tourism with a set of indicators that will allow us to describe this dependence in more detail. As a result, we form a model of Arctic communities' attitudes towards tourism development in the region.

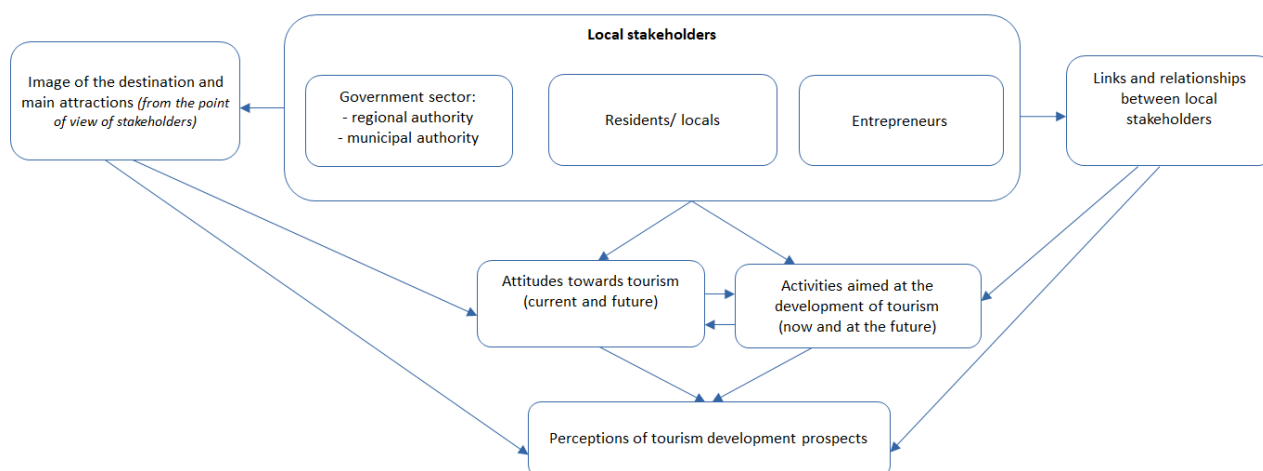


Fig 2. Conceptual model of Arctic communities' attitudes towards tourism development in the region.

This model was tested during the research process on the example of the single-industry town Inta in the Komi Republic.

The purpose of the study is to identify the attitude of key stakeholders in the region to the development of tourism as a driver of sustainable development of the territory.

Research objectives:

- identify key factors and barriers affecting the development of tourism and local communities, and the relationship between them;
- identify the main attractions highlighted by stakeholders for tourists through the creation of a mental map of the region;

- describe the relationships and connections between local stakeholders;
- test a conceptual model of Arctic communities' attitudes towards tourism development in the region.

Research assumptions:

- government authorities consider natural resources as an opportunity to “revitalize” a single-industry town, predominantly in terms of mining;
- due to insufficient development of infrastructure, lack of jobs and increased migration from the towns under consideration, local residents have little interest in developing tourism in their region;
- local residents' ideas about the most attractive attractions in the region coincide with the ideas of entrepreneurs, regional and local authorities.

Data collection methods are in-depth individual interviews and focus groups with the following categories of local stakeholders:

- Civil servants (in-depth interviews)
- Entrepreneurs (in-depth interviews)
- Local residents (focus group)

The study involved civil servants — heads of specialized departments of the Government of the Komi Republic and the administration of the city of Inta, with at least 5 years of work experience; experts — employees of specialized research institutes with at least 5 years of research experience; entrepreneurs — representatives of the tertiary sector in Syktyvkar and Inty, with at least 5 years of wholesale activity; local residents — active citizens who responded to the invitation to participate in the study and have been living in the Komi Republic for at least 5 years.

The main methods of data processing were descriptive statistics and content analysis.

### ***Research results***

There were:

- in-depth interviews with the heads of relevant departments of the Government of the Komi Republic (Syktyvkar) — the Ministry of Culture, Tourism and Archives, the Ministry of Natural Resources and Environmental Protection, the Ministry of Economy and the Ministry of Nationalities, the Finno-Ugric Ethnopark Eb (8 people);
- in-depth interviews with the heads of specialized departments of the Inta Administration — economics, entrepreneurship development, culture, representatives of the administration of the Yugyd Va National Park and the Severyanka State Hotel (6 people);
- focus group with heads of local tourism companies, guest houses, cafes, souvenir manufacturers and other tertiary sector companies (8 people);

- focus group with local residents of Inta (different age groups from youth to pensioners, 8 people).

The results of the study are presented in table 1.

Table 1

Results of the study of key stakeholders of the region for tourism development in the Yugyd Va National Park

	Development factors	Development barriers
Regional authorities of the Komi Republic	<p>“Virgin forests of Komi” — UNESCO site, rich natural resources</p> <p>Federal park (great possibilities for financing the park)</p> <p>High tourism potential, tourists from large Russian cities are the most attractive</p>	<p>Bad road to the park</p> <p>Difficulties in accommodating tourists (many independent travelers)</p> <p>Insufficient level of development of accommodation, parking, transportation and entertainment facilities in the park</p> <p>Low popularity of the park in Russia and abroad</p> <p>Limited qualified personnel</p>
Local authorities, Inta	<p>The unique nature of the park</p> <p>Availability of the necessary infrastructure for development of nature tourism</p> <p>Federal, regional and municipal measures to support tourism and entrepreneurship in the Arctic</p> <p>Development of local food production, hotels and restaurants</p>	<p>Bad road to the park, logistical difficulties</p> <p>Limited funding for the construction of comfortable hotels in the park</p> <p>Low city taxes from tourism</p> <p>Outflow of qualified personnel and youth</p>
Entrepreneurs, Inta	<p>Growing popularity of the park</p> <p>Reindeer Herders' Festival as a basis for ethnic tours and winter tourism development</p>	<p>Bad road to the park, logistical difficulties, limited number of vehicles</p> <p>Lack of mobile communications in the park (=security issues)</p> <p>Limited winter tourism</p> <p>Low popularity of the park in Russia and abroad</p> <p>Short tourist season (July - August)</p>
Local residents, Inta	<p>Growing popularity of the park over the past five years</p> <p>Hotels, restaurants and entertainment are actively developing in the city</p> <p>Unity of residents and love for their place of living</p> <p>Tourism development can reduce out-migration and increase incomes of local residents</p>	<p>Bad road to the park, logistical difficulties</p> <p>Tourists do not stay in the city, they go straight to the park</p> <p>Outflow of local population</p>

As the results of the study show, the research assumptions were partially confirmed:

- Government authorities consider natural resources as an opportunity to “revitalize” a single-industry town, mainly from the point of view of mining — *partially confirmed*.
- This view is prevalent mainly among regional and local authorities dealing with economic issues; the majority of respondents support tourism development and

see it as an opportunity to increase the region's income while preserving natural resources;

- Due to insufficient infrastructure development, lack of jobs and increased migration, local residents have little interest in developing tourism in their region — *not confirmed*.
- Local residents' perceptions of the most attractive sights in the region coincide with the perception of businessmen and state authorities — *confirmed*.

The main attractions identified by stakeholders for tourists through the mental map of the region are generally coincide among different stakeholders at the regional and city levels.

The difference is that entrepreneurs and local residents of Inta additionally highlight the Kazhym, Lemva and Shaman-Gora rivers, Sanovozh as attractions, as well as wooden houses on Kirov Street, a monument to L. Tchaikovskiy, miners' park and a number of other objects in the city itself.

The majority of respondents have a positive attitude towards the prospects for tourism development in the region.

Moreover, local residents and entrepreneurs of Inta see much greater prospects for the region and themselves personally in the development of tourism compared to resource scenarios. Local residents say that there are opportunities for a variety of leisure activities; hotels, restaurants and the entertainment sector are actively developing in the city. Entrepreneurs confirm that they use government support measures, receive grants for the purchase of equipment and the development of social entrepreneurship.

Both groups note that various types of tourism, permitted in the national parks, are developing, including hiking, cycling, rafting, but mainly unorganized tourism is growing, with a proviso that the flow of tourists has significantly decreased during the pandemic. They see prospects in the development of educational tourism for school groups from all over the Republic, geological and historical tours about miners and coal mining, ethnic and event tours with reindeer herders.

Most respondents identify logistics and infrastructure problems as the main limiting factors for the development of tourism in the republic.

As the main constraint to tourism development, many respondents note the poor quality of the road to the park and of regular air service. The same reasons are the main weaknesses of the Komi Republic in competition with other Arctic regions, through which federal highways and regular flights of major air carriers pass.

Both groups of respondents also cite the limited number of vehicles allowed for use in the park (TEKOLs and other types of vehicles with low-pressure tires, currently no more than 10 units in Inta) as an important limiting factor for the development of tourism in this territory. This factor will significantly limit the flow of tourists even with growing interest in the park — in fact, the only available type of tourism (if all vehicles are busy) will be only hiking or helicopter transfer.



Important infrastructural constraints include a small number of accommodation sites and equipped camping areas, as well as limited tourist equipment for rent.

Entrepreneurs named ensuring the safety of tours as another important barrier, primarily the lack of stable communications in the park, insufficient tourist stations, rising prices for transport and equipment, lack of qualified personnel, a short summer tourist season (July–August) and almost complete underdevelopment of the winter tourism due to the high cost of machinery and equipment.

Local residents also note logistical difficulties. “Tourists are not a problem, on the contrary, it’s nice. Yes, the city can come alive, but the city can turn into a pigsty. But as long as the road to the park is bad, there is nothing to worry about.” Local residents also noted that mostly pensioners and school-age children live in the city, the rest move to other places, “anywhere, just not here”.

Relations and connections between local stakeholders can be described as rather stable.

Representatives of the Inta administration and government organizations have a great similarity of opinions regarding positive scenarios for tourism development.

Entrepreneurs and local residents also express similar views, talking about joint holidays and free time spending (attending concerts, watching films, etc.), going to the forest, creativity, and mutual assistance. “We are northerners, we have a slightly different psychotype. Our people are responsive. It is customary to help. In such cities, a lot is built on mutual assistance.”

Regarding development scenarios, local residents note: “Realistic approach: further reduction of population. The villages will be closed, only the city will remain. There will be just a point where to go out to go to the city. One hotel will be left. Freelancers are coming here, there is cheap housing and it’s a great place to live. It’s really convenient here for remote work.”

They see risks regarding population migration and difficulties with the development of logistics. But they say they love their region and have no plans to leave in the next five years. “This is home. I like it here. Someone has to stay.” “I left, but I came back. Everything is fine there, but Kozhim is not there. And there are enough people here who think like that.” “It’s good to live in a small, quiet town. I have my own circle of acquaintances. People are more responsive and kinder.”

In general, it can be considered that the conceptual model for identifying the attitude of local stakeholders to tourism development has shown its validity. The majority of local stakeholders see prospects in the development of tourism and believe that tourism can really become a driver of sustainable development of the territory.

The conclusions of this study became part of the application materials of the Komi Republic “Tourist and recreational cluster “Virgin Forests of Komi”” for participation in the All-Russian competition for the development of ecological tourism, organized by the Agency for Strategic

Initiatives, as a result of which the Republic reached the final among the top 34 best tourism projects in Russia<sup>6</sup>.

### **Conclusion**

As international studies show, the interest of local communities is an important factor in sustainable tourism development. In recent years, there have also been works exploring the relationship between tourism, sustainability and the ability of communities to adapt to environmental changes, especially climate change. This area of research is especially relevant in relation to Arctic tourism due to global climate change, melting ice and the transformation of Arctic landscapes, which has led to the emergence of so-called “last chance” tourism.

Arctic tourism of the Komi Republic was chosen as the object of the present study because of its high tourist potential, including due to the location of the UNESCO World Heritage Site “Virgin Komi Forests”, the cultural heritage of the indigenous inhabitants of the Arctic zone of the Russian Federation, as well as the relevance caused by the socio-economic reasons for the transformation of the single-industry town of Inta.

Desk research and a series of in-depth interviews and focus groups with the main stakeholders — the population, government and business representatives — allowed us to draw the following conclusions.

All stakeholder groups confirm their interest in the development of tourism; most of them believe that tourism can really become a driver of sustainable development of the territory. Nevertheless, it is noted that the probability that tourism development will change the existing scenario of “compression” of the single-industry town Inta is extremely low.

Government officials note limited federal funding as the main constraint for the development of tourism in the Republic; most respondents among entrepreneurs and local residents highlight logistics and infrastructural problems. First of all, the lack of quality road surface from Inta to the park, the lack of regular air service, the limited availability of specialized vehicles for transportation to the park. Respondents also point to a small number of accommodation places and equipped camping areas, as well as limited tourist equipment for rent.

However, despite the continuing outflow of population from the Republic, the existing restrictions for further development of the single-industry town Inta, the majority of respondents do not plan to move to other regions, they love their region and actively travel around it, have a positive attitude towards the growth in the number of tourists, and see it as an opportunity to increase the income of the local population.

Thus, the majority of local stakeholders see prospects in the development of tourism and believe that Arctic tourism can become a driver for the sustainable development of the territory.

---

<sup>6</sup> Agency for Strategic Initiatives. URL: <https://asi.ru/news/150964> (accessed 14 January 2022).

### *Limitations and directions for future research*

As part of this study, it was not possible to conduct a sufficient number of interviews with an important group of stakeholders — reindeer herders, due to their dispersion throughout the territory of the Republic. It seems advisable to conduct interviews with them during the celebration of Reindeer Herder Day, which is attended by hundreds of representatives of this group.

Interviews with representatives of indigenous peoples living on the territory of the Komi Republic are also necessary.

If the research is extended to these groups, in general, it can be considered that the conceptual model of identifying the attitudes of local stakeholders to tourism development has shown its validity. In the future, it is necessary to verify the model using quantitative methods.

### *References*

1. Norris F., Stevens S., Pfefferbaum B., Wyche K., Pfefferbaum R. Community Resilience as a Metaphor, Theory, Set of Capacities, and Strategy for Disaster Readiness. *American Journal of Community Psychology*, 2008, iss. 41 (1–2), pp. 127–150. DOI: 10.1007/s10464-007-9156-6
2. Bec A., Moyle C.L., Moyle B.D. Community Resilience to Long-Term Tourism Decline and Rejuvenation: A Literature Review and Conceptual Model. *Current Issues in Tourism*, 2015, vol. 19, iss. 5, pp. 1–27. DOI: 10.1080/13683500.2015.1083538
3. Farrell B., Twining-Ward L. Reconceptualizing Tourism. *Annals of Tourism Research*, 2004, no. 31, pp. 274–295. DOI: 10.1016/j.annals.2003.12.002
4. Farrell B., Twining-Ward L. Seven Steps Towards Sustainability: Tourism in the Context of New Knowledge. *Journal of Sustainability Tourism*, 2005, vol. 13, iss. 2, pp. 109–122. DOI: 10.1080/09669580508668481
5. Cochrane J. The Sphere of Tourism Resilience. *Tourism Recreation Research*, 2010, vol. 35, iss. 2, pp. 173–185. DOI: 10.1080/02508281.2010.11081632
6. Munro J., Allison H., Moore S. Using Resilience Concepts to Investigate the Impacts of Protected Area Tourism on Communities. *Annals of Tourism Research*, 2010, vol. 37, no. 2, pp. 499–519. DOI: 10.1016/j.annals.2009.11.001
7. Lew A., Cheer J. Environmental Change, Resilience and Tourism: Definitions and Framework. In: *Tourism, Resilience and Adaptation to Environmental Change*. Routledge, 2018, pp. 3–12. DOI: 10.4324/9781315463971-2
8. Hall C., Prayag G., Amore A. *Tourism and Resilience: Individual, Organisational and Destination Perspectives*. Channel View Publications, 2017, 192 p. DOI: 10.21832/HALL6300
9. Lew A., Ng P., Ni Ch., Wu T. Community Sustainability and Resilience: Similarities, Differences and Indicators. *Tourism Geographies*, 2016, no. 18, pp. 18–27. DOI: 10.1080/14616688.2015.1122664
10. Shijin W., Mu Y., Xueyan Z., Jia X. Polar Tourism and Environment Change: Opportunity, Impact and Adaptation. *Polar Science*, 2020, vol. 25, p. 100544. DOI: 10.1016/j.polar.2020.100544
11. Runge C.A., Daigle R.M., Hausner V.H. Quantifying Tourism Booms and the Increasing Footprint in the Arctic with Social Media Data. *PLoS ONE*, 2020, no. 15 (1), pp. 1–14. DOI: 10.1371/journal.pone.0227189
12. Lemelin R., Dawson J., Stewart E., Maher P., Lueck M. Last-Chance Tourism: The Boom, Doom, and Gloom of Visiting Vanishing Destinations. *Current Issues in Tourism*, 2010, vol. 13, iss. 5, pp. 477–493. DOI: 10.1080/13683500903406367
13. Sevastyanov D.V. Arctic Tourism in the Barents Sea Region: Current Situation and Boundaries of the Possible. *Arktika i Sever [Arctic and North]*, 2020, no. 39, pp. 26–36. DOI: 10.37482/issn2221-2698.2020.39.26

14. Kikkas K., Sosnina M., Rubtsova A. Arctic Tourism Development: Comparative Study of Murmansk Region and Norway. *IOP Conference Series: Earth and Environmental Science*, 2021, no. 625. DOI: 10.1088/1755-1315/625/1/012002
15. Golovacheva T.A., Tsvetkova Yu.S. Gosudarstvennaya i regional'naya politika podderzhki arkticheskogo turizma [State and Regional Support Policy for Arctic Tourism]. *Okeanskiy menedzhment* [Ocean Management], 2021, no. 2 (11), pp. 40–45.
16. Skufyina T.P., Korchak E.A., Baranov S.V. Chimeras of the Past and Navigation through the Latest Development Conditions, Risks and Opportunities for Managing the Russian Arctic. *Arktika i Sever* [Arctic and North], 2021, no. 43, pp. 45–76. DOI: 10.37482/issn2221-2698.2021.43.45
17. Lemelin R., Fennell D., Smale B. Polar Bear Viewers as Deep Ecotourists: How Specialised Are They? *Journal of Sustainable Tourism*, 2008, no. 16 (1), pp. 42–62. DOI: 10.2167/jost702.0
18. Schmidt J., Dowsley M. Hunting with Polar Bears: Problems with the Passive Properties of the Commons. *Human Ecology*, 2010, no. 38, pp. 377–387. DOI: 10.1007/s10745-010-9328-0
19. Butler R. The Concept of a Tourist Area Cycle of Evolution: Implications for Management of Resources. *Canadian Geographer*, 2008, vol. 24, no. 1. pp. 5–12. DOI:10.1111/j.1541-0064.1980.tb00970.x
20. Goncharova N.A., Kiriyanova L.G. Upravlenie zhiznennym tsiklom destinatsii [Destination Lifecycle Management]. *Izvestiya Tomskogo politekhnicheskogo universiteta* [Bulletin of the Tomsk Polytechnic University.], 2011, vol. 318, no. 6, p. 52–56.
21. Lepp A. Residents' Attitudes Towards Tourism in Bigodi Village, Uganda. *Tourism Management*, 2007, vol. 28, iss.3, pp. 876–885. DOI: 10.1016/j.tourman.2006.03.004
22. Ajzen I., Fishbein M. *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall, 1980, 278 p.
23. Kaján E. Arctic Tourism and Sustainable Adaptation: Community Perspectives to Vulnerability and Climate Change. *Scandinavian Journal of Hospitality and Tourism*, 2014, vol. 14, iss. 1, pp. 60–79. DOI: 10.1080/15022250.2014.886097
24. Sisneros-Kidd A.M., Monz C., Hausner V., Schmidt J., Clark D. Nature-Based Tourism, Resource Dependence, and Resilience of Arctic Communities: Framing Complex Issues in a Changing Environment. *Journal of Sustainable Tourism*, 2019, vol. 27, iss. 8, pp. 1259–1276. DOI: 10.1080/09669582.2019.1612905
25. Byrd E.T., Bosley H.E., Dronberger M.G. Comparisons of Stakeholder Perceptions of Tourism Impacts in Rural Eastern North Carolina. *Tourism Management*, 2009, vol. 30, no. 5, pp. 693–703. DOI: 10.1016/j.tourman.2008.10.021
26. Getz D., Seldjan T. Stakeholder Involvement in Sustainable Tourism: Balancing the Voices. In: *Global Tourism*. Maryland Heights, MO, Butterworth-Heinemann. 2005. Pp. 230–247.
27. Sautter E.T., Leisen B. Managing stakeholders a Tourism Planning Model. *Annals of Tourism Research*, 1999, vol. 26, iss. 2, pp. 312–328. DOI: 10.1016/S0160-7383(98)00097-8
28. Palmer A. Linking External and Internal Relationship Building in Networks of Public and Private Sector Organizations: A Case Study. *International Journal of Public Sector Management*, 1996, vol. 9, no. 3, pp. 51–60. DOI: 10.1108/09513559610124487
29. Tyler D., Dinan C. The Role of Interest Groups in England's Emerging Tourism Policy Network. *Current Issues in Tourism*, 2001, vol. 4, no. 2, pp. 210–252. DOI: 10.1080/13683500108667888
30. Pforr C. The Makers and the Shakers of Tourism Policy in the Northern Territory of Australia: A Policy Network Analysis of Actors and Their Relational Constellations. *Journal of Hospitality and Tourism Management*, 2002, vol. 9, no. 2, pp. 134–151.
31. Presenza A., Cipollina M. Analysing Tourism Stakeholders Network. *Tourism Review*, 2010, vol. 65, no. 4, pp. 17–30. DOI: 10.1108/16605371011093845
32. Chen J., Wang W., Jensen O., Kim H., Liu W. Perceived Impacts of Tourism in the Arctic. *Journal of Tourism and Cultural Change*, 2021, vol. 19, no. 4, pp. 494–508. DOI: 10.1080/14766825.2020.1735403

*The article was submitted 15.02.2023; approved after reviewing 19.03.2023;  
accepted for publication 20.03.2023*

*Authors' contribution: Knyazeva G.A. — research concept, development of methodology;  
Porotnikova N.A. — development of methodology, scientific guidance, preparation of a report on the results  
of the study, final conclusions;  
Antipov V.V. — recruiting respondents, writing the original text, its revision;  
Makukha V.V. — literature review, research concept; development of in-depth interview and focus group  
guides*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 168–195.

Original article

UDC: 572.021(571.56)

doi: 10.37482/issn2221-2698.2023.52.199

## Rural Communities of Yakutia in Conditions of Permafrost Degradation: Key Risks, Social Consequences, and Adaptation Mechanisms

**Aleksandr A. Suleymanov**<sup>1</sup>, Cand. Sci. (Hist.)

**Vasily M. Lytkin**<sup>2</sup>, Cand. Sci. (Geogr.)

**Liliya I. Vinokurova**<sup>3</sup>, Cand. Sci. (Hist.), Senior Researcher

**Stepan A. Grigoryev**<sup>4</sup>, Cand. Sci. (Hist.)

**Svyatoslav I. Fedorov**<sup>5</sup>, Research Assistant

**Viktoriya Yu. Golomareva**<sup>6</sup>, Research Assistant

**Nikolay I. Basharin**<sup>7</sup>, Research Assistant

**Dmitriy A. Aprosimov**<sup>8</sup>, Research Assistant

<sup>1, 2, 3, 4, 5, 6, 7, 8</sup> The Institute for Humanitarian Research and North Indigenous Peoples Problems of the Siberian Branch of the Russian Academy of Science, ul. Petrovskogo, 1, Yakutsk, Russia

<sup>2, 7</sup> Melnikov Permafrost Institute of the Siberian Branch of the Russian Academy of Science, ul. Merzlotnaya, 36, Yakutsk, Russia

<sup>1</sup> alexas1306@gmail.com ✉, ORCID: <https://orcid.org/0000-0001-8746-258X>

<sup>2</sup> gidro1967@mail.ru, ORCID: <https://orcid.org/0000-0002-3780-6505>

<sup>3</sup> lilivin@mail.ru, ORCID: <https://orcid.org/0000-0002-5779-6893>

<sup>4</sup> DeTample@yandex.ru, ORCID: <https://orcid.org/0000-0001-9365-0122>

<sup>5</sup> fedorov.si@mail.ru, ORCID: <https://orcid.org/0000-0002-8610-3689>

<sup>6</sup> borodina-vichka@inbox.ru

<sup>7</sup> nikolay\_b89@mail.ru, ORCID: <https://orcid.org/0000-0002-8501-9186>

<sup>8</sup> dmitrii.aprosimov@gmail.com, ORCID: <https://orcid.org/0000-0003-4418-297X>

**Abstract.** During the period of global climate change, the territories of the Russian Federation, within which permafrost is widespread, are at particular risk. The aim of this article is to identify the social consequences of permafrost degradation on the example of a number of rural settlements in the Republic of Sakha (Yakutia) and to determine the emerging mechanisms of adaptation to the challenges associated with changes in the habitual state of the environment. In this regard, for the first time, the villages of Amga, Yunkur, Argakhtakh, Lippe-Atakh and Ulakhan-An, located in Yakutia, were the focus of relevant interdisciplinary research conducted during 2019–2022. The work in these settlements made it possible to establish local features of both the consequences of the degradation of permafrost and the specifics of their perception by the local population. It is noted that in the rural settlements studied, permafrost degradation limits the development of traditional economic activities, including among the Arctic and Subarctic indigenous population, limits the possibilities for the spatial development of settlements, leads to problems with the safety of the housing stock, and hinders transport communication. The observed changes entail an increase in the financial burden on the population, economic entities and local administrations, and negatively affect the social well-being of the inhabitants of the studied villages. At the same time, the conducted research allowed to reveal that the mechanisms of adaptation and sustainability of rural communities that are being formed in this regard are largely based on traditions of rural mutual assistance.

**Keywords:** Arctic, Yakutia, rural community, life support system, permafrost, thermokarst

\* © Suleymanov A.A., Lytkin V.M., Vinokurova L.I., Grigoryev S.A., Fedorov S.I., Golomareva V.Yu., Basharin N.I., Aprosimov D.A., 2023

For citation: Suleymanov A.A., Lytkin V.M., Vinokurova L.I., Grigoryev S.A., Fedorov S.I., Golomareva V.Yu., Basharin N.I., Aprosimov D.A. Rural Communities of Yakutia in Conditions of Permafrost Degradation: Key Risks, Social Consequences, and Adaptation Mechanisms. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 199–231. DOI: 10.37482/issn2221-2698.2023.52.199



### *Acknowledgments and funding*

The research was supported by the Russian Science Foundation grant No. 19-78-10088, <https://rscf.ru/project/19-78-10088/>.

### *Introduction*

The Republic of Sakha (Yakutia) (hereinafter referred to as the RS(Ya)/Yakutia) occupies an area of 3103.2 thousand km<sup>2</sup> and is not only the largest subject of the Russian Federation, but also the largest administrative-territorial unit in the world. The vast territory of the region is almost entirely located in the zone of continuous distribution of deep-frozen soil — permafrost. This natural phenomenon reaches its maximum thickness here — about 1.5 km [1, Suleymanov A.A., p. 117].

Highly icy soils (volumetric ice content from 0.4 to 0.8) occupy 39.8% of the total area of Yakutia [2]. In the conditions of modern climate change with a rapid increase in average annual air temperature in the Arctic and Subarctic, they are in the high-risk zone. Analysis of meteorological data from 52 weather stations in Yakutia, conducted by the candidate of geographical sciences Yu.B. Skachkov, showed that the region has seen a widespread increase in average annual air temperature over the past half century. This indicator increased by 2.0°C on average over the territory of Yakutia. At the same time, the increase is caused mainly by the warming of the winter seasons, which are the seasons with the largest deviations from the temperature norms [3].

The resulting “cold deficit” (its comparative shortage in relation to previous periods) [4, Suleymanov A.A., pp. 29–30] along with the consequences of anthropogenic impact led to the acceleration of permafrost degradation processes. The most vulnerable permafrost is located under open landscapes (mainly meadows) of the ice complex or yedoma, which are characterized by a thin protective layer (0.2 m), i.e. the zone between the base of the seasonal thawing layer and the top of the ice complex [5, Efimov G.F.], while in areas covered with boreal forest, its thickness reaches 0.7–1.0 m [6, Fedorov A.N.]. The peculiarity of this layer is also very high ice content of the surrounding soils (up to 60–70%). This horizon prevents permafrost thawing [7, Shur Y.]. As a result of climate warming, the protective layer is being destroyed, which leads to the rapid development of thermokarst processes — soil subsidence due to the melting of underground ice [8, Grosse G.]. Thermokarst refers to cryogenic processes that result in the formation of characteristic relief forms [9, Kachurin S.P.; 10, Fedorov A.N.] (Fig. 1–2).

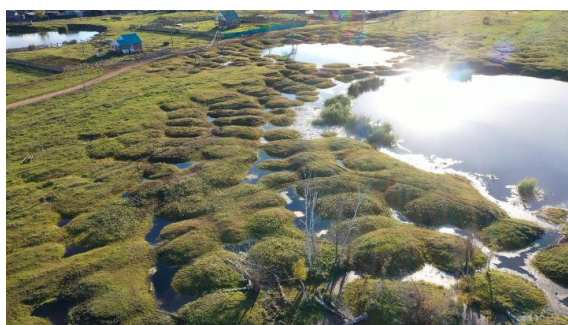


Fig. 1. Thermokarst landforms — bylars and duyodya — on the territory of the village Yunkyr, September 2022. Photo by A.A. Suleymanov.

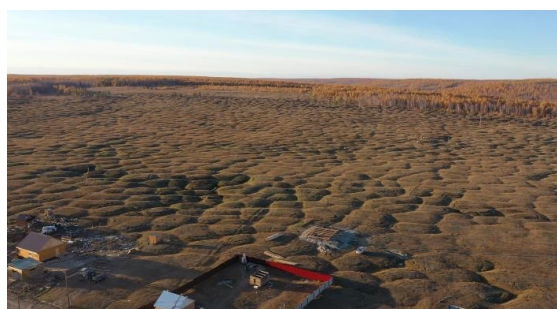


Fig. 2. Thermokarst landforms — bylars — on the territory of the village Amga, September 2021. Photo by A.A. Suleymanov.

It is expected that permafrost degradation, including the development of thermokarst, will affect 33.6% of the infrastructure in Yakutia by the middle of the 21st century, which will entail large social and economic costs for the region [11, Streletskiy D.A.]. The established life support systems of both urban and rural communities in the region are under threat. However, the latter are most dependent on the state of the environment and are currently experiencing the main pressure. Thus, the study of various aspects of the dynamics of the permafrost zone and its impact on the population of Yakutia has significant relevance and practical significance.

Research in this direction can contribute to the development of timely measures to prevent the occurrence and mitigation of the impact of dangerous cryogenic processes on the population and economic entities, taking into account the experience accumulated by representatives of local communities affected by thermokarst in responding and adapting to negative changes in the state of the environment, developing effective recommendations for authorities at various levels based on a set of obtained materials.

The relevance and significance of the above-mentioned problems cause an increased interest in the scientific development of a wide range of issues related to it both from domestic and foreign researchers. In recent years, a number of scientific works related to the degradation of permafrost soils have been published [12, Lupachev A.V.; 13, Sannikova E.E.; 14, Melnikov V.P.; 15, Zhirkov A.; 16, Lytkin L.V., etc.]. In particular, according to the results of recent studies conducted in the central regions of Yakutia, a high intensity of thermokarst development was noted, while the rate of surface subsidence can reach 10–15 cm per year [10, Fedorov A.N.; 17, Saito H.].

At the same time, there are relatively few papers that cover the consequences of permafrost degradation for the life of the population of Yakutia. For example, N.I. Shiklomanov and D.A. Streletskiy analyzed potential changes in the sustainability of Russian urban infrastructure built on “permafrost” under predicted climate changes, as well as the negative effects of climate change in the Arctic for urban settlements in the area, including the city of Yakutsk [18]. N. Doloisio and J.-P. Vanderlinden studied the perceptions of permafrost degradation among the population of the administrative center of the region [19]. In addition, there are a number of studies (except for several articles by the authors of this work) that examined the economic and sociocultural consequences of global climate transformations, including permafrost degradation, for the indigenous peoples of Yakutia [20, Svinoboev A.N.; 21, Fujiwara J.; 22, Ananicheva M.D. et al.].

In terms of cooperation between representatives of the natural sciences and humanities, it is worth noting the work of Russian and Japanese researchers within the framework of the project “Designing educational materials for environmental education related to the local history of Siberia, synthesizing cultural memories with scientific knowledge” in 2016–2020. Research conducted in the Churapchinskiy and Gornyy uluses of Yakutia addressed the problems of the impact of climate change, including permafrost degradation, on local rural communities and their adaptation to changing conditions. At the same time, the focus of the research was mainly aimed at identifying the characteristics of local residents’ perception of climate change, as well as the dynamics of

change and contradictions in public opinion when assessing the observed natural transformations. The project participants identified, among other things, 3 measures that the population of the Churapchinskiy and Gornyy uluses undertake to mitigate the consequences of degradation of permafrost: leveling the land surface in places of thermokarst development, constructing embankments under houses, as well as “selecting cultivated crops and varieties that correspond to ongoing climate changes” [23, Takakura H.; 24, Takakura H.].

The authors of the presented work agree that the problem of permafrost “melting” should be studied precisely through the interaction of representatives of various scientific disciplines. At the same time, it seems necessary to note that, as our experience has shown, there are quite serious local features in the consequences of permafrost degradation, its perception and ways of adaptation associated with both the geographical conditions of a particular area and the specificity of life support systems locally formed. Accordingly, the more settlements in Yakutia are covered by such research, the more objective and multifaceted the picture of the analyzed problems will be.

The aim of this study is to determine the impact of permafrost degradation and thermokarst processes on the livelihoods of rural communities in Yakutia on the example of 5 settlements of the region, to identify the consequences of emerging challenges, as well as the mechanisms of adaptation to them.

### ***Materials and methods***

The authors focused their work on research in the villages of Amga of Amginskiy and Yunkyr of Olekminskiy uluses (districts). These settlements were chosen due to a number of factors. Both villages are united by history: Russian settlers made the first attempts to introduce regional agriculture on their territory. During the Soviet period, the Amginskiy and Olekminskiy districts of Yakutia were even called the “second Ukraine”. As will be shown below, the development of thermokarst processes is quite closely related to soil cultivation for agricultural crops. For this reason, Amga and Yunkyr are characterized by active degradation of permafrost. However, these processes and their impact on local communities were not the focus of scientists’ attention at the beginning of our research. There are also certain differences between Amga and Yunkyr that are of comparative interest. First of all, they are located in different geographical areas of Yakutia: Amga is located in Central Yakutia, Yunkyr is in South-Western Yakutia.

For the same purposes — for comparison and more complete coverage of the various aspects and features of thermokarst processes in different geographical conditions — the materials identified during research in the villages of Argakhtakh of Srednekolymskiy, Lippe-Atakh of Verkhnevilyuyskiy and Ulakhan-An of Khangalasskiy uluses (districts) were used in writing this article. The first of these villages is located in the Arctic zone of Yakutia and the consequences of permafrost degradation here have their own serious specifics; the same can be said about Lippe-Atakh, located in the western part of the region, which is less susceptible to thermokarst. Despite the fact that the bulk of the field materials obtained in autumn 2022 has not yet been processed, the au-

thors decided to include the example of Ulakhan-An village (central part of the region) in the article. Only in recent years, the villagers have closely encountered the manifestations of permafrost degradation, which has led to certain nuances in the perception of ongoing processes and the peculiarities of their response to them.

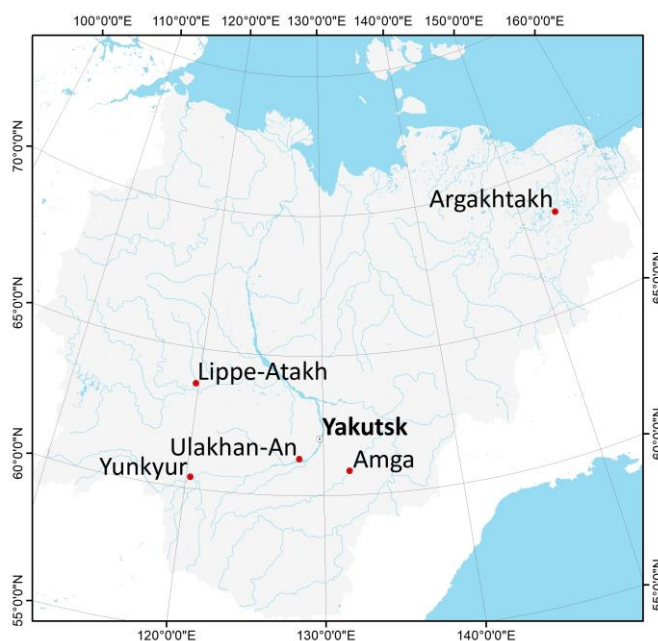


Fig. 3. Research locations in 2019–2022.

Field research in Amga (with the adjacent village of Chapchylgan) and Yunkyur was carried out in autumn 2019, 2020 and 2021 within the framework of project No. 19-78-10088, supported by the Russian Science Foundation, “Cryoanthropology: natural low temperatures in the life support system of rural communities of Yakutia (traditional practices, modern challenges and adaptation strategies)”. The importance of conducting research within approximately the same time frame is due to the need for maximum representativeness and correct correlation of the data obtained, since the seasonal thawing of permafrost reaches its apogee in September–early October; the consequences of its degradation for residential and commercial structures, infrastructure and farmland become most obvious.

In the first year, the work included landscape-permafrost surveying of the area, selection of key research areas and equipment of sites for temperature monitoring of permafrost soils. The selected key areas are located in the vicinity of Amga and Yunkyur and represent open surfaces where thermokarst processes are actively developing. Two boreholes were drilled in the vicinity of each settlement to assess changes in the active layer and temperature regime, which have a direct impact on thermokarst activation. The location of one of the boreholes was confined to a human-disturbed surface, which was formed by bylars [25, Solovyov P.A.] (the initial stage of thermokarst in the form of a hilly surface) (Fig. 4–5). The choice of location for the second borehole was linked to the limits of the natural landscape covered with larch forest, not subject to significant anthropogenic impact and not affected by thermokarst.





Fig. 4. Location of borehole no. 1 in the vicinity of the village Yunkyr, September 2021. Photo by A.A. Suleymanov.



Fig. 5. Location of borehole no. 4 in the vicinity of the village Amga, September 2021. Photo by V.M. Lytkin.

Boreholes 4.5 and 8 meters deep were drilled in the vicinity of the village of Yunkyr. Borehole no. 1 was drilled within an abandoned arable land, where thermokarst is now intensively occurring. In this well, at a depth of 2 m, ice-wedge casts was discovered, which can be traced to bottom (4.5 m). Borehole no. 2 was drilled on the surface of a mixed spruce-birch forest, which was not affected by anthropogenic impact (natural landscape). In this mine, ice-wedge casts was exposed in the interval of 4.9–7.2 m.

As a result of the work performed on the territory of the village Amga, boreholes with a depth of 7.5 (no. 3) and 10 (no. 4) meters were drilled. Well no. 3 was drilled in a mixed birch-larch forest, well no. 4 — on the surface of an abandoned arable land at the top of a bylar.

The drilled boreholes were equipped with logger-type sensors produced by Rusgeotech LLC with an accuracy of  $\pm 0.01^{\circ}\text{C}$  to record soil temperatures at depths of 0, 1, 3, 5, 7 and 10 meters. In addition, orthophotomaps of key research areas were created. The orthophotomaps were obtained using a DJI Mavic 2 Pro unmanned aerial vehicle (UAV) and GNSS georeferenced based on the creation of a reference frame. The reference points were georeferenced using Trimble 5700 high-precision geodetic equipment.

The geocryological part of the research in Amga and Yunkyr during the second and third years of work included repeated landscape-permafrost surveys of the area, documentation and GPS-mapping of decipherable relief features for further mapping of these territories. Along with the above-mentioned surveys, repeated aerial photography of the monitoring sites was carried out using UAVs. In addition, data from logger devices was extracted, which provided continuous monitoring of the temperature regime of the soil.

Based on the analysis and comparison of multi-temporal aerial images and a digital relief model of key research areas made in 2019, 2020 and 2021, the calculation of the dynamics of thermokarst processes was also carried out. The UAV-derived images were processed using the specialized ArcMap 10.1 software.

At the same time, a sociological survey was conducted during the field surveys in Yunkyr and Amga villages, covering 37 people in 2019, 211 people in 2020 and 80 people in 2021. The sociological research tools included sociological survey questionnaires and questionnaires for expert survey. The questionnaire consisted of 22 questions. For most of them, respondents had to give one of two or more answer options. The processing of materials obtained during the survey and the formation of final data sets were carried out in the format of a specialized statistical program SPSS Statistics v. 25. Heads or leading specialists of the village administration, as well as representatives of large (by local standards) business entities, took part in the expert survey. The main objectives of the expert interviews and questionnaires were to obtain information on local communities' assessment of the current state of the natural environment, existing or expected threats due to the "cold deficit" and active thermokarst processes, as well as to track current and potential practices of response and adaptation.

In parallel with the sociological research in Amga and Yunkyr, historical and anthropological research was conducted to study the historical evolution of the significance of permafrost in the livelihoods of local rural communities. This part of the work included conducting in-depth and narrative interviews based on a single questionnaire, mainly among old-timers, i.e. people who lived in the studied locality for at least 60 years, and covered 29 people over three years of research. For in-depth and narrative interviews, the "snowball" method was used to identify respondents with specific knowledge of the issues addressed by the project, since neighborhood ties are strong in local rural communities and the interviewees could quite accurately identify persons of interest for the study.

These methods were combined with visual identification and recording of material sources indicating the consequences of permafrost degradation, using photo and video equipment. In particular, damaged rural buildings (residential and commercial), infrastructure and landscapes were recorded. For better clarity and understanding of the ongoing processes, the article presents photographs taken in September 2022.

As noted, in order to create a more complete and comprehensive picture characterizing the consequences of permafrost degradation, field research were carried out in other settlements of Yakutia. In March–April 2021, surveys were carried out in the Argakhtakh village, in September 2021 — in the Lippe-Atakh village, in August 2022 — in the Ulakhan-An village. Activities in these settlements also included a complex of interdisciplinary work, but for this article, the results of reconnaissance geocryological surveys, expert and in-depth interviewing, conducted according to the same program as before, are mainly of interest.

### ***History of economic development of territories and climate regime dynamics***

Before proceeding directly to the analysis of the results obtained during the research, it seems necessary to briefly characterize the history of economic development and the current socio-economic situation, as well as the dynamics of the air temperature regime.



As noted, the Amginskiy and Olekminskiy uluses (districts) of Yakutia were the pioneers in the introduction of agriculture in the region by Russian settlers. Thus, according to F.G. Safronov, the first attempt to settle the middle reaches of the Amga river dates back to 1652. Thirty years later, 17 families lived in the Amginskaya settlement. In 1862, the population of the settlement was 798 people. Farming and cattle breeding remained the leading branches of economy all this time [26, Safronov F.G., pp. 114–115]. In 1930, Amga became the administrative center of the created Amginskiy district of Yakutia. Almost simultaneously, the Pobeda collective farm appeared in Amga, which later became part of the Amginskiy state farm that existed until the collapse of the USSR. The increase of the area cultivated by the Amginskiy state farm is an important indicator in terms of the problems under study. Thus, in the period from 1957 to 1992, 1702 hectares of uncultivated and about 4200 hectares of virgin and fallow lands were ploughed [27, Fedorov V.V., pp. 18–25].

After the collapse of the Soviet Union and the socio-economic crisis in Russia, large state-owned collective farms were liquidated and replaced by much smaller enterprises representing both state and private forms of ownership. At the same time, the area of cultivated land in Amga ulus was significantly reduced from about 13 thousand hectares in 1990<sup>1</sup> to 8 thousand by 2018<sup>2</sup>.

Another indicator that should be emphasized is the dynamics of the Amga population. The Soviet period was characterized by a significant increase in population. Thus, in 1939, there were 1230 people living in Amga, and in 1989 — already 5191 people<sup>3</sup>. The population of Amga, with rare exceptions, increased annually in the post-Soviet period due to the fact that the village, as noted, is the regional center of the Amga ulus. As of the beginning of 2022, the population of Amga was 6645 people<sup>4</sup>. Agriculture occupies a leading place in the economy: meat and dairy cattle breeding, meat herd horse breeding, growing crops — vegetables, grains and fodder<sup>5</sup>.

The agricultural development of the modern territory of Yunkyr began approximately at the same time as the development of the Amginskaya settlement. In the middle of the 17th century, on the right bank of the Malaya Cherepanikha River in the area of its mouth, i.e. approximately where Yunkyr is located now, the village of Olekminskaya was founded by Russian peasants [26, Safronov F.G., p. 113]. At the end of the 18th century, Vilyui and Amga peasants were resettled to these places due to poor harvests. They founded a new village, which the latter named “Amginskaya” in memory of their native places. The main occupation of the peasants was agriculture and cattle breeding. Thus, according to data for 1917, 655 hectares of land were sown here [28, Redko M.A., pp. 5–6]. During collectivization, since 1927, Yunkyr served as the center of various collec-

<sup>1</sup> Statistical Yearbook of the Republic of Sakha (Yakutia), 2018, 418 p.

<sup>2</sup> Statistical Yearbook of the Republic of Sakha (Yakutia), 2019, 350 p.

<sup>3</sup> According to demoscope.ru: URL: <http://www.demoscope.ru/weekly/> (accessed 24 October 2022).

<sup>4</sup> Population of the Russian Federation by municipalities as of January 1, 2022. Official Internet portal of the Federal State Statistics Service (Rosstat). URL: [https://rosstat.gov.ru/storage/mediabank/Chisl\\_nasel\\_RF\\_MO\\_01-01-2022.xlsx](https://rosstat.gov.ru/storage/mediabank/Chisl_nasel_RF_MO_01-01-2022.xlsx) (accessed 24 October 2022).

<sup>5</sup> Passport of socio-economic development of the Amginsky nasleg of the Amginsky ulus of the RS (Y) for 2021. Current archive of the administration of the Amginsky nasleg municipal organization of the Amginsky ulus of the RS (Y).

tive farms, since 1951 — of the united collective farm “Pravda”, and since 1971 — of the state farm “Olekminskiy”<sup>6</sup>.

The most important sectors of the economy of the Yunkur people in the USSR years were cattle breeding and grain growing, as well as well-developed vegetable growing. As in the case of the Amginskiy state farm, the Yunkyur branch was characterized by a significant increase in the area of cultivated plots. For example, this figure was 4697 hectares in 1977<sup>7</sup>. For comparison, the area of cultivated plots decreased to 2260 hectares by 2019, i.e. more than halved<sup>8</sup>.

The population of Yunkyur was constantly increasing during the Soviet period: in 1938, there were 335 people in the village<sup>9</sup>, in 1984 — 1058 people<sup>10</sup>. After the collapse of the USSR, the number of residents in Yunkyur remained quite stable for a long time and in 2012 it was 1139 people<sup>11</sup>. However, in recent years, the outflow of population has accelerated significantly, and now the village is inhabited by less than a thousand people. As of 2022, the population of Yunkyur was 953 people<sup>12</sup>. At the same time, these indicators are quite high by the standards of modern Yakutia for a rural settlement that is not the administrative center of an ulus (district) of the republic and is far from its capital. This fact is connected, first of all, with the proximity of the regional center — the city of Olekminsk, where, according to information received during an interview with the head of the village, about 3/4 of the working population travels from Yunkyur to work<sup>13</sup>. The economy of Yunkyur is still based on meat and dairy cattle breeding, herd horse breeding and cultivation of grain crops<sup>14</sup>. The production base of one of the modern flagships of Yakutia’s agriculture, LLC Kladovaya Olekmy, is located here.

Thus, summarizing a brief overview of the history and current situation in Amga and Yunkyur, three key characteristics should be noted. In both cases, there has been an increase in the area of land brought into agricultural circulation for more than three centuries, especially accelerated during the Soviet period. In both cases, with the collapse of the Soviet Union and the economic crisis, there was a significant sequestration of the area of cultivated land. The second point is the population growth in Amga and Yunkyur. While in Yunkyur it stopped, although the number of residents is still significant, in Amga it continues to grow to this day. Finally, the basis of the economy of both settlements is agriculture.

<sup>6</sup> Municipal archive of the municipal district "Olekminskiy district" (hereinafter - MA MDOD). F. 66. L. 1. File 1. S. 1–2.

<sup>7</sup> MA MDOD. F. 36. L. 1. File 87. S. 1.

<sup>8</sup> Passport of socio-economic development of the Malzhagarsky nasleg of the Olekminskiy district of the Republic of Sakha (Yakutia) for 2019 // Current archive of the administration of the municipal municipality "Malzhagarskiy nasleg" of the Olekminskiy district.

<sup>9</sup> MA MDOD. F. 3. L. 1. File 12. S. 4–5.

<sup>10</sup> MA MDOD. F. 3. L. 2. File 378. S. 2.

<sup>11</sup> Passport of socio-economic development of the Malzhagarskiy nasleg of the Olekminskiy district of the Republic of Sakha (Yakutia) for 2012.

<sup>12</sup> Population of the Russian Federation by municipalities as of January 1, 2022. Official Internet portal of the Federal State Statistics Service (Rosstat). URL: [https://rosstat.gov.ru/storage/mediabank/Chisl\\_nasel\\_RF\\_MO\\_01-01-2022.xlsx](https://rosstat.gov.ru/storage/mediabank/Chisl_nasel_RF_MO_01-01-2022.xlsx) (accessed 24 October 2022).

<sup>13</sup> Authors' field materials, p. Yunkyur, Olekminsky district of the Republic of Sakha (Yakutia), September 2020.

<sup>14</sup> Passport of socio-economic development of the Malzhagarskiy nasleg of the Olekminskiy district of the Republic of Sakha (Yakutia) for 2019.

Another unifying characteristic is the rhythmic increase in average annual air temperatures: according to the Amga weather station, during 1966–2021, the average annual air temperature increased from  $-12.5^{\circ}\text{C}$  to  $-8.8^{\circ}\text{C}$ , in Olekminsk during the same period — from  $-8.4^{\circ}\text{C}$  to  $-5.1^{\circ}\text{C}$  (see Fig. 6–7).

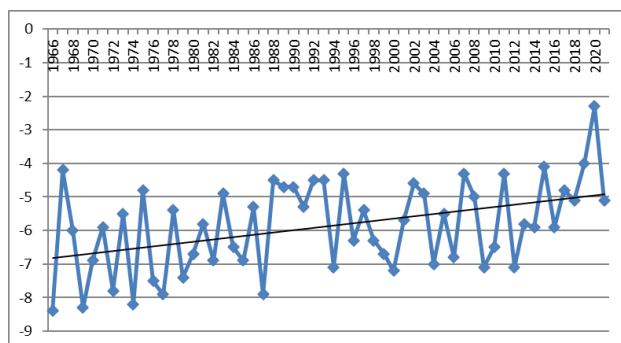


Fig. 6. Dynamics of average annual air temperature in 1966–2021 according to data from the Olekminsk weather station.

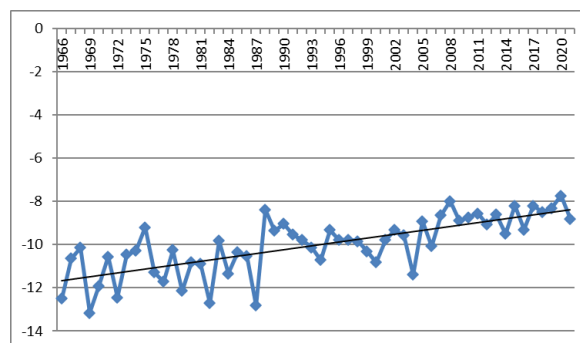


Fig. 7. Dynamics of average annual air temperature in 1966–2021 according to the Amga weather station.

To a large extent, it was the superposition of two factors: extensive cultivation of lands and subsequent abandonment of croplands, as well as a rhythmic increase in average annual air temperature that led to the consequences that will be discussed below.

### *Consequences of anthropogenic impact and climate change*

The creation of arable land was associated with the cutting down of forest plantations and bushes, which had previously shaded these areas and prevented them from being warmed by sunlight. If constant cultivation and sowing of lands together with a colder temperature regime generally neutralized the processes of permafrost degradation, their abandonment in the post-Soviet period led to a significant activation of thermokarst [29, Ugarov I.S.]. The situation was aggravated by the fact that the needs for spatial development of rural settlements that were quite large, by the standards of Yakutia, led to the fact that part of former arable lands was given over for housing construction.

In this regard, the results obtained during the research conducted in Amga and Yunkyur in 2019–2021 are indicative. Research has shown that for natural landscapes, where the original natural conditions were not disturbed during the economic development of territories, the permafrost temperature regime turned out to be stable over the entire observation period. The development of negative cryogenic processes in such areas was not detected. Thus, in borehole no. 2 in the vicinity of Yunkyur village, at a depth of 3 m, the average annual soil temperatures are below  $-1^{\circ}\text{C}$  and drop to  $-1.5^{\circ}\text{C}$  at a depth of 8 m. In borehole no. 3 at the Amga site, soil temperatures at the same depths were  $-1.7^{\circ}\text{C}$  and  $-1.8^{\circ}\text{C}$ , respectively. As a result, the depth of the seasonally thawed layer does not reach the roof of heavily icy soils and is 1.7 m in the Yunkyur village and 1.3 m in Amga. This circumstance has a beneficial effect on the resistance of such landscapes to thermokarst processes. The noted differences in soil temperatures are associated with the natural geographical features of Yunkyur and Amga: the first is located on the southern border of the con-

tinuous permafrost zone, where the climate is milder and average annual air temperatures are about  $-5.1^{\circ}\text{C}$ , and the second one is located in the central part of the continuous permafrost zone, where its thickness can reach 600 m, and the average annual air temperature is about  $-8.5^{\circ}\text{C}$ .

These factors also play an important role in the formation of soil temperature regime in anthropogenically disturbed areas — the territory of abandoned arable land. For such landscapes, ground temperatures were much higher due to the disruption of the heat balance regime of the surface because of the reduction of dense vegetation cover. The temperature regime of soils at a depth of 3 m is of the greatest interest. This horizon is the roof of ice-wedge casts in the studied areas, changes in which affect the development and dynamics of thermokarst processes. During the observation period, the average temperature in disturbed landscapes at this depth remains stable at two study sites. However, the average annual temperature in well no. 1, located in the vicinity of the Yunkyur village, is only  $-0.31^{\circ}\text{C}$ , in well no. 4, located in the vicinity of the Amga village, —  $-0.64^{\circ}\text{C}$  [30, Lytkin V.M., p. 426].

The obtained temperature regimes of soils in disturbed landscapes on the roof of permafrost and ice-wedge casts affect the depth of seasonal thawing (in the vicinity of Yunkyur — 2.1 m, in Amga — 2.4 m), which is reflected in the rate of thermokarst processes. These territories are characterized by the annual deepening of inter-byilar hollows. At the key study site in the vicinity of Yunkyur village, the relief surface subsided by an average of 14 cm during the observation period due to subsurface ice melt: by 8 cm during 2019–2020 and by 6 cm during 2020–2021; near the village Amga — on average by 11 cm: by 6 cm in 2019–2020 and by 5 cm in 2020–2021 (Fig. 8–9).



Fig. 8. Inter-byilar hollows in the Yunkyur village, September 2022. Photo by A.A. Suleymanov.



Fig. 9. Inter-byilar hollows in the Amga village, September 2021. Photo by A.A. Suleymanov.

Due to the deepening of such hollows and their merger, *duyodya* is formed — a form of thermokarst relief in the form of round depressions filled with water, which are the original thermokarst lakes (Fig. 10–11). There are 21 such lakes on the Yunkyur territory. Their maximum area is  $10.672\text{ m}^2$ , minimum —  $620\text{ m}^2$ . For the period 2019–2021, the surface area of some lakes increased by 40%, which is likely due to the increase in average annual air temperature.





Fig. 10. Dyuodya in the Yunkyr village, September 2022.  
Photo by A.A. Suleymanov.



Fig. 11. Dyuodya in the Yunkyr village, September 2022. Photo by A.A. Suleymanov.

In general, the research showed that negative cryogenic processes cover 19.5% of all yard areas in the Yunkyr village and 18% in the Amga village (Fig. 12–13).



Fig. 12. Distribution of thermokarst processes (bylars) in the Yunkyr village. Compiled on the basis of the results of the 2019–2021 research.



Fig. 13. Distribution of thermokarst processes (byllars) in the Amga village. Compiled on the basis of the results of the 2019–2021 research.

### *Influence of permafrost degradation on local life support systems*

The noted processes led to a number of negative consequences for the existing life support systems of Amga and Yunkyur. Thus, the degradation of permafrost leads to the deformation of residential and commercial buildings. In Yunkyur, the area of thermokarst forms (byllars) includes 249 residential and utility buildings, in Amga — 540. Some of the affected houses and buildings have to be regularly repaired by the local population (19% of respondents in Amga and 36% in Yunkyur), and some are completely abandoned and rebuilt in another place (Fig. 14–15) <sup>15</sup>.



Fig. 14. One of the houses affected by thermokarst. A new house, to which the owners of the site were forced to move, is in the background on the left, Yunkyur, September 2022. Photo by A.A. Suleymanov.



Fig. 15. Abandoned and new houses on the site damaged due to the activation of thermokarst on the site in Amga, September 2021. Photo by A.A. Suleymanov.

<sup>15</sup> Authors' field materials, p. Yunkyur, Olekminskiy district of the Republic of Sakha (Yakutia), September 2019 (PMA, 2019a), September 2020 (PMA, 2020a), September 2021 (PMA, 2021a); Authors' field materials, p. Amga, Amginskiy ulus of the Republic of Sakha (Yakutia), September 2019 (PMA, 2019b) and October 2020 (PMA, 2020b).



Among the affected, for example, is the “Orphanage” in the Yunkyr village, intended for socially vulnerable groups of the population (Fig. 16–17)<sup>16</sup>. An example of one of the apartment buildings in the Amga village, located on Mira Street, is also indicative. The municipality had to re-settle its residents because of the threat of house collapse due to permafrost degradation (Fig. 18–19)<sup>17</sup>.



Fig. 16. “Orphanage” in the Yunkyr village, September 2022. Photo by A.A. Suleymanov.



Fig. 17. “Orphanage” in the Yunkyr village, September 2022. Photo by A.A. Suleymanov.



Fig. 18. Apartment building on the Mira Street, affected by thermokarst.



Fig. 19. Apartment building on the Mira street, affected by thermokarst. At the time of research, only one family lived in the house, preparing to move, Amga, September 2021. Photo by A.A. Suleymanov.

The population of entire micro-districts on the territory of former arable lands suffers from the degradation of permafrost. In this case, the example of the new Neleger micro-district in Amga, located on the territory of the abandoned lands of the Amginskiy state farm, is representative. Plots here, among other things, were allocated to low-income families with the condition of rapid development. As a result, as can be seen from Fig. 20–22, the construction of houses had to be carried out on an area completely covered by thermokarst processes. The main reason is the shortage of land in Amga, superimposed on the continuous population growth. For this reason, among other things, a significant density of buildings in the village was observed.

<sup>16</sup> Authors' field materials (AFM), 2020a.

<sup>17</sup> Authors' field materials, p. Amga, Amginskiy ulus of the Republic of Sakha (Yakutia), September 2021 (2021b).



Fig. 20. Fig. 21. Construction of houses in the Neleger micro-district on areas with deeply dissected bylars, Amga, September 2021. Photo by A.A. Suleymanov.



Fig. 22. Construction of houses in the Neleger micro-district on areas with deeply dissected bylars, Amga, September 2021. Photo by A.A. Suleymanov.

Unfortunately, such examples when the population of newly built-up areas in rural Yakutia faces the activation of thermokarst processes are not isolated. In particular, a similar situation is observed in the new Chechir micro-district in the Ulakhan-An village (the population of the village in 2022 was 1132 people), where plots were given primarily to young families with children, as well as in micro-districts unofficially named First, Second, Third and Fourth arable land, located on the territories that used to be allocated for agriculture (Fig. 23–24).



Fig. 23. Construction in the zone of thermokarst processes activation, Chechir micro-district, Ulakhan-An village, August 2022. Photo by A.A. Suleymanov.



Fig. 24. Building freeze in areas where thermokarst processes have actively developed in recent years, Third arable land micro-district, Ulakhan-An village, August 2022. Photo by A.A. Suleymanov.



The reduction of buildable areas due to the formation of bylars and the flooding of areas due to the degradation of permafrost poses serious problems for the spatial development of Yunkyur, which continues despite the observed population decline. It is bounded on the north, east and west by active thermokarst processes occurring mainly in abandoned pastures, and on the south — by deep ravines.

All these factors affect the cost of construction works due to the need for preliminary back-filling of the territory to create a thermal insulation “cushion”, construction of a piled foundation, as well as location of objects in places difficult to reach from a logistical point of view<sup>18</sup>. The increased financial burden also determines the life strategies of villagers who, for example, are forced to continue working instead of retiring in order to pay for the necessary repairs and/or construction of a new house (Fig. 25–26)<sup>19</sup>.



Fig. 25. Consequences of permafrost degradation: the owner of this house had to take a loan for building on a new site and reconsider plans for retirement, Yunkyur, September 2021. Photo by A.A. Suleymanov.



Fig. 26. Consequences of permafrost degradation: the owner of this house had to take a loan for building on a new site and reconsider plans for retirement, Yunkyur, September 2021. Photo by A.A. Suleymanov.

The burden on local administrations has also increased significantly, as they are forced to carry out additional filling of public areas, solve the issues of resettlement of affected residents and redistribute already limited financial resources for these works, diverting them from other important tasks<sup>20</sup>.

Violation of the permafrost temperature regime and “deficit of cold” also affect the traditional economic activities of the population. In particular, cellars and glaciers — structures for storing food, dug in permafrost — are thawing. Thawing leads to a reduction in the period of their use or complete impossibility to use them. In this regard, it is indicative that only 28% of respondents in Amga and 16% in Yunkyur have preserved their glaciers, despite the fact that previously they were “used by everyone”<sup>21</sup>. Of course, a significant role was played by the increased stability of electricity supply to rural areas in Yakutia, the growing availability of freezers and the increased

<sup>18</sup> AFM, 2019a; AFM, 2019b; AFM, 2020b.

<sup>19</sup> AFM, 2021a.

<sup>20</sup> AFM, 2021a; AFM, 2021b.

<sup>21</sup> AFM, 2019a; 2019b; 2020a; 2021a; 2021b.

supply of products on the market, which made storing large volumes of food unnecessary. At the same time, we have repeatedly noted the fact that glaciers were forced to be abandoned: due to their regular flooding or because they stopped “keeping cold”. In addition, there were cases when cellars were specially buried to prevent degradation of permafrost under the house. According to our sociological survey, 27% of respondents in Yunkyr and 11% in Amga had to resort to such a measure. Large agricultural enterprises also have problems with the preservation of glaciers. In particular, about 5-6 years ago, the glacier of the Amma ACPC (89 m long) in Amga, used in summer for storing meat products, began to flood<sup>22</sup>. In Yunkyr, a 50-ton glacier owned by Kladovaya Olekmy LLC was flooded and abandoned<sup>23</sup>.

Similarly, permafrost degradation limits the possibilities of agricultural activities both within the personal plots of local residents (22% of respondents in Yunkyr were forced to relocate and/or reduce the size of their vegetable garden) and at the scale of leading actors of agricultural development. Territories affected by thermokarst fall out of agricultural use (Fig. 26–27). In addition to the impossibility of re-commissioning previously abandoned fields, the surface of which has almost completely degraded to bylars, existing fields are also affected. We were able to identify one of the illustrative cases during an interview with the head of an important economic entity in Yunkyr — the Poisk cooperative. Just a day before, a sudden subsidence of soil had occurred under one of its tractors while harvesting crops<sup>24</sup>. Another example is related to the activities of Berte Horse Farm LLC in the Khangalasskiy ulus. In addition to similar cases of ground subsidence under agricultural machinery, in recent years the enterprise has been forced to reduce the area of cultivated lands as it becomes impossible to use harvesters due to the active development of thermokarst processes<sup>25</sup>.



Fig. 27. The territory of former arable lands of the Olekminskiy state farm (Yunkyr village, September 2022). Re-introduction of these lands into agricultural turnover is impossible in the current situation.  
Photo by A.A. Suleymanov.



Fig. 28. The territory of former arable lands of the Amginskiy state farm (Amga village, September 2021). Re-introduction of these lands into agricultural turnover is impossible in the current situation.  
Photo by A.A. Suleymanov.

<sup>22</sup> AFM, 2021b.

<sup>23</sup> AFM, 2019a.

<sup>24</sup> AFM, 2019a

<sup>25</sup> AFM, 2022.

In the context of the negative impact of permafrost degradation on traditional economic activities, the example of the village of Argakhtakh is even more representative. Founded in the second half of the 1940s as part of the settlement policy and located on the bank of the Alazeya River, this settlement was regularly subjected to floods<sup>26</sup>. However, since the 1990s, floods reached catastrophic proportions. The most serious floods were in 2007 and 2017 (Fig. 29–30). In the first case, the water level reached 869 cm, in the second — already up to 897 cm, at a critical level for the village of 782 cm<sup>27</sup>. At the same time, unlike transient floods, which are typical for most rivers of Yakutia and last for several days, Alazeya is characterized by a long-lasting rise in water level, which lasts for months. This explains the fact that floods in Argakhtakh can continue for two summer seasons in a row if freeze-up occurs at critically high water levels.



Fig. 29. Streets of Argakhtakh during the flood of 2007. Photo from the museum of the Argakhtakh village.



Fig. 30. Streets of Argakhtakh during the flood of 2017. Photo from the museum of the Argakhtakh village.

Permafrost degradation played a significant role in the genesis of modern floods on Alazeya. An increase in seasonal thawing of heavily icy rocks led to an increase in the amount of supra-permafrost groundwater entering the basin of this river [31, Gotovtsev S.P., p. 7].

After the floods, forage grasses did not grow on the flooded agricultural land, because the entire area remained covered with silt. For example, during the last major flood in 2017, 85% of agricultural land and 50% of harvested hay were flooded. As a result, all plots in the vicinity of the village were withdrawn from economic use. The need to exploit more distant lands and to use transport naturally increased the economic burden on economic entities<sup>28</sup>. The lack of feed led to the forced slaughter of livestock or the subsequent abandonment of its maintenance due to significant costs and labor inputs. In particular, while in 2015 the population of Argakhtakh kept 139 cattle, in 2019 there were already 87. The number of horses decreased from 477 head to 325 over the same period. In addition, another branch of traditional economic activity — animal farming —

<sup>26</sup> Municipal archive of the Municipal District "Srednekolymskiy Ulus" (MAMD SU). F. 1. L. 1. File 428. S. 2–35; Current archive of the administration of the municipal municipality "Alazeiskiy nasleg" of the Srednekolymskiy ulus (CA AMM AN SU) RS (Y).

<sup>27</sup> CA AMM AN SU) RS (Y).

<sup>28</sup> Authors' field materials, p. Argakhtakh, Srednekolymskiy ulus of the Republic of Sakha (Yakutia), March-April 2021 (AFM, 2021c).



came to ought from a figure of 45 heads for the period 2015–2019<sup>29</sup>.

An important consequence of the 2017 flood was also the increased transport isolation of Argakhtakh. The village has traditionally been connected to the administrative center of the ulus — Srednekolymskoe — by a stable land connection only in winter time via the Arktika winter road. In summer, an airplane made flights to Argakhtakh. In 2017, the landing site was flooded and damaged so much that it became possible to use only expensive helicopter services. Flights to the village take place twice a month<sup>30</sup>.

As a result of permafrost degradation, prerequisites for the deformation of land transport routes are also being created. In this regard, the example of the Lippe-Atakh village is illustrative. Our research has shown that negative cryogenic processes directly within this settlement cover only 5% of all courtyard areas. At the same time, in the vicinity of the village, thermokarst processes are widely observed in anthropogenically disturbed areas, which include lands intended for roads and power lines. Thermokarst landforms are formed here — bylars and duyodyas, the depth of which can reach 3 m, with the thickness of ice-wedge casts up to 5 m. As a result of this, for example, one of the two roads connecting Lippe-Atakh with the Verkhnevilyuysk regional center was taken out of operation (Fig. 30)<sup>31</sup>.



Fig. 31. A section of the former road linking the Lippe-Atakh village and the Verkhnevilyuysk village, September 2021. Photo by V.M. Lytkin.

In Amga and Yunkyur, problems with the safety of communication routes due to permafrost degradation are also observed, but they are much less pronounced (Fig. 32–33). At the same time, respondents in the Yunkyur village reported significant trail deformations and landscape

<sup>29</sup> CA AMM AN SU) RS (Y).

<sup>30</sup> AFM, 2021c.

<sup>31</sup> Authors' field materials, p. Lippe-Atakh, Verkhnevilyuyskiy ulus of the Republic of Sakha (Yakutia), September 2021.



changes within their hunting grounds in the last decade<sup>32</sup>. It is difficult to verify this information due to the significant remoteness of these lands from the territory of the village.



Fig. 32. Examples of deformation of intra-village communication routes in the Yunkyur village, September 2021. Photo by A.A. Suleymanov.



Fig. 33. Examples of deformation of intra-village communication routes in the Chapchylgan village, September 2021. Photo by A.A. Suleymanov.

### *Peculiarities of perception and adaptation*

The ongoing processes have a negative impact on the social well-being of the local population and their confidence in the future (Fig. 34–35). In this regard, the results of the survey are interesting: in Amga, about 53% of respondents identified their own observations as the source of information about climate change, while in Yunkyur — about 75%. At the same time, 62% of respondents in Amga experienced negative manifestations of environmental change and permafrost degradation; in Yunkyur, this figure was 86%. Such answers, as well as the opinions expressed during the interviews, indicate a more sensitive, “acute” perception of permafrost degradation and its consequences on the part of Yunkyur residents than on the part of Amga respondents. The difference is probably due to two main factors: different times of conscious manifestation and the speed of thermokarst processes. The latter, as noted, is somewhat higher in Yunkyur. At the same time, while active thermokarst processes in Yunkyur started closer to the end of the 20th century, in Amga they appeared in the Soviet period, and its inhabitants, accordingly, had more time to adapt and accept them.

---

<sup>32</sup> AFM, 2019a.



Fig. 34. Sports ground of the Yunkyur Secondary School, 2007.



Fig. 35. Sports ground of the Yunkyur Secondary School, September 2022. Photo by A.A. Suleymanov.

It is indicative that in Ulakhan-Ana, where thermokarst processes entered their active phase only during the last decade and permafrost degradation is an unfamiliar phenomenon for the population, cases of freezing of building for an indefinite period in selected areas were recorded, when visible hollows began to form within its boundaries<sup>33</sup>. It is indicative that in Ulakhan-Ana, where thermokarst processes entered their active phase only during the last decade and permafrost degradation is an unfamiliar phenomenon for the population, cases of freezing of building for an indefinite period in selected areas were recorded, when visible hollows began to form within its boundaries)<sup>34</sup>.



Fig. 36. Construction of houses in areas with active thermokarst processes. According to the owner of the plot, the backfilling in the photo cost more than 300 thousand rubles, Chapchylgan village. September 2022. Photo by A.A. Suleymanov.

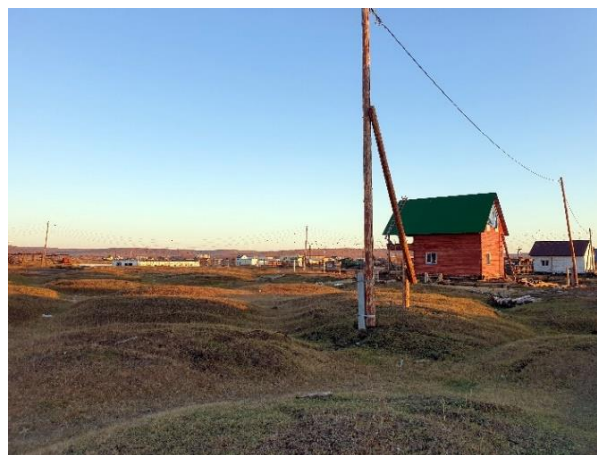


Fig. 37. Construction of houses in areas with active thermokarst processes, Chapchylgan village. September 2022. Photo by A.A. Suleymanov.

In search of answers to the problems that have arisen, representatives of rural communities of Yakutia have developed a number of adaptation mechanisms that make it possible, to a greater or lesser extent, to neutralize the threats associated with the degradation of permafrost.

<sup>33</sup> AFM, 2022.

<sup>34</sup> AFM, 2021b.



First of all, this is a change in the construction technology familiar to rural communities of Yakutia. In this regard, preliminary backfilling of sites during the construction of residential buildings has become widespread in order to create a thermal insulation cushion to reduce the heating effect on the soil. It is quite common to build houses on “beds” for these purposes, the role of which can be played by old car tires. Moreover, if the area around the house is regularly cleared of snow, the effect of a ventilated underground arises, which should have a favorable effect on ground freezing. Houses built on pile foundations have also become widespread (Fig. 38–41). The technology of “black” (double) flooring, which goes back centuries, has also acquired new life. However, if earlier the main purpose of its use was the desire to protect the house from the penetration of cold coming from the proximity of permafrost, now it protects the latter from warming up<sup>35</sup>.



Fig. 38. Adaptation of construction technology to the conditions of permafrost degradation: building a house on old car tires in compliance with the principle of a ventilated underground, Yunkyur, September 2022. Photo by A.A. Suleymanov.



Fig. 39. Adaptation of construction technology to the conditions of permafrost degradation: building a house on a pile foundation, Amga, September 2022. Photo by S.A. Grigoryev.



Fig. 40. Adaptation of construction technology to the conditions of permafrost degradation: building a house on a bedrock fill and a metal frame as a foundation, Ulakhan-An, August 2022. Photo by A.A. Suleymanov.



Fig. 41. Adaptation of construction technology to the conditions of permafrost degradation: construction of house foundation on 5-metre larch piles, Ulakhan-An, August 2022. Photo by A.A. Suleymanov.

<sup>35</sup> AFM, 2019a; 2019b; 2020a; 2020b; 2021a; 2021b; 2022.

The source of information about the advisability of using such technologies seems to be, first of all, the personal experience accumulated by the residents themselves, or, more precisely, living in an environment with quite rich traditions of taking into account the permafrost factor. The phrases “we build like in the city” (where apartment buildings stand on pile foundations) or “like our neighbor” are rather routine explanation for the choice of technology for building new houses, for example, in Amga and Ulakhan-An<sup>36</sup>.

At the same time, there is an obvious demand from representatives of rural communities of Yakutia and economic entities to obtain scientifically based data on leveling or preventing possible costs, including, for example, assistance in choosing suitable sites for construction. In this regard, the example of the mentioned company Kladovaya Olekmy is representative. In 2017, they constructed a new farm building in an area of permafrost with low ice content (Fig. 41). According to the information we received from one of the managers of Kladovaya Olekmy during an interview, it was decided to involve qualified specialists in construction in cryolithozone conditions to select the site, given the active thermokarst processes<sup>37</sup>. Our research has shown that the territory for the construction of the farm was indeed chosen well<sup>38</sup>. Following the recommendations we gave to the management of Malzhagarskiy nasleg, the filling of public areas subject to thermokarst processes started to be carried out in Yunkyr village (Fig. 42)<sup>39</sup>. In general, the significant interest of representatives of rural communities of Yakutia in scientifically based data on “interaction” with permafrost, recorded during field research, is a potentially important mechanism for adaptation to emerging challenges.



Fig. 42. Farm building of Kladovaya Olekmy LLC, built on an area of permafrost with low ice content, Yunkyr, September 2022. Photo by A.A. Suleymanov.



Fig. 43. Backfilling of the area around the club to reduce the activity of thermokarst processes, Yunkyr, September 2022. Photo by A.A. Suleymanov.

However, it should be noted that so far these data have been insufficiently taken into account. In particular, the mentioned orphanage in Yunkyr was built without a ventilated under-

<sup>36</sup> AFM, 2021b; 2022.

<sup>37</sup> AFM, 2019a.

<sup>38</sup> AFM, 2020a.

<sup>39</sup> AFM, 2021a.



ground. The fate of the sixteen-apartment “Experimental house”, built in Amga in 2009 without a pile foundation, turned out to be sad. In 2016, due to critical deformations, a decision was made to resettle its residents. To date, this house has been demolished (Fig. 44–45).

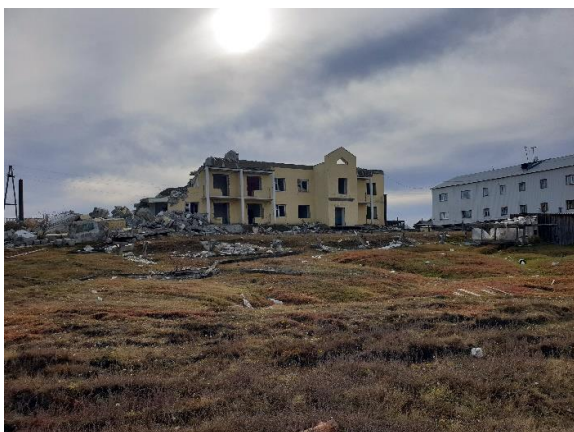


Fig. 44. Remains of the “Experimental house” built without a pile foundation, Amga, September 2021. Photo by A.A. Suleymanov.



Fig. 45. Remains of the “Experimental house” built without a pile foundation, Amga, September 2021. Photo by A.A. Suleymanov.

Other adaptation mechanisms we have identified include the mentioned intensification of the use of land suitable for construction, including denser building, which qualitatively changes the appearance and structure of the settlement. We encountered a situation quite atypical for standard households in rural Yakutia, when a second house for another family — the owner’s relatives — was being built on one plot of land that already had a residential building and several outbuildings.

In this regard, it should be noted that the most important adaptation resource is undoubtedly social relations and traditional collectivism, which is largely inherent in Yakutia’s rural communities. For example, in Argakhtakh, residents of flood-affected areas were able to wait out the disaster for months in the houses of their relatives and fellow villagers located in the higher part of the village<sup>40</sup>. In Yunkyur and Amga, residents who are forced to reduce the area of their vegetable gardens can use part of their relatives’ homestead plots. Similarly, the costs of the forced abandonment of glaciers and cellars are compensated to some extent<sup>41</sup>. It is obvious that mutual support and strong family ties allow local residents to endure various stressful situations more easily, reduce the threat of desocialization in case of force majeure, and make the life support system of the population of the studied villages more resistant to various shocks [32, Boyakova S .I., p. 220].

### Conclusion

Summarizing the data obtained during research in the villages of Amga and Yunkyur villages, it should be noted that thermokarst processes here occur primarily in areas with a developed ice complex, which are characterized by a large anthropogenic load — the territories of the settlements and active economic human activity. In these areas, due to changes in heat balance

<sup>40</sup> AFM, 2021c.

<sup>41</sup> AFM, 2020a; 2020b; 2021a; 2021c.

components and transformation of the climatic regime, thermokarst has rapid dynamics, and its consequences have a diverse impact on the life support system of the population of the villages studied. Degradation of permafrost and thermokarst lead to problems with the preservation of the housing stock, reduction of areas suitable for construction and corresponding restrictions in the spatial development of these villages, as well as transformations in the usual structure of households. In addition, they limit the opportunities for the development of traditional economic practices of local residents, preventing both the potential introduction of additional plots into agricultural turnover and the use of the former ones. The material accumulated to date suggests that these conclusions can be fully extrapolated to Ulakhan-An village.

In general, the first simultaneous cross-section of the current social situation, carried out in rural settlements of 5 administrative districts of Yakutia, which, among other things, differ in natural and geographical location, made it possible to establish that the consequences of permafrost degradation have both their local specifics and significant similarities. In particular, research in the villages of Argakhtakh and Lippe-Atakh made it possible to supplement the picture of the consequences of permafrost degradation with examples of the deterioration of the most important communication routes, which further separates the population already isolated from the main transport communications of the country. The impact of environmental changes on traditional economic activities is obviously most negatively expressed in Argakhtakh, located in northern Yakutia, where the population is a carrier of practices of Arctic indigenous peoples.

As a result, the ongoing transformations negatively affect the social well-being of villagers and influence their life strategies. Leveling of the costs arising from permafrost degradation and ongoing thermokarst processes entail a corresponding increase in the financial burden on the population, economic entities and local administrations. The material revealed allows us to conclude that there are certain features of perception of ongoing changes in the usual state of the environment and response to them, which, in our opinion, are determined, first of all, by different times of manifestation and the speed of permafrost degradation within and around the studied settlements. At the same time, the existing and apparently developing set of adaptation mechanisms, as well as the results of a questionnaire survey conducted during our research, showed that only less than 15% of respondents would like to move to another settlement in case of permafrost degradation continues, together with the personal observations of the project participants, seem to indicate a certain stability of the existing life support systems of rural communities in the region to emerging natural challenges.

## References

1. Suleymanov A.A. Antropologiya kholoda: estestvennye nizkie temperatury v traditsionnoy sisteme zhizneobespecheniya yakutov (XIX v. — 30-e gg. XX v.) [Cryoanthropology: Influence of Natural Low Temperatures on the Yakut Traditional Life Sustenance System, 19th Century to the 1930s]. *Oriental Studies*, 2021, vol. 14, no. 1, pp. 115–133. DOI: 10.22162/2619-0990-2021-53-1-115-133
2. Shestakova A.A., Fedorov A.N., Torgovkin Y.I., Konstantinov P.Y., Vasyliov N.F., Kalinicheva S.V., Samsonova V.V., Hiyama T., Park H., Iijima Y., Iwahana G., Gorokhov A.N. Mapping the Main Charac-



- teristics of Permafrost on the Basis of a Permafrost-Landscape Map of Yakutia Using GIS. *Land*, 2021, no. 10 (5), p. 462. DOI: 10.3390/land10050462
3. Skachkov Yu.B. Dinamika izmeneniya srednegodovoy temperatury vozdukh v respublike Sakha (Yakutiya) za poslednie 50 let [Mean Annual Air Temperature Variation in the Republic of Sakha (Yakutia) During the Last 50 Years]. In: *Trudy Devyatogo mezhdunarodnogo simpoziuma «Balans ugleroda, vody i energii i klimat boreal'nykh i arkticheskikh regionov s osobym aktsentom na Vostochnuyu Evraziyu»* [Proc. 9th Intern. Symposium "C/H<sub>2</sub>O/Energy Balance and Climate over the Boreal and Arctic Regions with Special Emphasis on Eastern Eurasia"]. Yakutsk, Russia. Nagoya, Nagoya University Publ., 2016, pp. 208–211. (In Russ.)
  4. Suleymanov A.A. «Resursy kholoda» v sisteme zhizneobespecheniya sel'skikh soobshchestv Yakutii. *Vtoraya polovina XIX–XX v.: monografiya* ["Cold Resources" in the Life Support System of Rural Communities of Yakutia. The End of the 19th - the Beginning of the 20th Century]. Novosibirsk, Nauka Publ., 2022, 136 p. (In Russ.)
  5. Efimov G.F., Grave N.A. Pogrebennye l'dy rayona ozera Abalakh [Buried Ice of the Abalakh Lake Area]. *Sotsialisticheskoe stroitel'stvo* [Socialist Construction], 1940, no. 10–11, pp. 67–78.
  6. Fedorov A.N., Konstantinov P.Y., Vasilyev N.F., Shestakova A.A. The Influence of Boreal Forest Dynamics on the Current State of Permafrost in Central Yakutia. *Polar Science*, 2019, vol. 22, p. 100483. DOI: 10.1016/j.polar.2019.100483
  7. Shur Y., Hinkel K.M., Nelson F.E. The Transient Layer: Implications for Geocryology and Climate-Change Science. *Permafrost and Periglacial Processes*, 2005, vol. 16, no. 1, pp. 5–17. DOI: 10.1002/ppp.518
  8. Grosse G., Romanovsky V., Jorgenson T., Anthony K.W. Vulnerability and Feedbacks of Permafrost to Climate Change. *Eos, Transactions American Geophysical Union*, 2011, no. 9 (92), pp. 73–74. DOI: 10.1029/2011EO090001
  9. Kachurin S.P. *Termokarst na territorii SSSR* [Thermokarst on the Territory of the USSR]. Moscow, AS USSR Publ., 1961, 262 p. (In Russ.)
  10. Fedorov A.N., Gavriliev P.P., Konstantinov P.Y., Hiyama T., Iijima Y., Iwahana G. Estimating the Water Balance of a Thermokarst Lake in the Middle of the Lena River Basin, Eastern Siberia. *Ecology*, 2014, no. 2 (7), pp. 188–196. DOI: 10.1002/eco.1378
  11. Streletskiy D.A., Suter L.J., Shiklomanov N.I., Porfiriev B.N., Eliseev D.O. Assessment of Climate Change Impacts on Buildings, Structures and Infrastructure in the Russian Regions on Permafrost. *Environmental Research Letters*, 2019, no. 2 (14), p. 25003. DOI: 10.1088/1748-9326/aaf5e6
  12. Motenko R.G., Lupachev A.V., Tananaev N.I., Shepelev A.G. Vliyanie degradatsii mnogoletney merzloty v Tsentral'noy Yakutii na sodержanie organicheskogo ugleroda v pochvakh i verkhnikh sloyakh MMP [Impact of Permafrost Degradation in Central Yakutia on Organic Carbon Content in Soils and Upper Layers of Permafrost]. In: *Monitoring v kriolitozone: Sbornik dokladov Shestoy konferentsii geokriologov Rossii s uchastiem rossiyskikh i zarubezhnykh uchenykh, inzhenerov i spetsialistov* [Monitoring in Cryolithozone. Collection of Reports of the 6th Conference of Geocryologists of Russia with the Participation of Russian and Foreign Scientists, Engineers and Specialists]. Moscow, KDU Publ., Dobrosvet Publ., 2022, pp. 1074–1079. (In Russ.)
  13. Sannikova E.E., Evstafyeva S.V., Tananaev N.I., Danilov I.V., Artamonov I.A. Vliyanie lesnykh pozharov na degradatsiyu mnogoletney merzloty [Impact of Forest Fires on Permafrost Degradation]. In: *DIGITAL EDU. Tsifrovye kompetentsii v obrazovanii: Sbornik materialov Vserossiyskogo nauchnogo foruma s mezhdunarodnym uchastiem* [DIGITAL EDU. Digital Competences in Education: Proc. . All-Russ. Sci. Forum with International Participation]. Kirov, MCITO Publ., 2022, pp. 271–274. (In Russ.)
  14. Melnikov V.P., Osipov V.I., Brushkov A.V., Badina S.V., Drozdov D.S., Dubrovin V.A., Zheleznyak M.N., Sadurtdinov M.R., Sergeev D.O., Okunev S.N., Ostarkov N.A., Osokin A.B., Fedorov R.Yu. Adaptatsiya infrastruktury Arktiki i Subarktiki k izmeneniyam temperatury merzlykh gruntov [Adaptation of Arctic and Subarctic Infrastructure to Changes in the Temperature of Frozen Soils]. *Kriosfera Zemli* [Earth's Cryosphere], 2021, vol. 25, no. 6, pp. 3–15. DOI: 10.15372/KZ20210601
  15. Zhirkov A., Permyakov P., Kirillin A., Wen Z. Influence of Rainfall Changes on the Temperature Regime of Permafrost in Central Yakutia. *Land*, 2021, vol. 10, no. 11, p. 1230. DOI: 10.3390/land10111230

16. Lytkin L.V., Syromyatnikov I.I. Application of an Unmanned Aerial Vehicle for Large-Scale Mapping of Thermokarst Landforms. *IOP Conference Series: Earth and Environmental Science*, 2021, vol. 666, p. 062030. DOI: 10.1088/1755-1315/666/6/062030
17. Saito H., Iijima Y., Basharin N.I., Fedorov A.N., Kunitsky V.V. Thermokarst Development Detected from High-Definition Topographic Data in Central Yakutia. *Remote Sensing*, 2018, no. 10, p. 1579. DOI: 10.3390/rs10101579
18. Shiklomanov N.I., Streletskiy D.A., Swales T.B., Kokorev V.A. Climate Change and Stability of Urban Infrastructure in Russian Permafrost Regions: Prognostic Assessment Based on GCM Climate Projections. *Geographical Review*, 2017, no. 1(107), pp. 125–142. DOI: 10.1111/gere.12214
19. Doloisio N., Vanderlinden J.-P. The Perception of Permafrost Thaw in the Sakha Republic (Russia): Narratives, Culture and Risk in the Face of Climate Change. *Polar Science*, 2020, no. 26, p. 100589. DOI: 10.1016/j.polar.2020.100589
20. Svinoboev A.N., Neustroeva A.B. Izmenenie klimata i usloviy zhizni na Severe v vospriyatii korennoogo naseleniya [Changes in Climate and Living Conditions in the North as Perceived by Indigenous People]. *Urbanistika* [Urban Studies], 2017, no. 4, pp. 28–39. DOI: 10.7256/2310-8673.2017.4.24619
21. Fujiwara J. Flood Risk and Migration in the Republic of Sakha (Yakutia). In: *Global Warming and Human — Nature Dimension in Northern Eurasia*. Singapore, Springer, 2018, pp. 125–143. DOI: 10.1007/978-981-10-4648-3\_8
22. Ananicheva M.D., Litvinenko T.V., Filippova V.V. Izmenenie klimata v Respublike Sakha (Yakutiya) i ego vliyanie na naselenie: instrumental'nye izmereniya i nablyudeniya mestnykh zhitel'ey [Climate Change in the Republic of Sakha (Yakutia) and Its Impact on the Population: Instrumental Measurement and Observations of the Local Population]. *Geograficheskaya sreda i zhivye sistemy* [Geographical Environment and Living Systems], 2021, no. 3, pp. 6–21. DOI: 10.18384/2712-7621-2021-3-6-21
23. Takakura H., Iijima Y., Ignatieva V.B., Fedorov A.N., Goto M., Tanaka T. *Permafrost and culture. Global Warming and the Republic of Sakha (Yakutia), Russian Federation*. Tohoku, Center for North-east Asian Studies, Tohoku University, 2021, 60 p.
24. Takakura H., Fujioka Y., Ignatyeva V., Vinokurova N., Grigorev S., Boyakova S., Tanaka T. Differences in Local Perceptions about Climate and Environmental Changes among Residents in a Small Community in Eastern Siberia. *Polar Science*, 2020, no. 27, pp. 100556–100630. DOI: 10.1016/j.polar.2020.100556
25. Solovyev P.A. *Kriolitizona severnoy chasti Leno-Amginskogo mezhdurech'ya* [Cryolithozone of the Northern Part of the Leno-Amginsky Interfluve]. Moscow, AS USSR Publ., 1959, 144 p. (In Russ.)
26. Safronov F.G. *Russkie na severo-vostoke Azii v XVII — seredine XIX v.: upravlenie, sluzhilye lyudi, krest'yane, gorodskoe naselenie* [Russians in Northeast Asia in the 17th — mid-19th Centuries: Management, Service People, Peasants, Urban Population]. Moscow, Nauka Publ., 1978, 258 p. (In Russ.)
27. Fedorov V.V. *Istoriya Amginskogo ulusa v datakh* [History of Amginsky District in Dates]. Yakutsk, Poligrafist Publ., 1996, 92 p. (In Russ.)
28. Redko M.A., Kulagin Yu.D., Pavlyak A.F., Gorizontov V.V., Gorizontova T.M., Kuzmina F.I., Kostenko S.A. *Yunkyrskiy nasleg* [Yunkyr Nasleg]. Olyokminsk, Central district library Publ., 2010, 24 p. (In Russ.)
29. Ugarov I.S., Efremov P.V. Monitoringovyie issledovaniya sel'skokhozyaystvennykh landshaftov v Tsentral'noy Yakutii [Cryoecological Monitoring Investigations of Agricultural Landscapes in Central Yakutia]. *Uspekhi sovremennogo estestvoznaniya* [Advances in Current Natural Sciences], 2011, no. 9, pp. 23–26.
30. Lytkin V.M. Temperaturnyy rezhim mnogoletnemerzlykh porod na uchastkakh proyavleniya termokarstovykh protsessov [Temperature Regime of Perennially Frozen Rocks in the Areas of Thermokarst Processes Manifestation]. In: *Geologiya i mineral'no-syr'evye resursy Severo-Vostoka Rossii: Materialy XII Vserossiyskoy nauchno-prakticheskoy konferentsii* [Geology and Mineral Resources of the Northeast of Russia. Proc. 12th All-Russ. Sci. and Pract. Conf.]. Yakutsk, NEFU Publ., 2022, pp. 424–427. DOI: 10.52994/9785751332846\_2022\_89 (In Russ.)

31. Gotovtsev S.P., Kopyrina L.I., Efimova A.P., Zakharova V.I., Nogovitsyn D.D., Poryadina L.N., Zabolotnik P.S., Syromyatnikov I.I., Ivanova A.Z., Egorov N.N., Desyatkin R.V., Okhlopkov I.M., Ivanova E.I., Mikhaleva L.G., Kirillin E.V., Gabysheva O.I., Salova T.A., Kilmyaninov V.V. *Krioekosistemy basseyna reki Alazei: monografiya* [Cryoecosystems in the Alazeya River Basin]. Novosibirsk, Geo Publ., 2018, 210 p. (In Russ.)
32. Boyakova S.I., Grigoryev S.A., Takakura H., Fudzhioka Y. Sel'skie poseleniya Yakutii v usloviyakh izmeneniya klimata: strategii adaptatsii k degradatsii vechnoy merzloty [Rural Settlements of Yakutia in the Face of Climate Change: Strategies for Adapting to the Degradation of Permafrost]. In: *Pravo v kontekste ustoychivogo razvitiya Arktiki: vyzovy vremeni i novye vozmozhnosti: sbornik materialov mezhdunarodnoy nauchno-prakticheskoy konferentsii* [Law in the Context of Sustainable Development of the Arctic: Challenges of Time and New Opportunities: Proc. Intern. Sci. and Pract. Conf.]. Kazan, Buk Publ., 2021, pp. 216–221. (In Russ.)

*The article was submitted 21.02.2023; approved after reviewing 23.02.2023;  
accepted for publication 03.03.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 196–205.

Original article

UDC [004.89:61](470.1/.2)(045)

doi: 10.37482/issn2221-2698.2023.52.232

## Artificial Intelligence in the Healthcare System of the Arctic Regions of the Russian Federation

**Lyudmila E. Khaymina**<sup>1✉</sup>, Cand. Sci. (Ped.), Associate Professor

**Larisa I. Zelenina**<sup>2</sup>, Cand. Sci. (Tech.), Associate Professor

**Evgeniy S. Khaymin**<sup>3</sup>, Senior Lecturer

**Svetlana I. Fedkushova**<sup>4</sup>, Lecturer

<sup>1,2,3</sup> Northern (Arctic) Federal University named after M.V. Lomonosov, Naberezhnaya Severnoy Dviny, 17, Arkhangelsk, Russia

<sup>2</sup> North-West Institute of Management of the Russian Presidential Academy of National Economy and Public Administration (NWIM RANEP), Sredniy pr., V.O., 57/43, Saint Petersburg, Russia

<sup>4</sup> Arkhangelsk College of Commerce and Economics, pr. Obvodnyy kanal, 12, Arkhangelsk, Russia

<sup>1</sup> l.khaimina@narfu.ru, ORCID: <https://orcid.org/0000-0003-4552-0440>

<sup>2</sup> l.zelenina@narfu.ru, ORCID: <https://orcid.org/0000-0002-0155-3139>

<sup>3</sup> e.khaymin@narfu.ru, ORCID: <https://orcid.org/0000-0003-0523-3623>

<sup>4</sup> sif-7@yandex.ru, ORCID: <https://orcid.org/0009-0008-9545-5230>

**Abstract.** Currently, in the Russian Federation, much attention is paid to the introduction of artificial intelligence technologies into the healthcare system in order to improve the quality of medical care provided. The AI methods support the medical decision-making; it becomes possible to obtain a second opinion for a doctor when determining a diagnosis, which leads to a reduced risk of determining erroneous diagnoses (including missed pathologies). The development of high-tech medical care is a particularly relevant issue for medical institutions in the Arctic regions, which are geographically distributed and remote territories with hard natural and climatic conditions. The solution of this issue is designed to ensure natural sustainable population growth in these regions and increase the life expectancy of the population of the Russian Arctic, including the indigenous peoples of the North. The article considers the positive experience of cooperation between Russian research centers, medical companies and higher educational institutions in the development and implementation of medical software products based on technologies and methods of artificial intelligence on the example of such Arctic territories of Russia as the Yamalo-Nenets Autonomous Okrug, the Republic of Sakha (Yakutia), the Murmansk Oblast, the Republic of Karelia and the Arkhangelsk Oblast.

**Keywords:** *Arctic region, artificial intelligence, healthcare system, decision support system, neural network, machine learning algorithm, telemedicine*

### Introduction

In 2019, the Russian Federation approved the “National strategy for the development of artificial intelligence for the period until 2030”. One of its priority areas was the use of artificial intelligence technologies in the social sphere, including for improving the quality of healthcare services<sup>1</sup>. The expected result of using software solutions based on artificial intelligence technolo-

\* © Khaymina L.E., Zelenina L.I., Khaymin E.S., Fedkushova S.I., 2023

For citation: Khaymina L.E., Zelenina L.I., Khaymin E.S., Fedkushova S.I. Artificial Intelligence in the Healthcare System of the Arctic Regions of the Russian Federation. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 232–245. DOI: 10.37482/issn2221-2698.2023.52.232

<sup>1</sup> Ukaz Prezidenta RF ot 10 oktyabrya 2019 g. № 490 «O razvitiy iskusstvennogo intellekta v Rossiyskoy Federatsii» [Decree of the President of the Russian Federation of October 10, 2019 No. 490 “On the development of artificial intelli-

gies and methods in Russian healthcare was to improve the quality of medical services provided and, as a result, to raise the standard of living of the population.

Currently, there is a growing interest in AI solutions related to the digital transformation of healthcare both in the field of diagnosing and prognosticating diseases (including monitoring and assessing the condition of patients in real time), and supporting clinical trials and creating robotic autonomous devices [1; 2].

AI-based diagnostics enables early detection of disease, which generally contributes to increasing the predicted life expectancy of the population. The opportunity to obtain additional opinions/consultations from colleagues from the professional community reduces the risks of medical errors [3].

Medical software solutions based on AI algorithms, helping doctors at all stages of decision-making [4], are able to assess the patient's condition, save time spent on making notes when examining patients, and reduce the risks of untimely identified pathologies or erroneous diagnoses. During difficult epidemiological situations, these technologies are designed not only to significantly reduce the workload of doctors, to facilitate the work of medical staff, but also to help them save the lives of patients.

In the Arctic zone of the Russian Federation, the problem of insufficiently high quality of medical care has long been an urgent one, due to the shortage of both medical facilities and medical personnel (especially in remote, hard-to-reach regions, places of residence of indigenous and small peoples). Modern remote methods based on artificial intelligence technologies and related to prevention, diagnosis and treatment [5; 6] are intended to become a solution to this problem.

### ***Telemedicine technologies in the regions***

Telemedicine technologies are being actively introduced into the healthcare system of the Russian Federation. Today, this is not only an opportunity for patients from the regions to communicate remotely via video with a doctor of the relevant specialization.

The most common type of telemedicine in the regions is "doctor-to-doctor" consultations. This method of interaction is not necessarily based on video communication. Medical needs can be resolved by exchanging research results/medical reports, getting a second opinion on ultrasound, MRT and other studies from colleagues from other medical institutions. It should be noted that the "second reading", when the study of, for example, X-rays, is independently conducted by two doctors at the same time, improves the quality of examinations. This format of communication in the professional community is especially important for regional doctors when they are faced with difficult diagnosis/treatment or the lack of specialized doctors in regional clinics.

Telemedicine technologies allow regional doctors to send requests for planned or emergency hospitalization of patients to higher-level medical institutions and determine the possibility

---

gence in the Russian Federation"]. URL: <https://www.garant.ru/products/ipo/prime/doc/72738946/> (accessed 30 January 2023).

of treatment on-site or at another medical center. If a patient is referred to another medical institution, the service notifies the receiving organization. At the same time, the appointment service allows the patient to choose the date and time of the visit independently. In case of hospitalization of a patient (if necessary), these technologies can solve the issues of interaction with air ambulances for geographically distributed regions.

Today, telemedicine allows holding consiliums of doctors from different medical organizations, when opinions from specialists of different fields are simultaneously required. At the same time, the system allows to solve many organizational issues, from the possibility of using digital signatures to the preparation of relevant medical reports.

Functioning telemedicine platforms make it possible to automate the work of ambulance specialists. For example, ambulance staff can transmit information that a patient in a serious condition will be hospitalized in the relevant hospital, which will undoubtedly allow this medical institution to prepare in advance for receiving the patient and provide him with the necessary assistance in a timely manner. If ambulance staff determines that hospitalization of the patient is not required, but a doctor's home call is necessary, the service also provides this option, and information about further medical care can be obtained.

An equally common type of telemedicine is the "doctor-patient" type of consultations, conducted on the results of an initial examination. In this case, both a consulting physician and a patient himself can initiate a consultation. Telemedicine platform services help a consulting physician collect the necessary medical information about a patient. Thus, after authorization through the Unified Identification and Authentication System, a patient can fill in a questionnaire (once or repeatedly) with his/her permanent (heredity, height, weight) or dynamic indicators (pulse rate, blood pressure, other results of his/her own observations) on the regional portal on the doctor's recommendation. The obtained data will allow a consulting physician to objectively assess the patient's condition and prescribe / correct the ongoing treatment.

Thus, telemedicine technologies can become the basis for medical decision-making. The range of directions is large; the priority of implementing certain capabilities of the telemedicine platform can be independently determined by regional medical institutions<sup>2</sup>.

### ***AI technologies in the Arctic healthcare system***

Artificial intelligence, actively developing in the healthcare system, has significant results both in the field of online diagnosis of diseases based on medical images, application of speech recognition systems, and in many other areas of medical data processing and analysis [7; 8]. Let us consider some examples of effective interaction between Russian medical companies, research centers, development institutes and higher educational institutions in the development of medical

---

<sup>2</sup> Evercare. Digital medicine in Russia. Telemedicine in the regions: multilateral dialogue. URL: <https://evercare.ru/> (accessed 30 January 2023).



software products based on AI technologies and used in medical institutions in the Arctic regions of Russia.

### ***Voice2Med software for voice filling in medical documentation***

The Russian company (group of companies) “Speech Technology Centre” presented the Voice2Med program, developed on the basis of artificial intelligence for medical speech recognition. The software product allows filling out medical documents in real time, converting doctor’s voice into text. The text is entered into the field where the cursor is positioned (for example, a Word document or a medical information system). A doctor dictates the entire description or makes changes to a ready-made template. The use of this product can significantly reduce the time of medical workers to fill in documents. In addition, the functionality of the product includes voice navigation and filling out protocols in medical information systems, voice confirmation of recognition results and the ability to voice control the printing and saving of documents. The program provides support for specialized dictionaries, which allows for accurate recognition and correct processing of medical terms. The program can be used by diagnosticians (ultrasound, CT/MRT/PET CT, Pathomorphology, Radiology, Cardiology, Endoscopy), doctors in clinics and hospitals, and outreach brigades. Speech recognition does not require access to the Internet. The recognition language is Russian<sup>3</sup>.

This voice filling system is being actively implemented in medical institutions in various regions. For example, in the Murmansk Oblast, one of the first medical institutions to use the system of voice filling out medical documents was the Murmansk Regional Clinical Hospital named after P.A. Bayandin<sup>4</sup>.

### ***TeleMD. Botkin.AI software platform***

The Russian company Itellogic, together with the Russian Cancer Research Center named after N. N. Blokhin and other leading scientific and clinical centers, presented the TeleMD software platform, which allows diagnosing and assessing the probability of cancer diseases based on the analysis of medical images and other medical data about a person. An important point for the use of this software product in medical institutions in the Arctic regions is the ability for the attending physician to receive remote consultations with colleagues from the professional community.

An important point is the process of cooperation between medical institutions located in the federal center (Moscow) and in remote territories of Russia. An example of such co-operation is the opportunity for doctors in the Yamalo-Nenets Autonomous Okrug to use the capital’s Hub Telemed platform. Radiological examinations of patients from regional clinics can be sent in anon-

---

<sup>3</sup> Group of companies STC. Program for filling out medical documentation by voice. Voice2Med. URL: <https://www.speechpro.ru/product/programmy-dlya-raspoznaniya-rechi-v-tekst/voice2med> (accessed 30 January 2023).

<sup>4</sup> V oblastnoy bol'nitse nachinayut zapolnyat' dokumenty pri pomoshchi golosa [The regional hospital is starting to fill out documents using voice]. URL: <https://kn51.ru/2020/01/17/v-oblastnoy-bolnice-nachinayut-zapolnyat-dokumenty-pri/> (accessed 30 January 2023).

ymized form to the platform, where they will be analyzed using neural networks (signs of seven pathologies can be examined at once), the results of which are returned to the doctor for a final description. The use of artificial intelligence technologies does not replace the consulting physician, but increases the accuracy and speed of disease diagnosis, including in the early stages<sup>5</sup>.

The Itellogic company, a Skolkovo resident, has also launched a pilot project to use the Botkin.AI platform in the Murmansk Oblast. The platform is a service that can be accessed by any authorized doctor. The platform is based on artificial intelligence technologies to support medical decisions: early detection of oncological (including) diseases, predicting the risks of disease development, and predicting the time when a patient will see a doctor. As part of the pilot project, it was planned to implement integration with the PACS (Picture Archiving and Communication System) system. Incoming medical images would be depersonalized and transferred to the Botkin.AI platform for analysis and recognition of disease foci. The project also included integration with electronic medical records to analyze the risks of disease development. It was planned to connect the Central Archive of Medical Images (CAMI) of the region, functioning on the basis of the Murmansk Regional Clinical Hospital, to the platform [5].

In general, the presented hardware and software complex can be connected to PACS or directly to a data source (CT, PET/CT, MRT, X-ray, fluorography). The list of some tasks solved by the platform includes computed tomography, X-ray, fluorography, mammography and others.

### ***Webiomed predictive analytics platform***

Scientists from Petrozavodsk State University (Karelia), together with the K-Sky company, a resident of the Skolkovo Foundation, have developed a unique scientific unit (USU), which can be used by doctors as a medical decision support system. According to the director of the Medical Institute of PetrSU, Alexander Balashov, this is the first hardware and software complex in the Russian Arctic, which includes artificial intelligence technologies, a virtual educational clinic, robots, telemedicine and other modern areas of the healthcare system. The installation allows anticipating possible health risks for patients related to cardiovascular diseases, oncology, lung and bronchial diseases, pregnancy complications<sup>6</sup>.

All biomedical data during the provision of medical services to patients (treatment, counselling, etc.) are entered into the medical information system "Unified Digital Platform", with which medical institutions of Karelia interact. Analysis of the data accumulated in the database allows a doctor to form a diagnostically holistic picture of a patient, on the basis of which treat-

---

<sup>5</sup>Vrachi Yamalo-Nenetskogo avtonomnogo okruga smogut ispol'zovat' moskovskie servisy iskusstvennogo intellekta [Doctors of the Yamalo-Nenets Autonomous Okrug will be able to use Moscow artificial intelligence services], 30.09.2022. URL: [https://advis.ru/php/view\\_news\\_ajax.php?id=7A08B789-82EF-9445-8ED0-635F922DE8A5](https://advis.ru/php/view_news_ajax.php?id=7A08B789-82EF-9445-8ED0-635F922DE8A5) (accessed 30 January 2023).

<sup>6</sup>Unikal'naya nauchnaya ustanovka: zdravookhranenie Karelii usovershenstvuyut s pomoshch'yu iskusstvennogo intellekta [A unique scientific installation: healthcare in Karelia will be improved with the help of artificial intelligence]. URL: <https://rk.karelia.ru/social/science/unikalnaya-nauchnaya-ustanovka-zravookhranenie-karelii-usovershenstvuyut-s-pomoshhyu-iskusstvennogo-intellekta/> (accessed 30 January 2023).

ment and dynamic monitoring are determined. Moreover, the more data volume will be downloaded and processed by the USU, the higher will be the accuracy of individual recommendations for a particular patient. Biomedical data from other regions, such as Kirov Oblast and Yamalo-Nenets Autonomous Okrug, are used to increase the volume of processed USU databases, and a co-operation agreement has been signed with the Ministry of Health of Murmansk Oblast.

The solution to the problem of medical data processing is based on the use of the Webiomed platform for predictive analytics and risk management in healthcare (developed by K-Sky), which uses such intelligent processing methods as predictive mathematical modeling, machine learning, and NLP technologies for data analysis.

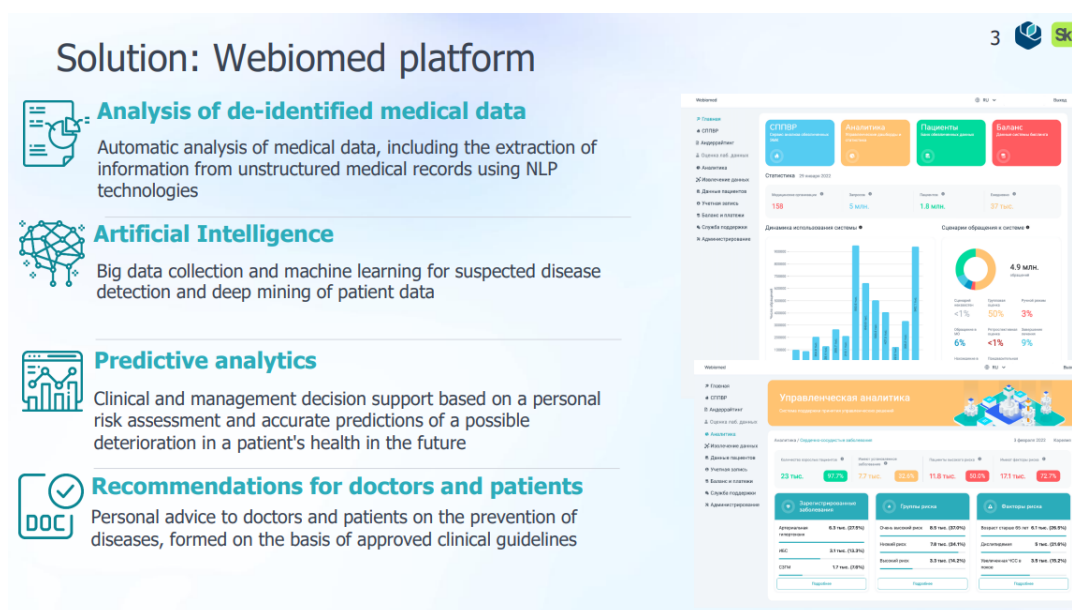


Fig. 1. Webiomed platform<sup>7</sup>.

The Webiomed platform was used by the government of the Yamalo-Nenets Autonomous Okrug together with the Association of developers and users of artificial intelligence in medicine “National Medical Knowledge Base” (NMKB) in the project “Implementation of artificial intelligence systems for medicine”. According to 2019 data, the project was tested in clinical trials at the Muravlenkovo City Hospital with a large database of electronic medical records.

Some results obtained during the pilot operation of Webiomed:

- accuracy of identifying risk factors and assessing the risk group for cardiovascular disease development by the Webiomed system is 99% (subject to the completeness and correctness of the information submitted for analysis) (the average value of accurate assessment by doctors is 51% of cases);
- correctness of assessment of the absolute risk of death from cardiovascular diseases among patients aged 40 to 65 years: in 37% of medical check-up cards the assessment

<sup>7</sup> Webiomed. Webiomed predictive analytics platform. URL: <https://webiomed.ru/> (accessed 30 January 2023).

was correct, in 61% — the assessment was underestimated, in 2% — overestimated (compared to the correct estimate determined by Webiomed);

- correctness of determining the health group. Health group I (patients without chronic non-communicable diseases and associated risk factors, or with a low/moderate risk of CVD mortality): in 9% of cases of patients incorrectly assigned to this health group, the Webiomed platform identified significant risk factors, assigning them high/very high risk degree. Health group II: 15% of misdiagnosed patients with a very high risk and 45% with a high risk of CVD were found<sup>8</sup>.

According to 2022, based on the integration of K-Sky and RT MIS software products, a joint project on medical data analysis based on artificial intelligence technologies (Webiomed platform) was implemented in the Republic of Sakha. Within three months, more than 2.8 million impersonal electronic medical documents were analyzed, 18 medical organizations in the region were connected, and about 2000 doctors had the opportunity to work on predicting the development of 40 diseases (CVD, blood diseases, diabetes mellitus, gastrointestinal and respiratory diseases, etc.)<sup>9</sup>.

### ***Sciberia software. Pilot project "ONKOPOISAKHA.RF"***

Sciberia, a resident of Yakutia Technopark and Skolkovo, develops software for analyzing medical images using computer vision and machine learning methods. The products allow solving the problems of diagnosing COVID-19 and acute cerebrovascular accident based on CT examinations of chest or brain<sup>10</sup>.

In 2020, the solution proposed by the company was applied to the task of identifying the COVID-19 viral infection in medical institutions in Yakutia. The speed of image processing averaged about 15 seconds, the accuracy of the study was up to 98.5%, while doctors needed at least 30–40 minutes to decipher the CT study<sup>11</sup>.

The Sciberia program complex is being implemented in the work of medical institutions of the Republic of Sakha (Yakutia). In addition, healthcare organizations in six regions of the Russian Federation were connected to Sciberia software in testing mode, including the Medical Information and Analytical Center of the Arkhangelsk Oblast<sup>12</sup>.

<sup>8</sup> Webiomed. Implementation in the Yamalo-Nenets Autonomous Okrug. URL: <https://webiomed.ru/nashi-proekty/yanao/> (accessed 30 January 2023).

<sup>9</sup> Iskusstvennyy intellekt proanaliziroval pochti 3 mln elektronnykh meditsinskikh dokumentov v Yakutii [Artificial intelligence analyzed almost 3 million electronic medical documents in Yakutia]. URL: <https://ysia.ru/tsifrovaya-meditsina-v-yakutii-proanalizirovali-pochti-3-mln-elektronnykh-dokumentov/> (accessed 30 January 2023).

<sup>10</sup> SCIBERIA. Healthcare software based on computer vision and machine learning. URL: <https://sciberia.ru/#about> (accessed 30 January 2023).

<sup>11</sup> Yakutskie uchenye nauchilis' diagnostirovat' porazhenie legkikh za 15 sekund [Yakut scientists have learned to diagnose lung damage in 15 seconds]. URL: <https://ysia.ru/yakutskie-uchenye-nauchilis-diagnostirovat-porazhenie-legkih-za-15-sekund/> (accessed 30 January 2023).

<sup>12</sup> Yakutskaya kompaniya «Sayberiya» sozdala mnogomestnuyu rabochuyu stantsiyu na baze «El'brus 16S» [The Yakut company "Sciberia" has created a multi-seat workstation based on the "Elbrus 16S"]. 2023. URL: [https://www.cnews.ru/news/line/2023-01-31\\_yakutskaya\\_kompaniya\\_sajberiya](https://www.cnews.ru/news/line/2023-01-31_yakutskaya_kompaniya_sajberiya) (accessed 30 January 2023).

With the support of the Ministry of Health of the Russian Federation, a pilot project “ONKOPOISKSAKHA.RF” has been developed in the Republic of Sakha (Yakutia), which allows the use of artificial intelligence technologies in preventive medicine of oncological pathologies. The project has an official website.

The questionnaire filled in by the patient is evaluated by trained neural networks, and in the case of a high risk of oncology, a recommendation to make an appointment at a medical institution, including instrumental and laboratory tests at the Yakutsk Republican Oncological Dispensary, is issued<sup>13</sup>.

### **Digital FAP mobile diagnostic software system**

In 2022, testing of the hardware and software complex for mobile diagnostics “Digital FAP” by SberMedII was carried out in the Murmansk Oblast. It is a compact case, safe for transportation and storage, the basic set of which includes the necessary diagnostic equipment.

#### MDDC FAP medical equipment



ECG recorder

Blood pressure monitor

Blood analyzer (glucose, cholesterol, triglycerides)

Thermometer

Urine analyzer

Pulse oximeter

The set can be added with an otoscope, portable ultrasound machine, fluoroscopy or X-ray machine, Holter monitor, video conference system for consulting with specialists, the Top 3 Diagnoses smart health assistant, other services and equipment.

Fig. 2. Digital FAP. Medical equipment.

The complex is integrated with the Medical Digital Diagnostic Center and, working on artificial intelligence algorithms, allows deciphering and routing data received from devices<sup>14</sup>. It should be noted that as of 2022, the platform of the Medical Digital Diagnostic Center united more than 50 SberMedII solutions (including “CT Lungs”, “CT Stroke”, “TOP-3” Smart digital medical assistant based on AI) and services of partner companies.

<sup>13</sup> SBERMED AI Iskusstvennyy intellekt v rossiyskoy sisteme zdravookhraneniya [SBERMED AI Artificial intelligence in the Russian healthcare system]. 2022. URL: <https://sbermed.ai/en/iskusstvennyy-intellekt-v-medsine-rossii/> (accessed 30 January 2023).

<sup>14</sup> SBERMED AI. Digital FAP. URL: <https://sbermed.ai/diagnostic-center/meditsinskoye-oborudovaniye-s-ii/fap/> (accessed 30 January 2023).

## How MDCC FAP works

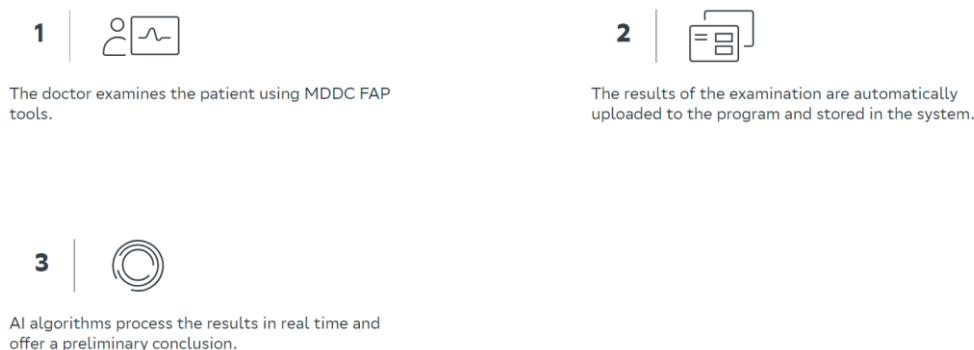


Fig. 3. Digital FAP. Work principles.

Thanks to the ability of connecting to services based on artificial intelligence algorithms, residents of remote and hard-to-reach areas can not only undergo examinations, but also receive scheduled or emergency consultations with relevant specialists of regional hospitals. At the same time, there is a high speed of obtaining the results of laboratory and instrumental studies in real time and their automatic entry into the patient's electronic record <sup>15</sup>.

### Conclusion

"Digital health", defined today as "cultural transformation in healthcare", is designed to solve many problems of providing medical services, including in institutions in the Arctic regions of the Russian Federation. Difficult climatic conditions, territorial remoteness and distribution of regions, insufficient provision of medical personnel and equipment cause such problems as reduced life expectancy of the population, high level of infectious diseases, etc. <sup>16</sup> The solution to these problems can be found in the use of advanced technologies related to digitalization and informatization of healthcare.

Undoubtedly, one of the most advanced areas is IT solutions developed on the basis of artificial intelligence technologies. Already today, artificial intelligence makes it possible to analyze skin condition using a smartphone, to analyze a person's condition using a video selfie, to measure a person's blood pressure using an ordinary camera, to carry out the initial diagnosis of severe neurodegenerative diseases on the basis of the analysis of the patient's speech, to determine the degree of risk of developing atherosclerotic cardiovascular diseases within 10 years on the basis of a chest X-ray, to predict the development of such diseases as dementia, Alzheimer's disease and many others based on the results of brain activity, and much more <sup>17</sup>.

An important point is the study and use by regional medical institutions of advanced digital medicine practices operating on machine learning and computer vision algorithms. Prompt and

<sup>15</sup> Information agency "B-port" News of Murmansk and the Murmansk Oblast, 2022. URL: <https://b-port.com/news/273748> (accessed 30 January 2023).

<sup>16</sup> Evercare. Digital health in the Arctic. URL: <https://evercare.ru/news/cifrovoe-zdorove-v-arktike> (accessed 30 January 2023).

<sup>17</sup> Evercare. Artificial intelligence. URL: <https://evercare.ru/category/iskusstvennyy-intellekt> (accessed 30 January 2023).



accurate examinations, higher quality of medical care should be the prospects of introducing artificial intelligence into the healthcare system.

## References

1. Gusev A.V., Vladzimirskyy A.V., Sharova D.E., Arzamasov K.M., Khramov A.E. Razvitie issledovaniy i razrabotok v sfere tekhnologiy iskusstvennogo intellekta dlya zdravookhraneniya v Rossiyskoy Federatsii: itogi 2021 goda [Evolution of Research and Development in the Field of Artificial Intelligence Technologies for Healthcare in the Russian Federation: Results of 2021]. *Digital Diagnostics*, 2022, vol. 3, no. 3, pp. 178–194. DOI: 10.17816/DD107367
2. Davenport T., Kalakota R. The Potential for Artificial Intelligence in Healthcare. *Future Hospital Journal*, 2019, vol. 6 (2), pp. 94–98. DOI: 10.7861/futurehosp.6-2-94
3. Evgina S.A., Gusev A.V., Shamanskiy M.B., Godkov M.A. Iskusstvennyy intellekt na poroge laboratorii [Artificial Intelligence on the Doorstep of the Laboratory]. *Laboratornaya sluzhba* [Laboratory Service], 2022, no. 2 (11), pp. 18–26. DOI: 10.17116/labs20221102118
4. Yang L., Ene I.C., Arabi Belaghi R., Koff D., Stein N., Santaguida P.L. Stakeholders' Perspectives on the Future of Artificial Intelligence in Radiology: A Scoping Review. *European Radiology*, 2021, no. 32 (3), pp. 1477–1495. DOI: 10.1007/s00330-021-08214-z
5. Kiselev M.A., Avdeeva T.V. *Primenenie sistem iskusstvennogo intellekta v usloviyakh novogo etapa osvoeniya Arktiki. Analiticheskiy obzor* [Application of Artificial Intelligence Systems in the Conditions of a New Stage of Arctic Exploration. Analytical Review]. Moscow, 2018, 52 p. (In Russ.)
6. Zelenina L.I., Fedkushova S.I. Ekologiya Arktiki i zdorov'e cheloveka (na primere Arkhangel'skoy oblasti) [Ecology of Arctic and Human Health (for Example, the Arkhangelsk Region)]. *Innovatika*, 2014, no. 2, pp. 32–39.
7. Karpov O.E., Khramov A.E. *Informatsionnye tekhnologii, vychislitel'nye sistemy i iskusstvennyy intellekt v meditsine* [Information Technologies, Computing Systems and Artificial Intelligence in Medicine]. Moscow, DPK Press Publ., 2022, 480 p. (In Russ.)
8. Zelenina L., Khaymina L., Khaymin E., Khripunov D., Zashikhina I. Convolutional Neural Networks in the Task of Image Classification. *Mathematics and Informatics*, 2022, vol. 65, no 1, pp. 19–29. DOI: 10.53656/math2022-1-2-con

*The article was submitted 27.02.2023; approved after reviewing 24.03.2023;  
accepted for publication 25.03.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

## REVIEWS AND REPORTS

Arctic and North. 2023. No. 52. Pp. 206–227.

Review article

UDC [811.511.2+008(=511.2)](985)(045)

doi: 10.37482/issn2221-2698.2023.52.246

### All-Russian Scientific and Educational Project “Preserve the Nenets Language and Culture Together”: Experience of Interaction and Prospects for Implementation

Alexander M. Polikarpov <sup>1</sup>✉, Dr. Sci. (Philol.), Professor

Maria V. Druzhinina <sup>2</sup>, Dr. Sci. (Ped.), Professor

Elena V. Polikarpova <sup>3</sup>, Cand. Sci. (Philol.), Associate Professor

<sup>1,2,3</sup> Northern (Arctic) Federal University named after M.V. Lomonosov, Naberezhnaya Severnoy Dviny, 17, Arkhangelsk, Russia

<sup>1</sup> a.polikarpov@narfu.ru ✉, ORCID: <https://orcid.org/0000-0003-0726-2524>

<sup>2</sup> m.druzhinina@narfu.ru, ORCID: <https://orcid.org/0000-0002-3445-6757>

<sup>3</sup> polikarpova.narfu@yandex.ru, ORCID: <https://orcid.org/0000-0001-9631-0860>

**Abstract.** The purpose of the article is to present to a wide range of readers the All-Russian scientific and educational project “Preserve the Nenets Language and Culture Together”, which is implemented at the Northern (Arctic) Federal University in cooperation with other institutions and organizations related to the study of the Nenets language and the preservation of Nenets culture. The problem that representatives of science, education, politics, economics, and social sphere are working to solve is to find effective mechanisms for preserving the languages and culture of the indigenous peoples of the Arctic region, which include the Nenets as the target group of the project. The paper provides a scientific rationale of the project, outlines the theory and practice of studying, describing, the possibilities of preserving the language and culture of the Nenets people. The authors describe the interdisciplinary activities and forms of work within the framework of the project being implemented since 2022 on the basis of current data of linguistics, pedagogy, cultural studies. Monitoring studies, academic activities, research projects, cultural and educational work, decisions and agreements reached are presented, aimed at transferring knowledge and achieving synergy in preserving the Nenets language and culture. The article substantiates the necessity of further implementation of the project, which allows coordinating the work of specialists of different organizations and structures, to build a language educational policy of interregional and regional levels in the Arctic territories of the Russian Federation, aimed at balanced preservation of the language and culture of the Nenets people.

**Keywords:** *research and education project, preservation of the Nenets language, Nenets culture, ethno-education, language policy, Arctic indigenous people*

#### Introduction

#### Relevance. Problematics

In the modern multicultural and multilingual conditions of Russia’s development, the idea of purposeful preservation of the languages and cultures of the indigenous peoples of the Arctic region seems particularly relevant due to the pronounced focus on the development of the Arctic territories. In order to prevent possible difficulties that may arise as a result of misunderstandings and even conflicts in the ethno-cultural sphere, cultural and educational activities, coverage of

\* © Polikarpov A.M., Druzhinina M.V., Polikarpova E.V., 2023

For citation: Polikarpov A.M., Druzhinina M.V., Polikarpova E.V. All-Russian Scientific and Educational Project “Preserve the Nenets Language and Culture Together”: Experience of Interaction and Prospects for Implementation. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 246–269. DOI: 10.37482/issn2221-2698.2023.52.246

events and measures related to the preservation of indigenous languages in the information space of the northern regions, as well as high professional level of specialists engaged in scientific research aimed at studying the state of the languages of the indigenous peoples of the Arctic, ethno-education and language policy are necessary. Due to the challenges of our time, the problem of preserving the Nenets language and culture of the Nenets people is becoming increasingly urgent.

In the regions of Russia with a compact Nenets population, there is a lack of motivation among children, youth and their parents to study and preserve their native language; there is a certain disappointment among representatives of the Nenets ethnic group in the prospects of employment with the Nenets language, the possibilities of practical application of their native language in everyday life are seen to be very limited. The gradual disappearance of the real ethno-cultural environment in the places of residence of the Nenets people is recorded, there is a desire to leave their small homeland and go to large cities for the purpose of career growth. It should also be noted that there is no unified strategy, coordinated action and decision-making on the part of the various organizations which, by their functional responsibilities, are called upon to be active in the development and implementation of language, educational, social, economic and cultural policy.

Projects and programs aimed at preserving inter-ethnic and inter-confessional harmony in the Arctic region, such as the scientific and educational project “Preserve the Nenets language and culture together”, acquire special significance within the framework of the International Decade of Indigenous Languages, declared by the UN General Assembly. At the 74th session of the United Nations General Assembly, which took place on November 6, 2019, ten years, starting from 2022, were declared the International UN Decade of Indigenous Languages. This decision is enshrined in the relevant final UN document. The resolution on the rights of the indigenous peoples states that a large number of languages, especially indigenous ones, are in danger of extinction. Therefore, there is an “urgent need for the preservation, popularization and revival” of these languages<sup>1</sup>. In connection with this decision, UN member states are recommended to take measures to preserve languages and develop national mechanisms for their implementation while allocating appropriate funding for activities carried out within the framework of the International Decade for Indigenous Languages.

In the Russian Federation, particular attention has recently been paid to the preservation and development of small indigenous languages, including those of the Arctic, Siberia and the Far East. A number of measures have been taken to revitalize minority indigenous languages. Nowadays, the designation of the ethnic group “Nenets” has been added to the “List of Indigenous Mi-

---

<sup>1</sup> Seventy-fourth session of the UN. Third Committee Agenda item 67 (a) Rights of indigenous peoples: rights of indigenous peoples. URL: <https://documents-dds-ny.un.org/doc/UNDOC/LTD/N19/348/71/PDF/N1934871.pdf?OpenElement> (accessed 09 January 2023).

nority Peoples of the North, Siberia and the Far East of the Russian Federation”, approved by the Government of the Russian Federation, which covers a total of 40 peoples<sup>2</sup>.

The aim of the project presented in this article is to preserve the language and culture of the Nenets people. The main objectives of the project include:

- interaction with government departments of the Nenets and Yamalo-Nenets Autonomous okrugs, ethno-cultural, scientific centers and education development centers of the regions with compact Nenets population;
- conducting monitoring studies to identify the state of the Nenets language and the preservation of the culture of the Nenets people in the Nenets Autonomous Okrug, Yamalo-Nenets Autonomous Okrug and other regions with a compact Nenets population;
- presentation of research results in the field of the Nenets language and culture at scientific events at the international, all-Russian, interregional and regional levels; publication of materials on the preservation and development of the Nenets language on social networks and on the websites of scientific and educational organizations;
- conducting the Federal Olympiad for schoolchildren in the native languages and literature of the peoples of Russia (Nenets language); preparation and implementation of a professional retraining program “Teaching the Nenets language and the culture of the Nenets people in the context of digitalization” for Nenets language teachers and cultural workers, etc.

The project co-directors are A.M. Polikarpov, Doctor of Philology, Professor, Head of the Department of Translation and Applied Linguistics of NARFU, Director of the Scientific and Educational Center “Integrative Translation Studies of the Subarctic Space” and M.V. Druzhinina, Doctor of Pedagogical Sciences, Professor, Professor of the Department of Translation and Applied Linguistics of NARFU.

The implementers and participants of the project are teachers and staff of the Department of Translation and Applied Linguistics and the Scientific and Educational Center “Integrative Translation Studies of the Subarctic Space” of the Higher School of Social Sciences, Humanities and International Communication, students, graduate students of Northern (Arctic) Federal University, leading specialists of educational and scientific organizations, ethno-cultural centers of Naryan-Mar, Salekhard, as well as scientists from Moscow and St. Petersburg.

The project implementation period covers the period from March 2022 to December 2026. The main stages of the project include: design and preparatory; monitoring; analytical and research stage; scientific and educational stage; publication and presentation; final.

---

<sup>2</sup> Rasporyazhenie ot 17 aprelya 2006 goda № 536-r «Ob utverzhdenii perechnya korennykh malochislennykh narodov Severa, Sibiri i Dal'nego Vostoka Rossiyskoy Federatsii (s izmeneniyami na 26 dekabrya 2011 goda)» [Order No. 536-r dated April 17, 2006 “On approval of the list of indigenous peoples of the North, Siberia and the Far East of the Russian Federation (as amended on December 26, 2011)”. URL: <https://docs.cntd.ru/document/901976648?marker=6500IL> (accessed 09 January 2023).

### *Scientific substantiation of the project*

According to the 2021 census, there are more than 49.6 thousand Nenets in the Russian Federation<sup>3</sup>. The Nenets language, as a language of indigenous small people, belongs to the northern group of the Samoyed branch of the Uralic language family. Sometimes it is included in a larger language family called Ural-Yukaghir [1, Burkova S.I.]. It should be noted that the first detailed description of the “Samoyeds with the inclusion of the Yuracs” in line with ethnographically oriented research was carried out by the Russian geographer and traveler A.F. Middendorf based on the results of his expedition to Northern and Eastern Siberia in 1842–1845. Half a century later, Finnish ethnographer and folklorist T. Lehtisalo tracked the traditional culture of the tundra and forest Nenets in expeditions of 1911 and 1914. In his studies, he called representatives of the Nenets people Yurako-Samoyeds [2, Lehtisalo T.].

The tundra dialect of the Nenets language is not uniform, but is represented by dialects and even so-called sub-dialects. The dialects of the Nenets language are divided into two main groups: western and eastern. Western dialects include Kaninskiy, Timanskiy, Kolguevskiy and Malozemelskiy. Eastern dialects are the Uralskiy, Yamalskiy, Gydanskiy (Yuratskiy), Nadymskiy, Tazovskiy dialects [4, Koshkareva N.B., p. 11]. Researchers point out that these dialects are very heterogeneous. The Taimyrskiy (Yeniseyskiy) dialect, being the easternmost dialect in the continuum of the tundra Nenets language, has a number of significant features that distinguish it not only from western and central dialects, but also from other eastern ones, which is often noted by the speakers themselves. In the Yamalskiy version of tundra Nenets one can distinguish, for example: Yarsalinskiy, Panaevskiy, Novoportovskiy, Yaptiksalinskiy, Seyakhinskiy, Tambeykiy and some other dialects. The Gydanskiy dialect of the Nenets language is considered one of the sub-dialects of the Tazovskiy dialect, along with the Antipayutinskiy dialect [5, Serotetto G.P., p. 498]. The Tambeykiy dialect of the tundra dialect of the Nenets language is spoken by a group of Nenets living compactly on the extreme northern coast of the Yamal Peninsula [6, Laptander R.I., pp. 423–428].

An intermediate position between the western and eastern dialects is occupied by the Bolshzemelskiy dialect, which is used in everyday oral communication of representatives of the eastern part of the Nenets Autonomous Okrug. It was taken as the basis for the creation of Nenets writing language. Some scientists believe that the presented division of Nenets dialects is very conventional, since “modern Samoyedology does not have reliable comprehensive information about their features” [7, Koshkareva N.B., pp. 131–132].

It should be further stated that the situation with the Nenets language is not distinguished by the homogeneity of its vitality. In the Yamalo-Nenets Autonomous Okrug, the language situation with the tundra Nenets language is relatively stable, since this is facilitated by the remoteness of the territories where the Tundra Nenets live from large populated areas, their traditional meth-

---

<sup>3</sup> Krass A. Etnicheskaya peregruppirovka: kak pomenyalos' sootnoshenie narodov Rossii [Ethnic regrouping: how the ratio of the peoples of Russia has changed]. URL: <https://news.ru/society/etnicheskaya-peregruppirovka-kak-pomenyalos-sootnoshenie-narodov-rossii/> (accessed 09 January 2023).

ods of economy and nomadic way of life. It is also important that “language transmission from parents to children is observed there, and it is not uncommon for a child to come to school without knowing Russian” [4, Koshkareva N.B., p. 12], especially among the Nenets of the Tazovskiy and Yamalskiy districts, which cannot be said about the representatives of the Nenets people of the Priuralskiy, Purovskiy and Nadymskiy districts” [ibid., p. 14]. In the Nenets Autonomous Okrug, the situation with the preservation of the Nenets language cannot be considered favorable, although much has been done recently in the direction of revitalizing the language.

Forest Nenets, who use the forest Nenets dialect in their communication, live mainly in the south of the Yamalo-Nenets Autonomous Okrug, in the basins of the Pur and Taz rivers. Representatives of the forest Nenets also live on the territory of the Khanty-Mansi Autonomous Okrug (Ugra). Their number today is small and does not exceed 2 thousand people. At the same time, no more than 800 native speakers actively use the Nenets language as their native language. Unlike the tundra Nenets, reindeer herding does not play a dominant role in the life of the forest Nenets: hunting and fishing are in the foreground. The forest dialect of the Nenets language is often considered by the forest Nenets themselves to be an independent language, called Neshanskiy by its speakers. An interesting fact in this regard is that in the 1990s, the forest dialect of the Nenets language received writing on the basis of the Purovskiy dialect [ibid., p. 14].

It should be noted that the forest dialect of the Nenets language is also not homogeneous; it has separate dialects (Purovskiy, Aganskiy and Numtovskiy), which are characterized by a number of distinctive features [8, Koshkareva N.B., pp. 15–37]. The Purovskiy dialect is spoken by about half of the forest Nenets, mainly living in the Purovskiy district of the Yamalo-Nenets Autonomous Okrug [4, Koshkareva N.B., p. 14], which explains its name.

Oral communication in the Nenets language in general is mainly limited to intra-family communication, as well as reindeer herding, fishing, hunting and traditional folk crafts. Oral folklore is also an important aspect of the functioning of the Nenets language. An indisputable fact is the preservation of the oral tradition of storytelling among the tundra Nenets, both in remote camps of the Nenets Autonomous Okrug and in a number of territories of the Yamalo-Nenets Autonomous Okrug. At the same time, “only a few representatives of the older generation” have the ability to reproduce folklore and continue folk traditions [4, Koshkareva N.B., pp. 11–14].

The need to implement a project to preserve the Nenets language and culture is explained primarily by the fact that, in terms of its social and functional indicators, the Nenets language today is one of the languages with a low level of vitality, although it is one of the largest in terms of the number of speakers among other indigenous languages of our country. It is worth mentioning that the UNESCO Atlas of the World's Endangered Languages defines tundra Nenets as “definitely endangered” and forest Nenets as “severely endangered”<sup>4</sup>. The two above-mentioned varieties of the Nenets language, considered dialects [1, Burkova S.I.] in Russia, differ significantly from each

---

<sup>4</sup> Atlas of the World's Languages in Danger. URL: <https://ich.unesco.org/en/home> (accessed 09 January 2023).



other, which allows some scientists to consider them as separate languages [3, Lyublinskaya M.D., Pushkareva M.V., pp. 5–32].

Despite some obvious dialectological differences, primarily related to phonetics, the vocabulary of the Nenets language as a whole can be considered rather uniform. But this does not exclude the fact that dialects and colloquialisms contain specific vocabulary, which can be explained by the predominance of one or another type of economic activity in different areas of compact residence of the Nenets people, which in turn is explained by dependence on natural conditions [9, Amelina M.K., p. 7].

The study of the state of the Nenets language in regions of compact residence of the Nenets people is of paramount importance for the implementation of the presented scientific and educational project. It started with the monitoring carried out in September–October 2022 in the Nenets Autonomous Okrug.

### ***Monitoring research during the expedition to the Nenets Autonomous Okrug***

The expedition to the Nenets Autonomous Okrug was carried out within the framework of the described project in the period from September 26 to October 2, 2022 by a group of scientists from the Department of Translation and Applied Linguistics of the Higher School of Social Sciences, Humanities and International Communication of NArFU, consisting of Doctor of Philology, Professor A.M. Polikarpov, Doctor of Pedagogical Sciences, Professor M.V. Druzhinina, Candidate of philological sciences, Associate professor E.V. Polikarpova, and graduate student of the Department of Translation and Applied Linguistics of NArFU O.E. Latysheva. The geography of the expedition's locations in the Nenets Autonomous Okrug was quite extensive: the city of Naryan-Mar; Krasnoe village (Bolshezemelskaya tundra); Andeg village; Nelmin Nos village (Malozemelskaya tundra). The components of the monitoring studies were correlated with the purpose and objectives of the project; they included immersion in the linguistic and cultural environment of the region; studying the educational environment of the Nenets Autonomous Okrug in order to monitor the state of the language and culture of the Nenets people; acquaintance with the history of the Nenets language and the culture; communication with teachers, students, kindergarten teachers and preschool children, residents, creative people; survey of teachers and schoolchildren, survey of interested parties, interviews with specialists, etc.

The organizers and authors of the project thought out in advance a register of organizations and teams of the Nenets Autonomous Okrug, which were the target group for monitoring research. The main ones are the Department of Education, Culture and Sports of the Nenets Autonomous Okrug, the Nenets Regional Center for Educational Development of the Nenets Autonomous Okrug, the Ethno-cultural Center of the Nenets Autonomous Okrug (Naryan Mar) and its branch in the village of Nelmin Nos, a branch of Northern Federal University in Naryan-Mar, 5 schools, 2 kindergartens, 2 boarding schools, tourist center "Arctic", community center "Arctic", 4 rural houses of culture, 3 museums, 5 creative groups, including the People's theater.

The purpose of the research work, which was carried out in the Nenets Autonomous Okrug, was to find mechanisms for the preservation and development of the language and culture of the Nenets people. The main tasks that were solved during the work within a week-long stay (09/26/2022–10/02/2022) in the Nenets Autonomous Okrug were:

- preparation for the II Federal Olympiad of schoolchildren in the native languages and literature of the Russian Federation, and more precisely in the language and literature of the Nenets;
- preparation of a professional retraining program “Teaching the Nenets language and culture of the Nenets people in the context of digitalization”, which is planned to be launched in the 2023–2024 academic year;
- monitoring studies of the state of the Nenets language and the teaching of the Nenets language in the system of preschool, school and additional education, as well as studying the situation of preserving and developing the culture of the Nenets people in the Nenets Autonomous Okrug.

O.E. Latysheva, a Nenets language speaker, a post-graduate student of the Department of Education, Culture and Sports of the Nenets Autonomous Okrug, the Deputy Director of the Ethno-Cultural Centre of the NAO, and a graduate student of the Department of Translation and Applied Linguistics of the Higher School of Education, Culture and Sports of the Nenets Autonomous Okrug, was appointed to supervise the program for NArFU scientists. She successfully managed to organize meetings with representatives of numerous educational organizations and cultural institutions in the city of Naryan-Mar, as well as accompanying during trips to remote towns and villages of the Nenets Autonomous Okrug. Scientists from the Department of Translation and Applied Linguistics of NArFU visited more than twenty organizations, institutions and centers of the Nenets Autonomous Okrug. The researchers communicated with representatives of regional authorities, management of educational organizations, local residents, creative groups, preschool and school-age children. The scientists immersed themselves in the linguistic and cultural environment of the Nenets people and were impressed by the nature of the Nenets Autonomous Okrug, history, culture, art of the Nenets people, their traditions and customs. The researchers from NArFU were most impressed by the residents of the Nenets Autonomous Okrug, especially children. Representatives of the Nenets people are very creative and talented people, who write poems and songs, create unique works of art, dance and sing, preserving a culture that is surprisingly in harmony with nature. Nenets children love to draw, sculpt, and create beautiful crafts from natural materials. The main features of the Nenets people are taciturnity, hard work, modesty, patience, calmness, love for neighbors and children, and preservation of family ties. Representatives of the Nenets people form a single harmony with nature and are characterized by the desire to preserve their culture.

More than 100 representatives of the Nenets people took part in the monitoring study. The results of the research, educational, information and monitoring activities of the NArFU research

group were summed up at a meeting with the participation of the senator from the Nenets Autonomous Okrug in the Federation Council R.F. Galushina together with representatives of the Department of Education, Culture and Sports of the Nenets Autonomous Okrug, as well as employees of the Center for Educational Development of the Nenets Autonomous Okrug and other interested parties.

The main results of the trip to the Nenets Autonomous Okrug:

- carrying out a detailed analysis of the situation with teaching the Nenets language, preserving the culture of the Nenets people and discussing mechanisms for improving the situation;
- description of the problems of kindergartens and identification of opportunities to assist preschool organizations in learning the language and culture of the Nenets people;
- development of proposals for intensifying and diversifying forms of work with parents in order to improve the language situation;
- consideration of the mechanism for providing benefits for representatives of the Nenets people in the process of their participation in the Federal Olympiad, professional retraining, vocal and dance groups, skill competitions, etc.;
- presentation of the primary results of the monitoring study in the Nenets Autonomous Okrug. Senator Rimma Fedorovna Galushina highly appreciated the results of the work of the NArFU research group and noted current problems that require solutions by authorities at the federal level. When summing up the results, a fruitful exchange of views took place and a strategy for further action was outlined <sup>5</sup>.

During the expedition, numerous meetings between expedition participants and representatives of organizations and institutions in the Nenets Autonomous Okrug took place, which is reflected in the photos below <sup>6</sup>.



Fig. 1. Visit to the Ethno-cultural Center of the Nenets Autonomous Okrug, September 26, 2022.



Fig. 2. Nenets language class at the school of the Ethno-cultural Center of the Nenets Autonomous Okrug.

<sup>5</sup> Vmeste sokhranim nenetskiy yazyk i kul'turu nenetskogo naroda [Preserve the Nenets language and culture together]. URL: <https://narfu.ru/life/news/university/371053/> (accessed 30 May 2023).

<sup>6</sup> Source: photo by the authors.





Fig. 3. Meeting at the Department of Education, Culture and Sports of the Nenets Autonomous Okrug, September 27, 2022.



Fig. 4. Meeting with artists of the Nenets amateur theater "Ilelbs" (Naryan-Mar).



Fig. 5. Attending a Nenets language class in a kindergarten in the Krasnoe village.



Fig. 6. Visit to a boarding school in the Krasnoe village.

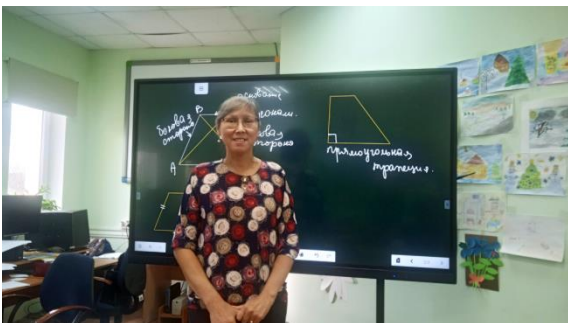


Fig. 7. Visit to a school in the Andeg village.



Fig. 8. Visit to a school in the Nelmin Nos village.



Fig. 9. Visit to the branch of the State Budgetary Institution "Ethnocultural Center of the Nenets Autonomous Okrug", Nelmin Nos village.



Fig. 10. Summing up the results of the expedition at the Education Development Center of the Nenets Autonomous Okrug with the Senator of the Russian Federation Galushina R.F.

The results of monitoring studies carried out in the Nenets Autonomous Okrug are presented in scientific reports by members of the NArFU research group at the interregional scientific and practical conference “Civilization — North: languages and cultures of indigenous peoples of the North” (Salekhard, October 30–November 2, 2022).



Fig. 11. At the conference in Salekhard.



Fig. 12. Participants of the conference in Salekhard “Civilization — North: languages and cultures of indigenous peoples of the North” (Salekhard, October 30–November 2, 2022).

### ***Key activities of the project***

The official presentation of the scientific and educational project to the Russian public in March 2022 was preceded by cooperation with the Ethno-cultural center of the Nenets Autonomous Okrug, participation in the work of the Union of Translators of Russia and the activities of its Council on translation using the languages of the peoples of Russia, the study by project participants of the phenomena of multiculturalism and multilingualism in the world, their participation in the work of expert communities, commissions and associations for the analysis of educational programs, manuals, textbooks, scientific and methodological products and scientific works, including monographs, dissertations and theses.

The official presentation of the project took place in March 2022 at the international seminar on the preservation and popularization of the languages of indigenous peoples of the Arctic (St. Petersburg, Russian State Pedagogical University, March 16–18, 2022). The seminar was attended by Doctor of Philology, Professor, Head of the Department of Translation and Applied Linguistics A.M. Polikarpov and Deputy Director of the Ethno-cultural Center of the NAO O.E. Latysheva. The international seminar on the preservation and popularization of the languages of indigenous peoples of the Arctic was included in the plan of main events of the Russian Federation’s chairmanship of the Arctic Council in 2021–2023, and was also included in the plan of events of the International Decade of Indigenous Languages, announced by the UN General Assembly. The seminar was attended by representatives of nine constituent entities of the Russian Federation: teachers, university professors, IT project developers, librarians, language activists, representatives of public organizations and movements, including youth, as well as representatives of federal executive authorities and executive authorities of constituent entities of the Russian Federation.

At the first session, which was entitled “Digitalization of the languages of indigenous peoples of the Arctic,” A.M. Polikarpov presented the scientific and educational project of NArFU, as well as the professional retraining program “Teaching the Nenets language and Nenets culture in the context of digitalization”. The presented report caused a great resonance among those present. Postgraduate student of the Department of Translation and Applied Linguistics Olga Latysheva, who writes PhD thesis on the topic “Ethnocultural aspects of translating Nenets folklore into Russian” (scientific advisor is A.M. Polikarpov), presented two reports at the seminar. As a graduate student, she spoke at the section “Publishing literature in the languages of indigenous peoples of the Arctic: current state and prospects” with a report on the topic “From the experience of translating Nenets folklore texts into Russian (based on a complex expedition to the Kanin Nenets)”. Olga Latysheva comes from the Kanin tundra, so her interest in the folklore of these particular places is not accidental. As deputy director of the Ethno-cultural Center of the Nenets Autonomous Okrug (Naryan-Mar), Olga Latysheva presented a report on the preservation of the Nenets language through the editorial and publishing activities of the State Budgetary Institution of Culture “Ethnocultural center of the Nenets Autonomous Okrug” at the third session entitled “Promotion of the languages of indigenous minorities of the Arctic in the public and information space”.

Cooperation between the Ethno-cultural Center of the Nenets Autonomous Okrug and Northern (Arctic) Federal University in the field of education, translation activities, culture and intercultural communication is currently carried out on the basis of an Agreement signed between these organizations.

It should be noted that representatives of the Northern (Arctic) Federal University named after M.V. Lomonosov actively participate in many events held by state bodies of executive and legislative power at the federal level in connection with the preservation and development of the languages of the peoples of Russia. On December 16, 2021, A.M. Polikarpov took part in the 5th Forum “Language policy in the Russian Federation”, which was held by the Federal Agency for Nationalities of the Russian Federation. He made a report at the forum on the topic “Translation activities using the languages of the peoples of Russia: regional interaction”. On February 8, 2022, A.M. Polikarpov took part in a round table held by Federal Agency for Ethnic Affairs entitled “Program for the preservation of Russian languages: development and implementation”, participating in a discussion about translation as an important tool for preserving the languages of the peoples of Russia. Since March 2022, A.M. Polikarpov is a member of the Working Group on legislative support for the ethno-cultural development of the peoples of Russia and improving the language policy of the Committee on Nationalities Affairs of the State Duma of the Russian Federation and takes an active part in the meetings of the Working Group.





Fig. 13. At the international seminar in St. Petersburg (RSPU, March 16–18, 2022).

***All-Russian round table “Translation activities using the languages of the peoples of Russia: the Nenets language”***

The All-Russian round table “Translation Activities Using the Languages of the Peoples of Russia: The Nenets Language” was held on June 14, 2022. The initiators were the Department of Translation and Applied Linguistics of Northern Federal University, the State Budgetary Institution “Ethno-cultural Center of the Nenets Autonomous Okrug” and the Union of Translators of Russia. The main topic of the round table was devoted to the issues of preserving the Nenets language through translation in the context of the development of Nenets culture. More than 40 people from different regions of Russia took part in the round table meeting. Among the event participants were representatives of government bodies at the federal and regional levels, members of public organizations and associations, representatives of science, education and culture interested in the preservation and development of the Nenets language and other native languages of Russia, practicing translators, translation teachers at Russian universities, members of the Union of Translators Russia and other interested parties from Moscow, St. Petersburg, the Nenets Autonomous Okrug, the Yamalo-Nenets Okrug, the Taimyr Dolgano-Nenets District of the Krasnoyarsk Krai, the Komi Republic, the Arkhangelsk and Murmansk oblasts, as well as other regions of Russia. Director of the SBI “Ethno-cultural Center of the Nenets Autonomous Okrug” E.I. Vergunova, Rector of NARFU E.V. Kudryashova, President of the Union of Translators of Russia O.Yu. Ivanova, Vice-President of the Association of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation on issues of education, native languages and project activities N.G. Veisalova, as well as a member of the Federation Council Committee on Science, Education and Culture, Senator R.F. Galushina addressed the participants of the round table with a welcoming speech. Rector of NARFU E.V. Kudryashova drew the attention of the round table participants to the importance of studying and preserving the languages of the indigenous peoples of the Arctic, including Nenets, in our time, when the country is faced with the task of preserving multilingualism and uniting the

peoples of Russia in order to strengthen statehood. The rector pointed out the promise of research related to the culture and education of our closest neighbors.

The round table participants discussed the historical role and current state of the Nenets language, its place in the education system and culture of the Nenets, the scope and directions of translation activities using the Nenets language, specific steps to develop translation using the Nenets language, problems of its preservation and prospects for the revival, methodology teaching Nenets as a native language in preschool and general education organizations and many other issues. A.M. Polikarpov named in his speech on the topic “Translation as a tool for the preservation and development of the Nenets language” facts that are significant for the development of the written language of the Nenets language. For example, it was mentioned that in the 1820s, “enlightener of the Samoyeds” Archimandrite Veniamin invented the letters of the Samoyed (Nenets) alphabet, compiled a Russian-Samoyed dictionary and translated almost all the books of the New Testament into the Samoyed language. According to A.M. Polikarpov, important events in the development of writing are also the fact that in 1856 priest Joseph Korelin wrote a brief grammar of the Nenets language, and Petr Zuev, a priest of Bolshezemelskiy parish, was engaged in translations and proofreading of Bible translations into Nenets. In total, 15 people made presentations at the All-Russian round table within the framework of the compiled program. These were scientific presentations in the form of impulse messages, which aroused keen interest of all participants in the issues covered and were accompanied by discussions, as is customary at round tables. O.E. Latysheva in her report focused on some aspects of documenting Nenets folklore texts for the purpose of translating them into Russian. Many speakers in their reports noted that the main factors in translation activities, including from the Nenets language, remain the preservation of the linguistic picture of the world and the style of the text; transfer of imagery and specificity of language; compliance with grammar rules and ethical standards; adequacy when translating borrowed words, neologisms, phraseological units, etc. At the end of the round table meeting, the draft resolution was discussed and then officially published on the websites of NArFU and the Union of Translators of Russia, taking into account comments and additions<sup>7</sup>. Information about the work of the round table was presented on the NArFU website<sup>8</sup>. Links to video recordings of two parts of the round table meeting are also posted on the NArFU website<sup>9</sup>.

---

<sup>7</sup> The resolution of the All-Russian round table on translation using the Nenets language is a significant step towards the vitalization of the language of the indigenous people of the Arctic. URL: <https://narfu.ru/hssshic/nauka/sec-perevodovedenie/news/370602/> (accessed 30 May 2023).

<sup>8</sup> News on the official website of NArFU. URL: <https://narfu.ru/life/news/university/369223/> (accessed 30 May 2023).

<sup>9</sup> Video recordings of the All-Russian round table. URL: <https://narfu.ru/hssshic/nauka/sec-perevodovedenie/news/370602/> // (accessed 30 May 2023).

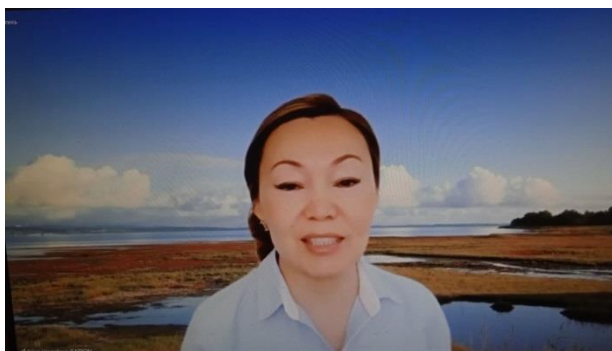


Fig. 14. Speech at the round table by N.G. Veysalova, Vice-President of the “Association of Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation”.

E.V. Polikarpova deals with the issues of reflecting the linguistic picture of the Nenets world and the style of the original texts in Russian translations of Nenets tales. At the interregional conference “Civilization — North: languages and cultures of indigenous peoples of the North”, held in Salekhard, Yamalo-Nenets Autonomous Okrug from October 31 to November 2, 2022, E.V. Polikarpova presented in her scientific report “Nenets folk tale in comparison and contrast with Russian” the main features of the text of Nenets tales, immersing herself in the originality of the representation of the natural world and the characters of the Nenets people in the fairy tale genre. Speech by E.V. Polikarpova aroused genuine interest among the conference participants, for whom the Nenets fairy tale appeared not just as a literary genre, but as a set of linguistic and cultural observations from the outside, revealing the connection between the fabulous, illogical, and unreal with the completely logical, down-to-earth characteristics of the Nenets ethnic group. E.V. Polikarpova’s translation studies traces the close connection of the Nenets with nature: nature is harsh, the heroes of fairy tales have to wander long distances, defeating evil monsters and cannibals. It is shown that such phenomena as intrigue, envy, betrayal are found in Nenets tales, but they are opposed by perseverance, fearlessness, and readiness to sacrifice in the name of others. The Nenets fairy tale as a genre of folklore and as a narrative type of folk art, along with the tough struggle for existence, reflects the best character traits of the Nenets people: friendliness, loyalty, kindness, hospitality, the strength of maternal love, denial of betrayal. Nenets folklore appears in fairy tales not only as a monument of oral folk art, but also as a reflection of important information about the spiritual and material culture of the Nenets, the social structure of life and the way of life of the Nenets people. Nenets fairy tales trace both collectivism and individualism, class stratification, and touch upon issues of property and protection of the rights of the Nenets. Based on research into the genre of the Nenets fairy tale, teachers and students of the Department of Translation and Applied Linguistics of NARFU continue to explore ideas about the world order that are important for the Nenets and are directly related to nature. In 2023, several final bachelor’s theses on the study of concepts of Nenets culture, important for understanding the Nenets ethnos, were defended. For example, this year, under the guidance of E.V. Polikarpova, Y.M. Valkov successfully defended his graduate work “Transfer of means of representation of the concept “Reindeer” when translating English texts about Nenets into Russian”.

Knowledge of the features of representatives of the Nenets ethnic group was useful to Associate Professor E.V. Polikarpova during a regional seminar of cultural workers jointly with the State Budgetary Institution “Ethno-cultural Center of the Nenets Autonomous Okrug”. She acted as a referent on issues of business etiquette in Naryan-Mar on March 21–27, 2023. According to the organizers — representatives of the Department of Education, Culture and Sports of the Nenets Autonomous Okrug, the “Ethnocultural Center of the Nenets Autonomous Okrug” — E.V. Polikarpova immersed listeners from among cultural workers in the problems of conflictology, presented the basic requirements of business etiquette with a focus on the northern region, showed examples of self-development using examples of specific names of famous northerners from among the Nenets, taught in a number of master classes how to restore one’s strength by drawing energy, as it is customary among the Nenets, among nature, and conducted several psychological trainings, demonstrating clearly how one can successfully represent one’s interests.



Fig. 15. Speech by E.V. Polikarpova, Candidate of philological sciences, Associate Professor, at the regional seminar of cultural workers, Naryan-Mar, March 21–27, 2023.

***Participation in the round table meeting “Preservation and development of the Nenets language in the Nenets Autonomous Okrug”***



Fig. 16. Participants of the round table in Naryan-Mar.

At the round table meeting “Preservation and development of the Nenets language in the Nenets Autonomous Okrug” in Naryan-Mar on December 5, 2022, a group of NArFU scientists from among the participants of the project “Preserve the Nenets Language and Culture Together” presented the main results of monitoring studies in their speech, held in September–October 2022 and made specific proposals for developing round table recommendations:

- consider the issue of the possibility of improving Articles 11 and 14 in the Federal Law “On education in the Russian Federation” in the State Duma of the Russian Federation;
- take part in the development of materials and holding of the II Federal Olympiad for schoolchildren in philology and literature (in Nenets language and literature) at the site of the NArFU branch in Naryan-Mar and at the regional site in Salekhard;
- popularize the study of the Nenets language and culture of the Nenets people by holding significant cultural, educational and scientific-educational events: create a special section on the Nenets language and culture of the Nenets people at the online exhibition “Virtualika” of NArFU within the framework of the project “Scientific interaction of federal universities in applied linguistics and professional pedagogy in the context of digitalization”; organize an exhibition of paintings by the famous Nenets poet, prose writer, artist, public figure P.A. Yavtysyy in NArFU in 2023
- develop an electronic dictionary of concepts of Nenets culture (2024–2026);
- continue the practice of conducting ethno-cultural and scientific research expeditions in order to preserve the Nenets language and culture of the Nenets people;
- carry out further monitoring research to study the state of the Nenets language and preserve the culture of the Nenets people, present the results to the general public in various forms of presentations and publications;
- implement a professional retraining program “Teaching the Nenets language and the culture of the Nenets people in the context of digitalization” at NArFU in the 2023–2024 academic year;
- continue posting information about the project “Preserve the Nenets Language and Culture Together” on the electronic platform of the Arctic multilingual portal as part of the international project “Digitalization of the linguistic and cultural heritage of the indigenous peoples of the Arctic”;
- improve linguodidactic, educational, methodological and logistical support for kindergartens, schools, educational and cultural centers by introducing the methodology of language nests, gaming, communicative and sociocultural techniques;
- offer to teach the Nenets language according to the methods of teaching foreign languages;
- improve the publication of educational and didactic materials, children’s literature, printed products, handouts, posters, and song collections in the Nenets language;
- provide kindergartens, schools, educational and cultural centers with natural materials for group work, models of tents and their interior furnishings, game models of animals and birds of the Arctic.
- create and actively use videos, animated films, computer games and visualized fairy-tale stories in the Nenets language in teaching;



- recommend developing and staging theatrical plays and artistic sketches in the Nenets language in schools and kindergartens, as well as at cultural events;
- motivate children, youth and adults to study the Nenets language and culture of the Nenets people through special radio broadcasts and video channels, electronic and print media in the Nenets language at the regional and all-Russian levels.

### ***Legal and regulatory framework of the project***

At the moment, there are three fundamental official documents that help to organize activities within the framework of the presented project:

- Agreement on cooperation between NArFU and the Ethno-cultural Center of the Nenets Autonomous Okrug (November 25, 2021);
- Order of NArFU No. 1138 on approval of the Roadmap of the All-Russian scientific and educational project “Preserve the Nenets Language and Culture Together” (December 30, 2022);
- Agreement on cooperation between NArFU and the Nenets Regional Center for Educational Development (June 27, 2023).

The Ethno-cultural center of the Nenets Autonomous Okrug and the Northern (Arctic) Federal University signed a cooperation agreement on November 25, 2021, which envisages mutual scientific, methodological and information support, joint fundamental and applied research, exchange of analytical data, development and implementation of educational programs, holding conferences, seminars, round tables and other events, as well as many other areas of joint activities. The interaction of these two institutions contributes to the development of both the presented scientific and educational project and many others.

The project Roadmap included the most significant activities to achieve the goal and solve complex problems of preserving the Nenets language and culture of the Nenets people. The project events include:

- conducting monitoring studies on the state of the Nenets language and its teaching in the Nenets Autonomous Okrug and the Yamalo-Nenets Autonomous Okrug;
- holding the All-Russian round table “Translation activities using the languages of the peoples of Russia. Nenets language” together with the Ethno-cultural Center of the Nenets Autonomous Okrug and the Union of Translators of Russia;
- preparation of uniform requirements for the tasks of the preparatory and final stages of the Federal Olympiad for schoolchildren in the native languages and literature of the peoples of the Russian Federation and tasks in the Nenets language and literature of the Nenets people as part of the methodological commission of the Olympiad in the Nenets language;
- inclusion of the Nenets language as a translation language in the competition task within the framework of the international written translation competition “Digital Arctic

transfer”, annually held by the Northern (Arctic) Federal University named after M.V. Lomonosov, conducting an expert assessment of submitted written translations using the Nenets language;

- preparation and implementation of a student project to translate Frederick J. Jackson’s book “The Great Frozen Land” about a trip to the Nenets tundra (commissioned by the State Budgetary Institution “Museum Association of the Nenets Autonomous Okrug”, Naryan-Mar);
- preparation and holding of an exhibition of paintings by the Nenets artist, poet, prose writer, public figure Prokopyy Andreevich Yavtysyy (from the artist’s family fund) with philological and cultural support for the event;
- preparation and implementation of a professional retraining program “Teaching the Nenets language and culture of the Nenets people in the context of digitalization” at the Center of the Integrative Translation Studies of the Subarctic Space and some others.

NArFU and the Nenets Regional Center for Educational Development have been linked by mutually beneficial cooperation for many years. Active interaction between NArFU and the center began within the framework of the All-Russian scientific and educational project “Preserve the Nenets Language and Culture Together”. In the 2023–2024 academic year, the Professional Retraining Program “Teaching the Nenets language and Nenets culture in the context of digitalization” is being prepared for implementation in cooperation with the Nenets Regional Center for Educational Development. At the site of the NArFU branch in the Nenets Autonomous Okrug, in close cooperation with the Nenets Regional Center for Educational Development, as well as with the Center for Working with Talented Youth (Salekhard) and the Regional Institute for Educational Development of the Yamal-Nenets Autonomous Okrug, colleagues from the Institute of the Peoples of the North of the Russian State Pedagogical University named after A. I. Herzen and representatives of the Department of Translation and Applied Linguistics of NArFU conducted the qualifying and final stages of the II Federal Olympiad in the native languages and literature of the peoples of Russia (Nenets language). As part of the cooperation, talented children and youth are supported; children, their parents, and specialists in the field of education and culture are invited to participate in competitions, olympiads, and other events. Development, implementation and examination of basic and additional educational programs, interaction on issues of ethno-cultural education using the languages of the peoples of the Arctic Zone of the Russian Federation is an integral part of the Agreement signed by NArFU and the Center on June 27, 2023.

It should be noted that the agreements signed between NArFU and the Ethno-cultural Center of the Nenets Autonomous Okrug and the Nenets Regional Development Center are supported by roadmaps approved by the Academic Council of NArFU, that is, they receive official status, thus making the project participants responsible for the implementation of the activities set out in the relevant documents.

### ***The 2nd Federal Olympiad for schoolchildren in native languages and literature of the peoples of Russia***

In 2022–2023, the qualifying and final stages of the Nenets language Olympiad in Native languages and literature of the peoples of Russia were held at the NArFU website. The director and deputy director of the NArFU branch in Naryan-Mar, colleagues from the Nenets Regional Center for Educational Development, employees of the Center for Work with Talented Youth (Sal-ekhard) and the Regional Institute for Educational Development of the Yamal-Nenets Autonomous Okrug, colleagues from the Institute of Peoples of the North, Russian State Pedagogical University named after A.I. Herzen (St. Petersburg), teachers of the Department of Translation and Applied Linguistics of Northern Federal University, colleagues from the Siberian Federal University took part in the preparation and holding of the Olympics. 124 schoolchildren from the Nenets and Yamalo-Nenets Autonomous okrugs took part in the qualifying round. 42 students reached the final stage; 3 ninth-grade students became winners of the Nenets language Olympiad.



Fig. 17. Participants and organizers of the 2023 Olympiad <sup>10</sup>

### ***Exhibition of works by P.A. Yavtysyy***

In April 2023, the Northern (Arctic) Federal University named after M.V. Lomonosov hosted a personal exhibition of paintings “Salyad” (Return), dedicated to the 90th anniversary of the birth of the outstanding Nenets artist, poet and public figure Prokopiyy Andreevich Yavtysyy. The opening was accompanied by a two-day lecture, which could be attended not only by students and staff of NArFU, but also by all interested Arkhangelsk residents. His daughter Larisa Prokopyevna Latysheva told about Prokopiyy Andreevich Yavtysyy. She heads the department of ethnography and regional art history of the State Budgetary Institution “Museum Association of the Nenets Autonomous Okrug” in Naryan-Mar and is a graduate student at Northern Federal University. Prokopiyy Yavtysyy believed that literary creativity should be combined with artistic creativity, and only then will it be clear what is inside another person. His daughter demonstrated this by reading the story “Penzer” (Tambourine). L.P. Latysheva invited listeners to interpret and unravel the meanings em-

<sup>10</sup> Source: photo of the Olympiad organizers.

bedded in the paintings of P.A. Yavtysyy, reflecting the mythological world of the Nenets. Dancing also helped the guests of the lecture hall to immerse themselves in the work of Procopiy Yavtysyy. The dance “Penzer” (Tambourine) was performed by the soloist of the ensemble “Zindegi”, Associate professor of the Department of Translation and Applied Linguistics Elena Polikarpova. The opening of the exhibition of paintings, which took place after the lecture, also started with the Nenets dance “Masters” performed by the Zindegi ensemble. The exhibition featured artistic works by Procopiy Yavtysyy, who was one of the first to depict scenes of Nenets mythology on paper. The red ribbon to mark the opening of the exhibition was solemnly cut by NArFU Vice-Rector for Information Policy, International and Interregional Cooperation Konstantin Zaikov, Larisa Latsheva, as well as the Chairman of the Board of the Arkhangelsk regional public organization “Community of the Nenets Tosavey District” Ivan Ivkin. Full information about the event is presented on the NArFU website <sup>11</sup>.



Fig. 18. Opening of the exhibition <sup>12</sup>.



Fig. 19. Nenets dance “Masters” performed by the ensemble “Zindegi” <sup>13</sup>.

### ***Professional retraining program “Teaching the Nenets language and Nenets culture in the context of digitalization”***

The above-mentioned professional retraining program for Nenets language teachers and cultural specialists is aimed at developing the professional competencies necessary for teaching, preserving and developing the Nenets language and culture of the Nenets people. The main tasks include carrying out professional activities in accordance with regulations in the field of education, requirements for maintaining educational documentation in an educational institution and standards of professional ethics; implementation of effective interaction with all subjects of the educational process; mastering modern methods of teaching the Nenets language and literature; mastery of a wide range of digital tools for effective work in the digital educational environment; development of general pedagogical and subject-pedagogical ICT competencies; development and

<sup>11</sup> Information about the opening of the exhibition P.A. Yavtysyy in NArFU. URL: [https://narfu.ru/life/news/university/377958/?sphrase\\_id=486852](https://narfu.ru/life/news/university/377958/?sphrase_id=486852) (accessed 30 May 2023).

<sup>12</sup> Source: photo by the authors.

<sup>13</sup> Source: photo by the authors.

implementation of individual projects with the aim of preserving and developing the Nenets language and culture of the Nenets people. The program includes five main modules that allow developing the competencies necessary for teaching the Nenets language, literature, and culture using digital technologies. Linguistic, ethno-cultural, literary, methodological and applied topics of the classes are focused on expanding the range of thinking in the field of ethno-education using digital tools. The project module is focused on the implementation of creative projects that are in demand and ready for implementation in the Nenets and Yamalo-Nenets Autonomous Okrug. In the process of working on projects, students will be able to implement the acquired interdisciplinary knowledge and will be able to actively participate in the implementation of the scientific and educational project “Preserve the Nenets Language and Culture Together”. The project will be implemented in the 2023–2024 academic year.

### **Conclusion**

#### ***The main components of the strategy for the preservation of the language and culture of the Nenets people, prospects of the project development***

The scientific and educational project “Preserve the Nenets Language and Culture Together” is interdisciplinary in nature. The subject field of the collective of participants is very large and continues to expand due to new stakeholders from various organizations at the regional, federal and international levels. The geographical scope of the project also acquired an all-Russian and international character. Phenomena such as the transfer of knowledge from different fields of science, multiplier effects in the form of the generation of new ideas and their implementation, the emergence of mini-projects within the framework of the main one, allow us to state a high level of political, social, socio-economic, scientific, educational and socio-cultural resonance of the project in Russia and abroad. The project makes a significant contribution to the preservation of the Nenets language and culture of the Nenets people, which is part of the political strategy of the country and regions. The presented article demonstrates the main opportunities and prospects for further development of the project in the form of scientific events, educational courses, educational work, exchange of experience, presentations of information content, examination of educational and methodological literature, and the creation of new scientific products. The project plays a socially significant role for the indigenous peoples of Russia, is designed to make a worthy contribution to the spiritual values of speakers of minority languages, and therefore has potential for further implementation.

### **References**

1. Burkova S.I. *Sopostavitel'noe opisaniye funktsional'no-semanticheskikh poley obuslovlennosti v lesnom i tundrovom dialektakh nenetskogo yazyka: monografiya* [A Comparative Description of the Functional Semantic Fields of Conditionality in the Forest and Tundra Dialects of the Nenets Language]. Novosibirsk, Novosibirsk State University Publ., 2003, 259 p. (In Russ.)
2. Lehtisalo T. *Juraksamojedische Volksdichtung, gesammelt und herausgegeben von T. Lehtisalo*. Helsinki, Suomalais-ugrilainen seura, 1947, 615 p.



3. Lyublinskaya M.D., Pushkareva M.V. Sozdanie novoy terminologii na tundrovom nenetskom yazyke [Vocabulary Development in Tundra Nenets]. *Rodnoy yazyk* [Mother Tongue], 2019, no. 2, pp. 5–32.
4. Koshkareva N.B. *Dialektologicheskiy atlas ural'skikh yazykov, rasprostranennykh na territorii Yamalo-Nenetskogo avtonomnogo okruga: monografiya* [Dialectological Atlas of the Uralic Languages Common in the Territory of the Yamal-Nenets Autonomous District]. Kaliningrad, ROST-DOAFK Publ., 2017, 256 p. (In Russ.)
5. Serotetto G.P. Foneticheskie osobennosti gydanskogo govora nenetskogo yazyka [Phonetic Features of the Gydan Dialect of the Nenets Language]. *Voprosy uralistiki 2014. Nauchnyy al'manakh* [Questions of Uralistics 2014. Scientific Almanac]. Saint Petersburg, Nestor-Istoriya Publ., 2014, pp. 498–501.
6. Laptander R.I. Terminologiya snega i l'da v nenetskom yazyke [Nenets Snow and Ice Terminology]. *Voprosy uralistiki 2014. Nauchnyy al'manakh* [Questions of Uralistics 2014. Scientific Almanac]. Saint Petersburg, Nestor-Istoriya Publ., 2014, pp. 423–428.
7. Koshkareva N.B. O leksikograficheskom opisanii dialektov nenetskogo yazyka [On the Lexicographic Description of the Dialects of the Nenets Language]. In: *Materialy 2-y mezhdunarodnoy konferentsii po samodistike — posvyashchaetsya 100-letiyu so dnya rozhdeniya Natalyi Mitrofanovny Tereshchenko* [Proc. 2nd Intern. Conf. on the Samoyed Languages Studies (Dedicated to the Natalya Mitrofanovna Tereshchenko's 100th Anniversary of the Birth)]. Saint Petersburg, Nestor-Istoriya Publ., 2008, pp. 131–136. (In Russ.)
8. Koshkareva N.B. *Ocherki po sintaksisu lesnogo dialekta nenetskogo yazyka: monografiya* [Essays on the Syntax of the Forest Dialect of the Nenets Language]. Novosibirsk, Lyubava Publ., 2005, 334 p. (In Russ.)
9. Amelina M.K. Aktsentnye kharakteristiki neproizvodnykh imen v tundrovom narechii nenetskogo yazyka [The Accent Characteristics of the Underived Nouns in Tundra and Forest Nenets Dialects]. *Uralo-altayskie issledovaniya* [Ural-Altai Studies], 2011, no. 2 (5), pp. 7–38.

*The article was submitted 05.07.2023; accepted for publication 06.07.2023*

*Contribution of the authors: the authors contributed equally to this article*

*The authors declare no conflicts of interests*

Arctic and North. 2023. No. 52. Pp. 228–240.

Original article

UDC 314.15(985)(045)

doi: 10.37482/issn2221-2698.2023.52.270

## Review of Scientific Publications on the Study of Population Migration in the Russian Arctic

**Irina S. Stepus**<sup>1</sup>✉, Cand. Sci. (Econ.), Leading Researcher

**Aleksandr O. Averyanov**<sup>2</sup>, Postgraduate, Researcher

**Inna V. Rodion**<sup>3</sup>, Graduate Student

<sup>1,2,3</sup> Petrozavodsk State University, ul. Lenina, 33, Petrozavodsk, Russia

<sup>1</sup>stepus@petsu.ru ✉, ORCID: <https://orcid.org/0000-0001-5070-0273>

<sup>2</sup>aver@petsu.ru, ORCID: <https://orcid.org/0000-0003-2884-8110>

<sup>3</sup>irodion@petsu.ru, ORCID: <https://orcid.org/0000-0002-6243-4010>

**Abstract.** The purpose of the article is to conduct a quantitative and qualitative analysis of Russian-language publications on the topic of population migration in the Arctic zone of Russia. The national bibliographic database of scientific citation hosted on the eLIBRARY.RU platform was used as a source of information. The research methodology is based on the use of structural-semantic analysis of texts in combination with general scientific methods (analysis, generalization and systematization). The time period of 2010–2022 is characterized by an increase in the number of publications on migration issues in the Arctic zone of Russia, which was most clearly manifested during the adoption of Russia’s Arctic strategies. During the period under review, Russian authors prepared about 300 articles on the study of population migration in the Russian Arctic. However, the number of researchers who regularly publish papers on this topic is small. The analysis made it possible to identify an objective list of authors groups (scientific schools) that are leading in terms of the number of publications in this subject area. The main directions of the population migrations study in the Russian Arctic zone are considered according to six key scientific schools, general and special approaches of the authors to the study of Arctic migrations are highlighted. The study results will be useful and interesting to scientists, whose research area is related to population migration, including in the Russian Arctic regions; specialists dealing with social issues of the development of the Arctic territories; postgraduates and students involved in this field.

**Keywords:** *population migration, the Arctic zone of Russia, publication, migration study*

### **Acknowledgments and funding**

The research was supported by a grant from the Russian Science Foundation, project No. 22-78-10148 “Motivational drivers in the dynamics of human resource flows in the Russian Arctic: trends, challenges, prospects”.

### **Introduction**

Unique Arctic territories have always attracted attention of Russian and foreign scientists. Russia, being the largest Arctic state with the longest border in this part of the world, makes an extremely important contribution to the scientific study of the Arctic [1, Pestsov S.K., p. 6]. The

---

\* © Stepus I.S., Averyanov A.O., Rodion I.V., 2023

For citation: Stepus I.S., Averyanov A.O., Rodion I.V. Review of Scientific Publications on the Study of Population Migration in the Russian Arctic. *Arktika i Sever* [Arctic and North], 2023, no. 52, pp. 270–286. DOI: 10.37482/issn2221-2698.2023.52.270

Arctic as an object of modern research is multifaceted and covers geopolitical, climatic, biological, economic, military and other aspects.

Currently, there is increasing interest in the Arctic, not only from an economic point of view, but also from the perspective of national security. On the other hand, “the Arctic should be looked at not only as a huge storehouse of natural resources and a strategic base, but also as a place of residence for people who will ensure appropriate economic relations” [2, Stepus I.S., Simakova A.V. , p. 117]. Yu.F. Lukin rightly notes that the Arctic is not only “natural resources, oil and gas reserves, transport communications, but first of all, it is people, human, creative and intellectual capital, which are the main resource of the Arctic regions” [3, Lukin Yu. F., p. 4]. The relevance of scientific research in the field of social processes in the Arctic zone of the Russian Federation (hereinafter referred to as AZRF) is beyond doubt and is only intensifying in new socio-economic circumstances. Taking into account the economic and geopolitical significance of the Arctic territories, “it is extremely important for Russia to expand its presence in the Arctic not only with new infrastructure and industrial projects, but also with human resources” [2].

Migration processes have historically played an important role in the formation of the permanent population and social and labor potential of the Russian Arctic. If during the Soviet period of Arctic development the population of the Russian Arctic was replenished due to migration, now migration outflow is the main reason of population decline. Over the past 25 years, the population of the Russian Arctic has decreased by 20%, primarily due to large-scale migration to the central regions of the country [4, Ukhanova A.V., Smirennikova E.V., Voronina L.V., p. 123].

Within the framework of this article, we will focus specifically on migration processes out of the many social aspects of studying the Arctic. Population migration in the Arctic is the subject of scientific research by domestic and foreign authors who devote their works to studying various aspects of the exploration and development of the Arctic. Researchers from various fields of science conduct statistical analysis of migration indicators, sociological studies, forecast migration flows, study patterns and factors contributing to the outflow or influx of various population groups to the Arctic territories.

The aim of the article is to analyze the dynamics of research on the topic of migration processes in the Russian Arctic in the National Bibliographic Database of Science Citation (RSCI), to compile a list of scientific editions that most often publish articles on this topic, as well as a list of scientific teams with the largest number of publications in this subject area. The second part of our review will be devoted to a qualitative analysis and systematization of approaches to the study of migration processes in the Arctic territories in the selected set of publications, as well as to the identification of practices in the field of migration research in the Arctic zone.

The eLIBRARY.RU platform, which is one of the largest Russian-language databases, currently provides wide opportunities for this kind of research. For example, a similar approach to the summarizing analysis of Russian scientific publications on the topic of sustainable development is presented in a collective monograph edited by V.V. Fauser [5].



this array of publications went through several stages of modification. At the first stage, publications from non-core branches of science (migration of birds, fish, mammals in the Arctic) were removed. Next, publications on migration and similar topics that were included in the sample but not related to the Arctic zone of Russia were excluded. At the third stage, the remaining array of publications was expertly verified for compliance with the search topic by checking the title of the article, abstract, keywords, and, in some cases, the text of the publication itself. Structural-semantic analysis was used, as well as various text processing algorithms, including stemming and text lemmatization.

As a result of “clearing” the initial publication array from irrelevant papers, a list of 286 journal articles on the subject of population migration in the regions of the Arctic zone of Russia was formed. It can be noted that 171 articles are directly devoted to the study of population migration in the Arctic territories, while 115 publications consider migration processes more concisely in the context of the peculiarities of socio-economic development of the AZRF, human capital, demographic and personnel problems in the development of the Arctic territories.

Fig. 2 visualizes the number of Russian-language publications on the topic of interest in the database of scientific publications on the eLIBRARY.RU platform in the period from 2010 to 2022. In general, the dynamics of publications shows steady growth. At the same time, two waves can be distinguished, possibly related to increased attention to the Arctic and the adoption of Russia’s Arctic strategies in 2013 and 2020, which led to an increase in the number of publications on the topic of population migration to the Russian Arctic.

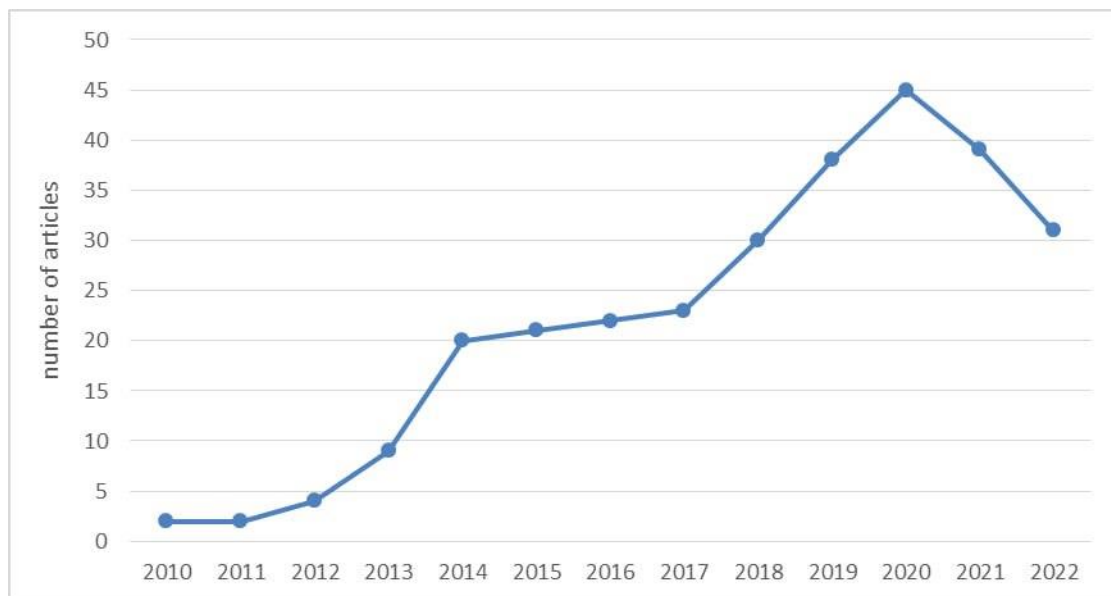


Fig. 2. Dynamics of the number of publications on population migration in the Arctic zone of Russia, 2010–2022. <sup>2</sup>

Based on the analysis of publication activity, a list of TOP 5 scientific journals was identified, in which the results of research on migration processes in the Russian Arctic are most often published (Table 1).

<sup>2</sup> Note: data for 2022 does not claim to be complete, since the collection of publications was carried out in December 2022.



Table 1

List of journals that most frequently publish the results of research on population migration in the Arctic (2010–2022)

Journal title	Number of articles from 2010 to 2022
Arctic and North	26
The North and the Market: Forming the Economic Order	12
Corporate Governance and Innovative Economic Development of the North. Bulletin of Research Center of Corporate Law, Management and Venture Investment of Syktyvkar State University	12
Regional Economics: Theory and Practice	8
Economics and Management: Problems, Solutions	7

The presented list was determined by summing the number of publications that address the topic of population migration in the Arctic for the period from 2010 to 2022. The journal “Arctic and North” is clearly in the lead among the presented publications. The journal publishes articles on economic, sociological and political science, the founder is the Northern (Arctic) Federal University named after M.V. Lomonosov.

Along with the growing number of papers, the range of authors publishing on these topics is also expanding. The authors of the selected 286 articles on the topic of migration processes in the Russian Arctic were 519 Russian scientists. Thus, taking into account the fact of co-authorship, there are on average two authors per article. At the same time, only 20 Russian authors are regular authors (with 5 or more publications), 60 authors have 2–4 publications in this subject area, and for the vast majority (218 authors) such publications are single.

An analysis of the profiles of the authors of articles on migration topics in the Arctic allows us to identify a number of author collectives (scientific schools) that regularly publish on migration topics in the Russian Arctic and are leaders in the number of publications in this subject area. The second part of the article will present an overview of scientific works, revealing the main approaches to the study of population migration in the Arctic regions of Russia.

### ***Population migration in the Russian Arctic in publications of leading research teams***

A research team from the *Institute of Socio-Economic and Energy Problems of the North of the Komi Scientific Center of the Ural Branch of the Russian Academy of Sciences* under the leadership of V.V. Fauzer studies migration processes in the context of their influence on population size and the transformation of socio-demographic structures [9], as well as on the processes of population settlement in the Arctic zone of Russia [10]. Using official statistics from Rosstat and population census materials, the authors analyze the dynamics, structure and spatial differentiation of migration processes, as well as the contribution of the migration component to population changes [11; 12]. The publications of the scientific team present not only a statistical analysis of demographic and migration indicators, but also deeply consider theoretical approaches to determining population migration, factors and causes of migration mobility of the population, issues of population settlement in the Russian Arctic, special attention is paid to the historical overview of the de-

velopment of the North and the Arctic through migration processes [13]. When studying migration processes, the authors do not ignore the ethnic component that is special for the North and the Arctic, analyzing the impact of migration on the number and composition of indigenous ethnic groups [14].

The objects of research of this research team are both the northern and Arctic regions of the country, as well as individual settlements located there. The possibilities of such research are significantly expanded by the emergence of new sources of information that are accumulated in the digital environment (data from social networks and other digital platforms). Using digital traces of the population, the authors obtain detailed and timely data on migration processes in urban districts and municipal areas of the Russian Arctic, comprehend and systematize this information, analyze the connectivity of Arctic territories, and build models of migration flows [6; 15].

It is worth noting that the works of this research team are the most highly cited among all selected publications on migration topics in the Russian Arctic, the average number of citations among the articles of the team of authors for 2010–2020 amounted to 25, the most highly cited works were publications [10; 16], having more than 50 citations in the RSCI.

A team of scientists from *the Federal Center for Integrated Arctic Research named after Academician N.P. Laverov of the Ural Branch of the Russian Academy of Sciences* under the leadership of A.G. Shelomentsev used various approaches to analyze migration processes in the Arctic zone of Russia. In their studies, the authors assess the impact of population migration on the socio-economic development of the Arctic territories, employment, socio-demographic structure, using a wide mathematical apparatus: methods of approximation and correlation-regression analysis of statistical data [17], construction of a set of econometric models of migration dynamics based on time series aggregation [18]. The Arctic municipalities of all regions of the Russian Arctic within the boundaries established by the Decree of the President of the Russian Federation are in the field of scientific attention of researchers. The source base of the research is official data from Rosstat, municipal statistics provided by the administrations of municipalities of the Russian Arctic, as well as information posted on their official websites.

Among the qualitative approaches used by the authors in research on Arctic migrations, one can highlight: content analysis of strategic planning documents for the regulation of the migration situation, development of directions for improving state regulation of migration flows in the regions of the Russian Arctic [19], as well as the construction of classification systems of factors of migration of the Russian Arctic population based on an in-depth analysis of scientific literature [20].

Scientists from *the Institute for Economic Studies named after G.P. Luzin of the Federal Research Center "Kola Science Center of the Russian Academy of Sciences"* consider migration processes in the regions of the Russian Arctic through the prism of sustainable balanced development of the Arctic territories and various aspects of the socio-economic systems of the North and the Arctic. A number of recent studies by this scientific team led by T.P. Skufyina is devoted to the

analysis of migration attitudes of Arctic residents, including in the context of the impact of the pension reform of 2018, and is based on a series of representative sociological surveys of the population, including employees of city-forming enterprises in the Arctic regions [21].

Another aspect of migration research in the Russian Arctic is devoted to studying the role of the migration factor in the formation of labor resources and socio-labor potential of the Arctic territories of Russia [22; 23]. Korchak E.A., Ivanova M.V. focus on such causes of migration outflow as difficulties in finding employment, low satisfaction with living conditions, supporting these conclusions not only by statistical analysis of socio-economic indicators, but also by the results of long-term sociological studies of living conditions and quality of life of the population, including young people [24]. The objects of research in most of the works of the scientific team of the Luzin Institute for Economic Studies, dedicated to migration to the Russian Arctic, are regions of the country that are entirely part of the Arctic zone of the Russian Federation. The Murmansk Oblast occupies a special place in the pool of these studies [25; 26].

The topic of migration processes in the Arctic is one of the areas of research by scientists from *the Northern (Arctic) Federal University named after M.V. Lomonosov*. Sokolova F.H. analyses the dynamics of population migration indicators in the Russian Arctic on the basis of census materials and statistical data, based on historical excursions [27]. *Arctic Center for Strategic Studies of the Northern (Arctic) Federal University named after M.V. Lomonosov* conducts monitoring and analytical studies to assess the state of development of the Arctic region, including sociological studies to identify the migration intentions of residents of the Arctic regions, the causes and motives of possible migration [28]. For example, work [29] analyzes the migration attitudes of students of higher education programs with an Arctic focus in the cities of Arkhangelsk, Murmansk, Krasnoyarsk and Yakutsk. The research of A.A. Dregalo and V.I. Ulyanovsky, who adhere to the paradigm of “settling” of the northern and Arctic territories, is devoted to the issues of population migration there. The authors pay special attention to the problems of motivation, social and cultural adaptation of labor migrants, using data from sociological surveys and standardized interviews accumulated over several decades as a source of information [30].

A.N. Pilyasov and N.Y. Zamyatina, founders of *the Institute of Regional Consulting*, a leading research centre in the field of development of the Arctic and northern regions, and employees of *Moscow State University named after M.V. Lomonosov*, study the specifics of settlement and modern arrangement of the Arctic territories, paying attention to the migration factor. Summarizing the best achievements of the Soviet northern studies, foreign works on the frontier and a number of other modern directions in the study of resource territories, the authors set themselves the task of developing a new comprehensive theory of the development of the North and the Arctic [31; 32]. In their research they address both the Russian Arctic as a whole and its individual regions or municipalities.

When studying migration processes in the Arctic regions, N.Yu. Zamyatina relies on such a phenomenon as “social translocal connections”, thanks to which constant and intense migration

flows are maintained between pairs of regions (north–south) [33]. The author’s approach to analyzing the connection between migration processes among young people and the symbolic capital of territories is also interesting [34]. These studies are based on a combination of statistical analysis of migration indicators, the study of migration behavior and motivation using questionnaires and qualitative anthropological methods.

Scientists from *the Institute of Economic Forecasting of the Russian Academy of Sciences* are making a significant contribution to the study of Arctic migrations. The publications of the team of authors under the leadership of A.G. Korovkin assess the intensity, directions, and probability of migration of the population in the regions of the Russian Arctic, and also examine the socio-economic factors influencing this process [35]. Another layer of work by the team is devoted to research of labor migration trends in the context of analyzing indicators of regional labor markets [36]. These studies are based on the author’s methodology of balances of population movement and labor resources; Rosstat data, as well as reported and forecasted balances of labor resources of the regions of the Russian Arctic, serve as the information base for the research. The authors focus on the Arctic regions as a whole, without singling out Arctic parts, presenting the results of calculations for the Asian and European parts of the Russian Arctic.

The table summarizes and systematizes information about the methods that are dominant in the study of migration processes in the Russian Arctic by the above-mentioned research teams.

Table 2

*Leading research teams in the field of population migration in the Russian Arctic and the dominant methodologies in the study of migration processes*

Organizations whose employees are regular authors of articles on the subject of migration processes in the Arctic Zone of the Russian Federation	Descriptive Analysis of Statistics	Mathematical Modeling	Content Analysis	Surveys	Interview	Review (theoretical, historical, etc.)
Institute of Socio-Economic and Energy Problems of the North, Komi Science Center Ural Branch of Russian Academy of Sciences	✓	✓	✓			✓
N. Laverov Federal Center for Integrated Arctic Research of the Ural Branch of the Russian Academy of Sciences	✓	✓	✓			
Luzin Institute for Economic Studies — Subdivision of the Federal Research Centre “Kola Science Centre of the Russian Academy of Sciences”	✓	✓		✓		✓
Northern (Arctic) Federal University named after M.V. Lomonosov	✓			✓	✓	✓
Institute for Regional Consulting			✓	✓	✓	✓

The Institute of Economic Forecasting of the Russian Academy of Sciences	✓	✓				
--	---	---	--	--	--	--

In addition to the works of the above-mentioned research teams, the topic of migration processes in the Russian Arctic is touched upon in the publications of V.V. Markin, A.N. Silin (*Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences*), one of the areas of scientific interests of which is related to the human and social potential of the Arctic regions and is expressed in studies of the socio-demographic characteristics of the quantity and quality of people intending to live and (or) work in the Arctic, their professional competencies, health, social trust, etc. [37]. Another direction of the authors' research concerns the study of rotational labor migration characteristic of many Arctic territories [38]. As an empirical basis for research, the authors use statistical data, as well as the results of mass public surveys, focus groups, and expert surveys using proprietary methods.

A number of studies in the field of population migrations in the Russian Arctic, reflected in a large number of scientific publications, are local in nature and are limited to the analysis of these processes in specific Arctic regions. Among such authors we can single out S.A. Suknyova (*Eastern Federal University named after M.K. Ammosov*), who analyzes migration processes in the Republic of Sakha (Yakutia) in the context of their impact on the economic and demographic development of the region and the formation of labor resources [39]. In the works of E.N. Sharova (*Murmansk State Arctic University*), special attention is paid to the study of youth migration in the Murmansk Oblast in the sociological dimension: life strategies and professional and educational attitudes of young people in the conditions of migration outflow of the population are analyzed, as well as the level of regional identity among young people as a factor influencing migration attitudes [40].

### **Conclusion**

The problem of population migration in the Arctic is currently a relevant subject of research and is reflected in the publications of researchers studying various aspects of the development of Arctic territories.

This article analyzes the dynamics of research on population migration in the Russian Arctic in journal publications in the scientific citation database on the eLIBRARY.RU platform. Over the past ten years, research on population migration in the Arctic has been developing, expanding the range of authors and increasing the number of works in this subject area. However, the number of regular authors publishing on this topic is small.

Based on the results of the analysis, we have identified a list of scientific publications that most frequently publish articles on the problems of population migration in the Arctic region. The analysis of the publication activity of the authors of these articles made it possible to identify a circle of regular authors (teams of authors) whose scientific interests are concentrated on the study of population migration in the Arctic regions of the country. Among these authors are scientists of various specializations: economists, sociologists, geographers, demographers, mathemati-



cians, historians, who demonstrate a complex of different methods and approaches to the study of migration processes in the Russian Arctic. The authors of most of the analyzed works agree that the migration outflow of the population from the Arctic regions of the country is a problematic phenomenon that creates a number of objective risks and threats to the implementation of strategic plans for the development of the Arctic macroregion. As basic recommendations for overcoming these threats, the authors propose the formation of an effective population settlement system in combination with the use of a rotational method of labor organization in relation to underdeveloped Arctic territories, as well as a set of measures aimed at improving the quality of life of the population in the Russian Arctic.

It is worth noting that solving the problem of migration outflow requires objective scientific knowledge not only about migration mobility in the Russian Arctic, but also about the patterns of spatial distribution of flows of various social groups against the backdrop of a comprehensive study of the Arctic macroregion. One cannot but agree with the opinion of A.A. Dregalo, V.I. Ulyanovskiy that “modern migration policy in the region should be targeted, specific, focused on various types of migrants, and built taking into account the new paradigm for the development of the North — the settlement of territories” [30]. Of course, each of the social groups (youth, labor migrants, pensioners, rotation workers) influences the economy and social and labor potential of the territory of residence, and it is important to consider and regulate the interests of each group in the light of the prospects of development of the Arctic regions [41, Andreeva Yu.V. , Magomedov A.K., Omarov M.A., p. 46]. This determines the field of promising directions for the study of migration processes in the Arctic zone of Russia.

## References

1. Pestsov S.K. Strategiya i politika Rossii v Arktike [Strategy and Policy of Russia in the Arctic]. *U karty Tikhogo okeana* [The Map of the Pacific], 2016, no. 45 (243), pp. 6–19.
2. Stepus I.S., Simakova A.V. Motivatsionnye drayvery v dinamike potokov chelovecheskikh resursov v Arkticheskoy zone Rossii: postanovka problem [Motivational Drivers in the Dynamics of Human Resource Flows in the Arctic Zone of Russia: Problem Statement]. In: *Sever i Arktika v novoy paradigme mirovogo razvitiya. Luzinskie chteniya — 2022: Materialy XI Mezhdunarodnoy nauchno-prakticheskoy konferentsii (Apatity, 22-23 sentyabrya 2022 g.)* [North and the Arctic in the New Paradigm of World Development. Luzin Readings 2022: Proc. 11th Intern. Scie. Pract. Conf.]. Apatity, FRC KSC Publ., 2022. S. 117–118. (In Russ.)
3. Lukin Yu.F. *Mnogolikaya Arktika v potoke vremeni i smyslov: monografiya* [The Diverse Arctic in the Flow of Time and Meanings]. Arkhangel'sk, NARFU Publ., 2019, 241 p. (In Russ.)
4. Ukhanova A.V., Smirennikova E.V., Voronina L.V. Klassifikatsiya faktorov migratsii naseleniya Rossiyskoy Arktiki [Classification of Migration Factors of the Russian Arctic Population]. *Fundamental'nye issledovaniya* [Fundamental Research], 2021, no. 4, pp. 123–129. DOI: 10.17513/fr.43011
5. Fauzer V.V., Smirnov A.V., Yurkov D.V., Fauzer G.N., Lytkina T.S. *Demograficheskiy i trudovoy faktory ustoychivogo razvitiya severnykh regionov Rossii: monografiya* [Demographic and Labor Factors of Sustainable Development of the Northern Regions of Russia]. Moscow, Ekon-Inform Publ., 2018. 215 s. (In Russ.)
6. Fauzer V.V., Smirnov A.V. Migratsii naseleniya rossiyskoy Arktiki: modeli, marshruty, rezul'taty [Migration of the Russian Arctic Population: Models, Routes, Results]. *Arktika: ekologiya i ekonomika* [Arctic: Ecology and Economy], 2020, no. 4 (40), pp. 4–18. DOI: 10.25283/2223-4594-2020-4-4-18

7. Shelomentsev A.G., Voronina L.V., Smirennikova E.V., Uhanova A.V. Faktory migratsii v arkticheskoy zone Rossiyskoy Federatsii [Migration Factors in the Arctic Zone of Russian Federation]. *Ars Administrandi (Iskusstvo upravleniya)* ["Ars Administrandi" ("The Art of Governance")], 2018, vol. 10, no. 3, pp. 396–418. DOI: 10.17072/2218-9173-2018-3-396-418
8. Stepus I.S., Gurtov V.A., Averyanov A.O. Migratsii naseleniya dlya razvitiya rossiyskoy Arktiki: osobennosti i vozmozhnosti [Population Migration for the Development of the Russian Arctic: Features and Opportunities]. *Region: ekonomika i sotsiologiya* [Region: Economics and Sociology], 2022, no. 1, pp. 73–103. DOI: 10.15372/REG20220103
9. Fauzer V.V., Lytkina T.S., Fauzer G.N., Smirnov A.V. Vliyanie migratsiy na chislennost' i transformatsiyu sotsial'no-demograficheskikh struktur naseleniya rossiyskogo Severa [The Impact of Migration on the Number and Transformation of Socio-Demographic Structures of the Population in the Russian North]. *Izvestiya Komi nauchnogo tsentra UrO RAN* [Proceedings of the Komi Science Centre of the Ural Division of the Russian Academy of Sciences], 2018, no. 4 (36), pp. 111–121. DOI: 10.19110/1994-5655-2018-4-111-121
10. Fauzer V.V., Lytkina T.S., Fauzer G.N. Osobennosti rasseleniya naseleniya v Arkticheskoy zone Rossii [Features of Population Settlement in the Arctic Zone of Russia]. *Arktika: ekologiya i ekonomika* [Arctic: Ecology and Economy], 2016, no. 2 (22), pp. 40–50.
11. Fauzer V.V., Lytkina T.S. Migratsionnye protsessy na rossiyskom Severe [Migratory Processes in the Russian North]. *Sotsial'naya politika i sotsiologiya* [Social Policy and Sociology], 2017, vol. 16, no. 1 (120), pp. 141–149. DOI: 10.17922/2071-3665-2017-16-1-141-149
12. Fauzer V.V. Otsenka roli migratsiy v formirovanii naseleniya Respubliki Komi [Evaluation of Migration Role in Formation of the Komi Republic Population]. *Korporativnoe upravlenie i innovatsionnoe razvitie ekonomiki Severa: Vestnik NITs KPUVI SyktGU* [Corporate Governance and Innovative Economic Development of the North: Bulletin of Research Center of Corporate Law, Management and Venture Investment of Syktyvkar State University], 2014, no. 4, pp. 170–183.
13. Lytkina T.S., Fauzer V.V. Gosudarstvennoe upravlenie prinuditel'noy migratsiyey kak sposob osvoeniya Severa Rossii v 1930–1950-e gg. [Forced Migration as a Way of Russian North Development in the 1930s–1950s]. *Zhurnal sotsiologii i sotsial'noy antropologii* [The Journal of Sociology and Social Anthropology], 2016, vol. 19, no. 1 (84), pp. 90–109.
14. Fauzer V.V., Lytkina T.S., Fauzer G.N. Migratsionnyy faktor dinamiki chislennosti i etnicheskikh struktur naseleniya rossiyskogo Severa [Migratory Factor of the Population Dynamics and Ethnic Structures in the Russian North]. *Sever i rynek: formirovanie ekonomicheskogo poryadka*, 2018, no. 5 (56), pp. 32–43. DOI: 10.25702/KSC.2220-802X-5-2017-56-32-43
15. Smirnov A.V. Tsifrovye sledy naseleniya kak istochnik dannykh o migratsionnykh potokakh v rossiyskoy Arktike [Digital Traces of the Population as a Data Source on Migration Flows in the Russian Arctic]. *Demograficheskoe obozrenie* [Demographic Review], 2022, no. 9 (2), pp. 42–64. DOI: 10.17323/demreview.v9i2.16205
16. Fauzer V.V. Demograficheskiy potentsial severnykh regionov Rossii — faktor i uslovie ekonomicheskogo osvoeniya Arktiki [Demographic Potential of the Russia's Northern Regions as a Factor and Condition of Economic Development of the Arctic]. *Ekonomika regiona* [Economy of Regions], 2014, no. 4, pp. 69–81.
17. Shelomentsev A.G., Voronina L.V., Ukanova A.V., Smirennikova E.V. Otsenka vliyaniya migratsii naseleniya na sotsial'no-demograficheskuyu strukturu Arkticheskoy zony Rossiyskoy Federatsii [Assessing the Impact of Population Migration on the Socio-Demographic Structure of the Arctic Zone of the Russian Federation]. *Korporativnoe upravlenie i innovatsionnoe razvitie ekonomiki Severa: Vestnik Nauchno-issledovatel'skogo tsentra korporativnogo prava, upravleniya i venchurnogo investirovaniya Syktyvkar'skogo gosudarstvennogo universiteta* [Corporate Governance and Innovative Economic Development of the North: Bulletin of the Research Center of Corporate Law, Management and Venture Capital of Syktyvkar State University], 2019, no. 3, pp. 83–91. DOI: 10.34130/2070-4992-2019-3-83-91
18. Shelomentsev A.G., Goncharova K.S., Voronina L.V. Modeli migratsionnoy dinamiki naseleniya na territorii Arkticheskoy zony Rossiyskoy Federatsii [Models of Migration Dynamics of Population in the Territory of the Arctic Zone of the Russian Federation]. *Upravlenie v sovremennykh sistemakh*

- [Management in Modern System], 2020, no. 4(28), pp. 52-64. DOI: 10.24411/2311-1313-2020-10012
19. Shelomentsev A.G., Voronina L.V., Smirennikova E.V., Ukhanova A.V. Migratsionnaya politika na territorii Arkticheskoy zony Rossiyskoy Federatsii: osobennosti i napravleniya sovershenstvovaniya [Migration Policy in the Arctic Zone of the Russian Federation: Features and Directions of Improvement]. *Korporativnoe upravlenie i innovatsionnoe razvitie ekonomiki Severa: Vestnik Nauchno-issledovatel'skogo tsentra korporativnogo prava, upravleniya i venchurnogo investirovaniya Syktyv-karskogo gosudarstvennogo universiteta* [Corporate Governance and Innovative Economic Development of the North: Bulletin of the Research Center of Corporate Law, Management and Venture Capital of Syktyvkar State University], 2018, no. 4, pp. 53–65.
  20. Ukhanova A.V., Smirennikova E.V., Voronina L.V. Klassifikatsiya faktorov migratsii naseleniya Rossiyskoy Arktiki [Classification of Migration Factors of the Russian Arctic Population]. *Fundamental'nye issledovaniya* [Fundamental Research], 2021, no. 4, pp. 123–129. DOI: 10.17513/fr.43011
  21. Skufina T.P., Samarina V.P., Baranov S.V., Bazhutova E.A. Socio-Demographic Processes in the Russian Arctic in Statistical Assessments and Population Surveys. *Arktika i Sever* [Arctic and North], 2021, no. 45, pp. 127–149. DOI: 10.37482/issn2221-2698.2021.45.127
  22. Ivanova M.V., Zaitsev D.V. Arkticheskie trudovye resursy: tekushchee sostoyanie i budushchie vyzovy [Human Resources of the Arctic: The Current Condition and Future Challenges]. *Regional'naya ekonomika: teoriya i praktika* [Regional Economics: Theory and Practice], 2016, no. 10 (433), pp. 46–62.
  23. Korchak E.A. Migratsionnye protsessy v formirovanii trudovogo potentsiala Murmanskoy oblasti [The Processes of Migration in the Formation of Labor Potential in the Murmansk Region]. *Sovremennye problemy nauki i obrazovaniya* [Modern Problems of Science and Education], 2014, no. 3, p. 428.
  24. Ivanova M.V., Klyukina E.S. Sovremennye predposylki budushchego arkticheskikh trudovykh resursov [Contemporary Preconditions for the Future of the Arctic Labor Resources]. *Monitoring obshchestvennogo mneniya: Ekonomicheskie i sotsial'nye peremeny* [Monitoring of Public Opinion: Economic and Social Changes Journal], 2017, no. 6, pp. 180–198. DOI: 10.14515/monitoring.2017.6.08
  25. Korchak E.A. Migratsionnaya situatsiya v Murmanskoy oblasti v svete realizatsii arkticheskikh interesov Rossii [The Migration Situation in the Murmansk Region in the Light of Implementation of Russian Arctic Interests]. *Regional'naya ekonomika i upravlenie* [Regional Economy and Management], 2019, no. 2, pp. 1–13.
  26. Baranov S.V., Skufina T.P., Gushchina I.A. Vliyanie povysheniya pensionnogo vozrasta na ekonomiku i nastroyeniya naseleniya Murmanskoy oblasti [The Impact of the Retirement Age Increase on the Economy and Attitudes of the Population of the Murmansk Oblast]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2020, vol. 13, no. 1, pp. 160–173. DOI: 10.15838/esc.2020.1.67.9
  27. Sokolova F.Kh. Migratsionnye protsessy v rossiyskoy Arktike [Migration Processes in the Russian Arctic]. *Arktika i Sever* [Arctic and North], 2016, no. 25, pp. 158–172. DOI: 10.17238/issn2221-2698.2016.25.158
  28. Katorin I.V. *Arktika dlya lyudey. Itogi sotsiologicheskogo proekta po teme «Sostoyanie i perspektivy sotsial'no-ekonomicheskogo razvitiya arkticheskikh regionov Rossii v predstavleniyakh zhiteley Evropeyskogo Severa»* [Arctic for People. The Results of a Sociological Project “The Status and Prospects of Socio-Economic Development of the Arctic Regions of Russia as Viewed by Residents of the European North”]. Arkhangelsk, A4 Publishing House, 2015, 68 p. (In Russ.)
  29. Zaikov K.S., Katorin I.V., Tamitskii A.M. Migratsionnye ustanovki studentov, obuchayushchikhsya po obrazovatel'nym programmam vysshego obrazovaniya arkticheskoy napravlenosti [Migration Attitudes of the Students Enrolled in Arctic-Focused Higher Education Programs]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2018, no. 3, pp. 230–247. DOI: 10.15838/esc.2018.3.57.15
  30. Dregalo A.A., Ulyanovsky V.I. Tipologicheskie osobennosti sotsial'no-kul'turnoy adaptatsii migrantov v usloviyakh lokal'noy Severnoy sredy [Typological Features of Social and Cultural Adaptation of Migrants in the Local Northern Environment]. *Vestnik Severnogo (Arkticheskogo) federal'nogo*

- universiteta. Ser.: Gumanitarnye i sotsial'nye nauki* [Vestnik of Northern (Arctic) Federal University. Ser.: Humanitarian and Social Sciences], 2011, no. 2, pp. 66–72.
31. Pilyasov A.N., Zamyatina N.Yu. Development of the North 2.0: Challenges of Making a New Theory. *Arktika i Sever* [Arctic and North], 2019, no. 34, pp. 57–76. DOI: 10.17238/issn2221-2698.2019.34.57
  32. Zamyatina N.Yu., Pilyasov A.N. The New Theory of the Arctic and Northern Development: Multi-Scale Interdisciplinary Synthesis. *Arktika i Sever* [Arctic and North], 2018, no. 31, pp. 5–27. DOI: 10.17238/issn2221-2698.2018.31.5
  33. Zamyatina N.Yu., Liarskaya E.V. Lyudi Arktiki v prostranstve Rossii: mezhdistsiplinarne podkhody k translokal'nym soobshchestvam [The People of the Arctic in the Space of Russia: Interdisciplinary Approaches to the Translocal Communities]. *Vestnik Arheologii, Antropologii i Etnografii*, 2022, no. 2 (57), pp. 210–221. DOI: 10.20874/2071-0437-2022-57-2-17
  34. Zamyatina N.Yu. Simvolicheskiy kapital territorii v kontekste arkticheskikh migratsiy: vzglyad iz Noril'ska [Symbolic Capital of a Territory in the Context of Arctic Migrations: A View from Norilsk]. *Etnograficheskoe obozrenie* [Ethnographic Review], 2016, no. 4, pp. 45–59.
  35. Korovkin A.G., Sinita A.L. Otsenka intensivnosti i napravleniy dvizheniya naseleniya v regionakh rossiyskoy Arktiki v 1991–2015 godakh [Assessment of Intensity and Directions of Population Movement in the Russian Arctic Regions in 1991-2015]. *Nauchnye trudy: Institut narodnokhozyaystvennogo prognozirovaniya RAN* [Scientific Works: Institute of Economic Forecasting of the Russian Academy of Sciences], 2019, vol. 17, pp. 323–340. DOI: 10.29003/m823.sp\_ief\_ras2019/323-340
  36. Korovkin A.G. Makroekonomicheskaya otsenka sostoyaniya regional'nykh rynkov truda v evropeyskoy chasti Rossiyskoy Arktiki [Macroeconomic Assessment of the Regional Labor Markets in the European Part of the Russian Arctic]. *Problemy prognozirovaniya* [Studies on Russian Economic Development], 2016, no. 1 (154), pp. 74–89.
  37. Markin V.V., Silin A.N. Chelovecheskiy i sotsial'nyy potentsial neoindustrial'nogo osvoeniya Arktiki: sotsiologicheskii analiz, modelirovanie, regulirovanie [Human and Social Potential of Neo-Industrial Development of the Arctic: Sociological Analysis, Modeling, And Regulation]. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz* [Economic and Social Changes: Facts, Trends, Forecast], 2017, vol. 10, no. 6. pp. 75–88. DOI: 10.15838/esc.2017.6.54.5
  38. Silin A.N. Arkticheskii gorod i vakhtovik: novye vyzovy [Arctic City and Rotational Worker: New Challenges]. *Nauchnyy vestnik Yamalo-Nenetskogo avtonomnogo okruga* [Scientific Bulletin of the Yamal-Nenets Autonomous District], 2021, no. 1, pp. 68–82. DOI: 10.26110/ARCTIC.2021.110.1.005
  39. Sukneva S.A. Tendentsii migratsionnoy dinamiki v Respublike Sakha (Yakutiya) [Migration Trends in the Sakha Republic (Yakutia)]. *Vestnik Severo-Vostochnogo Federal'nogo Universiteta Im. M.K. Ammosova. Ser.: Ekonomika. Sotsiologiya. Kul'turologiya* [Vestnik of North-Eastern Federal University. Economics. Sociology. Culturology], 2017, no. 1 (05), pp. 31–40.
  40. Sharova E.N. Migratsionnye ustanovki molodezhi Murmanskoy oblasti [Migration Attitudes of Young People in the Murmansk Oblast]. *Problemy razvitiya territorii* [Problems of Territory's Development], 2015, no. 3 (77), pp. 88–103.
  41. Andreeva Yu.V., Magomedov A.K., Omarov M.A. Kriticheskiy analiz opyta issledovaniy migratsionnykh protsessov v regionakh rossiyskoy Arktiki i subarktiki [Critical Analysis of the Experience of Research on Migration Processes in the Regions of the Russian Arctic and Subarctic]. *Vo prosy etnopolitiki* [Issues of Ethnopolitics], 2020, no. 3, pp. 33–49. DOI: 10.28995/2658-7041-2020-3-33-49

*The article was submitted 25.01.2023; approved after reviewing 30.01.2023;  
accepted for publication 03.02.2023*

*Contribution of the authors: the authors contributed equally to this article.*

*The authors declare no conflicts of interests*



## Editorial board of the “Arctic and North” journal

### International members:

**Alfred Colpaert**, PhD in Geography, Professor in Physical Geography and Geoinformatics, Department of Geographical and Historical Studies, University of Eastern Finland (Finland).

**Arild Moe**, Cand. of Political Sciences, Research professor, Fridjof Nansen Institute (Norway).

**Jens Petter Nielsen**, PhD in History, Professor, Department of Archaeology, History, Religious Studies and Theology, UiT — the Arctic University of Norway (Norway).

**Jukka Nyysönen**, Doctor Artium, Researcher, High North Department, Norwegian Institute for Cultural Heritage Research (Norway).

**Lassi Heininen**, PhD in Social Sciences, Emeritus Professor at University of Lapland (Finland), Visiting professor at Northern (Arctic) Federal University named after M.V. Lomonosov, Editor of Arctic Yearbook (Finland).

**Maria Lähteenmäki**, PhD in Philosophy, Professor, Department of Geographical and Historical Studies, University of Eastern Finland (Finland).

**Andrey N. Petrov**, PhD in Geography, Associate Professor of Geography and Geospatial Technology, Department of Geography, Director of Arctic, Remote and Cold Territories Interdisciplinary Center, University of Northern Iowa (USA).

**Øyvind Ravna**, PhD in Law, Professor, Faculty of Law, UiT — the Arctic University of Norway (Norway).

**Paul Josephson**, PhD in Political Science, Professor, Department of History, Colby College (USA).

### Russian members:

**Kirill S. Golokhvast**, Doctor of Biological Sciences, Professor of the Russian Academy of Sciences, Corresponding Member of the Russian Academy of Education, Siberian Federal Research Centre of Agro-BioTechnologies of the Russian Academy of Sciences (SFSCA RAS) (Russia)

**Konstantin S. Zaikov**, Doctor of Historical Sciences, Philosophiae Doctor in humanities and social sciences, Northern (Arctic) Federal University named after M.V. Lomonosov (Arkhangelsk, Russia)

**Igor F. Kefeli**, Doctor of Philosophical Sciences, Professor, Director of the Center for Geopolitical Expertise of the North-West Institute of Management of the RANEPa under the President of the Russian Federation, First Vice-President of the Academy of Geopolitical Problems, expert of the Russian Academy of Sciences. Honored Worker of Higher Education of the Russian Federation. Center for geopolitical expertise of North-West Institute of Management (RANEPa) (Saint Petersburg, Russia)

**Valery N. Konyshv**, Doctor of Political Sciences, Professor, Professor of the Department of Theory and History of International Relations, Saint Petersburg State University (Saint Petersburg, Russia)

**Vladimir M. Kotlyakov**, Doctor of Geographical Sciences, Professor, Scientific Director of the Institute of Geography of the RAS. Honorary President of the Russian Geographical Society. Full member of the Russian Academy of Sciences, member of the European Academy of Sciences, foreign member of the French and Georgian Academies of Sciences. Doctor Honoris Causa, Tbilisi State University. Honorary Member of the American, Mexican, Italian, Georgian, Estonian and Ukrainian Geographical Societies, Honorary President of the Russian Geographical Society. Member of the Intergovernmental Panel on Climate Change awarded the Nobel Peace Prize (2007). Winner of 11 gold medals and prizes, incl. the Russian Federation National Awards in Science and Technology (2001) (Moscow, Russia)

**Elena V. Kudryashova**, Doctor of Philosophy, Professor, Rector, Northern (Arctic) Federal University named after M.V. Lomonosov, Editor-in-Chief of the “Arctic and North” journal (Arkhangelsk, Russia)

**Svetlana A. Lipina**, Doctor of Economics, Deputy Chairman of the Council for the Study of Productive Forces, Russian Foreign Trade Academy, Ministry of Economic Development of the Russian Federation (Moscow, Russia)



**Yuriy F. Lukin**, Doctor of Historical Sciences, Professor, Honored Worker of Higher Education of the Russian Federation (Arkhangelsk, Russia)

**Vladimir A. Masloboev**, Doctor of Engineering Sciences, Professor, Senior Advisor to the Chairman of FRC “Kola Science Center of the RAS”, Scientific Supervisor of the Institute of Industrial Ecology Problems in the North FRC KSC RAS, Honorary Doctor of Northern (Arctic) Federal University named after M.V. Lomonosov, Kola Science Center of the Russian Academy of Sciences (Apatity, Russia)

**Aleksandr N. Pilyasov**, Doctor of Geographical Sciences, Professor, Department of SocioEconomic Geography of Foreign Countries, Geographical Faculty. General Director of ANO “Institute of Regional Consulting”. Chairman of the Russian section of the European Regional Science Association. Deputy Chairman of the Economics Section of the Arctic and Antarctic Council of the Federation Council. Member of the Presidium of the Expert Council on Legislative Support for the Development of Regions of the High North of the State Duma. Lomonosov Moscow State University (Moscow, Russia)

**Maria A. Pitukhina**, Doctor of Political Sciences, Leading Researcher of the Department of Regional Economic Policy of the Institute of Economics of the Karelian Research Center of the Russian Academy of Sciences, Chief Researcher of the Budget Monitoring Center of PetrSU, Professor of the Department of Foreign History, Political Science and International Relations. Petrozavodsk State University (Petrozavodsk, Russia)

**Ludmila A. Sergienko**, Doctor of Biological Sciences, Professor, Department of Botany and Physiology of Plants, Institute of Biology, Ecology and Agricultural Technology, Petrozavodsk State University (Petrozavodsk, Russia)

**Aleksandr A. Sergunin**, Doctor of Political Sciences, Professor, Department of Theory and History of International Relations, Faculty of International Relations, Saint Petersburg State University (St. Petersburg, Russia); external part-timer of the Department of World Politics, MGIMO University

**Irina L. Sizova**, Doctor of Social Sciences, Professor, Department of Applied and Sectoral Social Studies, Faculty of Social Studies, Saint Petersburg State University (Saint Petersburg, Russia)

**Flera Kh. Sokolova**, Doctor of Historical Sciences, Professor, Department of Regional Studies, International Relations and Political Sciences, Northern (Arctic) Federal University named after M.V. Lomonosov. Honored Worker of Higher Education of the Russian Federation (Arkhangelsk, Russia)

**Viktor I. Ulyanovskiy**, Doctor of Social Sciences, Professor, Department of the State and Municipal Government, Northern (Arctic) Federal University named after M.V. Lomonosov. Honored Worker of Higher Professional Education of Russia (Arkhangelsk, Russia)

**Alexey M. Fadeev**, Doctor of Economics, Professor, Graduate School of Business and Management, Institute of Industrial Management, Economics and Trade, Peter the Great Saint Petersburg Polytechnic University (Saint Petersburg, Russia)

**Viktor V. Fauzer**, Doctor of Economics, Professor, Chief Researcher, Laboratory for Demography and Social Management, Institute for Social, Economical and Energetic Problems of the North, Federal Research Center "Komi Scientific Center. Ural Branch of the Russian Academy of Sciences". Honorary Scientist of the Russian Federation (Syktyvkar, Russia)

Order on approval of the editorial board of the scientific online journal  
“Arctic and North” No. 266 dated April 08, 2021,  
“On Amendments to Order No. 266 dated April 8, 2021” dated November 02, 2022

Online: <http://www.arcticandnorth.ru/DOCS/redsovet.php>

## Output data

### **ARCTIC and NORTH, 2023, no. 52**

DOI: 10.37482/issn2221-2698.2023.52

Editor-in-chief — Kudryashova E.V.

Deputy Editor-in-chief — Zaikov K.S

Executive secretary — Kuznetsova E.G.; e-mail: e.g.kuznetsova@narfu.ru

Editor — Grosheva T.E.; e-mail: t.grosheva@narfu.ru

Art editor (English version) — Kovaleva M.N.; e-mail: m.kovaleva@narfu.ru

Placement on the webpage by E.G. Kuznetsova

Registration certificate Эл No. ФC77-78458 dated June 08, 2020

Founder, publisher — Northern (Arctic) Federal University named after M.V. Lomonosov

Address of the founder, publisher: Naberezhnaya Severnoy Dviny, 17, Arkhangelsk, 163002, Russia

Address for correspondence: “Arctic and North” journal, Naberezhnaya Severnoy Dviny, 17, Arkhangelsk, 163002, Russia

E-mail address of the editorial office: **aan@narfu.ru**

Signed for placement on the webpage <http://www.arcticandnorth.ru/> on September 29, 2023