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Preconditions for the development of Russian Arctic export, coastal (cabotage) transportation and project cargo for the arctic demand*

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Abstract. The article considers the concept and description of the Northern Sea Route (NSR), the main prerequisites for the development of Russian Arctic export by using the NSR. The concept and analysis of coastal shipping using Arctic vessels and the predictive conclusions on possible Arctic projects are also presented in the article.
Systems for the development of Russian Arctic export, coastal transportation, and project cargo for Arctic demand include freight transport systems by rail and sea transport fleet. The purpose of this article is to analyze the data of transport systems, as well as to identify key prospects for the development of this system in Russia, taking into account a new concept – the Northern Sea Transport Corridor. According to the fact that it is a national transport corridor of the Russian Federation, the development of the cargo traffic is mainly connected with the Arctic exploration projects.
Keywords: *the Northern Sea Route, short sea shipping, Russian Arctic, The Northern Sea Transport Corridor, transshipment, exports, arctic vessels, hydrocarbons, transport and logistics routes, transport infrastructure.*

Introduction

"In the 21st century, one of the national interests of the Russian Federation in the Arctic region is the use of the Northern Sea Route, which contains great strategic potential not only for the northern territories but for the entire state. This transport way, existing in especially extreme climatic conditions, has important geopolitical significance and has a high economic potential" [1, Osipova E.E., Shirikhina E.Yu., p. 639].

"Since the mid-80s of the 20th century, one can trace the trend towards increased attention of the world community to the Arctic territories. European states are interested in the development of international transit shipping along the Northern Sea Route since this route is a profitable solution to reduce the time of delivery of goods from Europe to the countries of the Asia-Pacific region. In this regard, international interest in the commercial use of the Northern Sea Route is growing. The Arctic and the Northern Sea Route are becoming new objects of international politics and the world economy" [2, Lukin Yu.F., p. 156].

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The prospects for the development of international shipping along the Northern Sea Route reinforce the need to intensify the activities of the northern territories of Russia, so the role of the Arkhangelsk Oblast in the development of the Arctic region is increasing.

For shipping companies, the Northern Sea Route opens the possibility of participating in various Arctic projects and carrying out freight transit, coastal, multimodal transportation.

"In shipping, the Northern Sea Route is defined as the "navigation-recommended route from Novaya Zemlya to the Bering Strait", and in the legislation of the Russian Federation, it is "the historically developed national unified transport communication of Russia in the Arctic"[1].

"The water area of the Northern Sea Route is a body of water adjacent to the north coast of the Russian Federation, encompassing inland sea waters, the territorial sea, the adjacent zone and the exclusive economic zone of the Russian Federation and bounded in the east by the line of demarcation of sea spaces with the United States of America and the parallel to Cape Dezhnev in the Bering Strait, from the west by the meridian of Cape Zhelaniya to the Novaya Zemlya archipelago, the eastern coastline of the Novaya Zemlya archipelago and the western borders of straits: the Matochkin Shar, Karskie Vorota, Ugorskiy Shar"[2].

Inland sea waters of the Russian Federation are the waters located offshore from the baselines from which the breadth of the territorial sea of the Russian Federation is measured. Inland sea waters are part of the territory of the Russian Federation.

The territorial sea of the Russian Federation is a sea belt 12 nautical miles wide, adjacent to the land territory or internal sea waters, measured from the baselines.

"The adjacent zone of the Russian Federation is the sea belt located outside the territorial sea, adjacent to it, and whose outer border is at a distance of 24 nautical miles, measured from the baseline, from which the breadth of the territorial sea is measured"[3].

The exclusive economic zone of the Russian Federation is a marine region located outside the adjacent territorial sea of the Russian Federation and adjacent to it, with a legal regime established by this Federal Law, international treaties of the Russian Federation, and international law. The internal border of the exclusive economic zone is the external border of the territorial sea.

A new concept of the Northern Sea Transport Corridor will appear in the Arctic development strategy until 2035 (Figure 1), because "The functions of a single operator of the Northern Sea Route (NSR) should extend to the territory from Novaya Zemlya to Kamchatka, and not to Chukotka, where the currently defined boundaries of the NSR end." It was reported by TASS with reference to the Deputy

[1] Severnyy morskoy put' – glavnaya transportnaya arteriya Rossii [Northern Sea Route - the main transport artery of Russia]. URL: https://будущее-арктики.рф/severnyj-morskoj-put-glavnaya-transportnaya-arteriya-rossii/ (accessed 04 November 2019).

[2] Kodeks torgovogo moreplavaniya (KTM RF), Glava I. Obshchie polozheniya (st. 1–11), Stat'ya 5.1. Plavanie v akvatorii Severnogo morskogo puti [Merchant Shipping Code (MShK of the Russian Federation), Chapter I. General Regulations (Articles 1–11), Article 5.1. Sailing in the water area of the Northern Sea Route]. URL: https://base.garant.ru/12115482/c739ecf0943aabba2bfe9e5fa22e57a6/ (accessed 04 November 2019).

[3] Severnyy morskoy put' v probleme mezhdunarodnykh transportnykh koridorov [The Northern Sea Route in the problem of international transport corridors]. URL: http://rostransport.com/transportrf/pdf/3/05.pdf (accessed 04 November 2019).

Minister of the Russian Federation for the Development of the Far East and the Arctic Alexander Krutikov. The existing regulation is not enough for the project, and the boundaries of the NSR are clearly defined following international law - from Novaya Zemlya to Chukotka. Therefore, in the strategy, we introduce a new concept of the Northern Sea Transport Corridor - the transport communication from Murmansk to Kamchatka, and we believe that the functions of a single NSR operator should extend to this entire corridor, "he said at the parliamentary hearings" On the preparation of the draft Arctic development strategy zones of the Russian Federation until 2035." Krutikov noted that it was planned to make the Northern Sea Route a globally competitive transport corridor and to increase the volume of international traffic starting from the 2030s. "We need to ensure the regularity and predictability of such transportation, the cost of passing the NSR due to state support should be slightly lower than the cost of the southern route, at least in the first years. Transport companies and shippers must believe that goods can be transported safely and on time via the NSR", the deputy minister explained. He also added that work had begun on a project to create a regular container line between Murmansk and Petropavlovsk-Kamchatsky, "to which goods from Europe and Asia would be delivered by vessels, consolidated there on domestic container ships, by the way, they could also be nuclear or LNG and delivered under state guarantees"[4].

Fig. 1. Northern Sea Transport Corridor[5].

Use of the Northern Sea Route for the export of goods by Russia

"The beginning of the first decade of the 21st century is characterized by a sharp actualization of the Arctic theme in world politics, a significant change in the geopolitical situation. It was due to several

[4] V strategii razvitiya Arktiki poyavitsya ponyatie Severnogo morskogo transportnogo koridora [The concept of the Northern Sea Transport Corridor will appear in the Arctic development strategy]. URL: https://www.korabel.ru/news/comments/d_strategii_razvitiya_arktiki_poyavitsya_ponyatie_severnogo_morskogo_transportnogo_koridora.html (accessed 04 November 2019).

[5] Rossiyskiy transportnyy koridor Severnyy morskoy put' [Russian transport corridor Northern Sea Route] URL: https://expert.ru/data/public/281963/281999/expert_734_138.jpg (accessed 04 November 2019).

factors. The main issues include the delimitation of legally marine areas and continental shelves. Besides, under the conditions of climate change and the reduction of ice cover in the Arctic, favorable conditions arise for the development of natural resources and hydrocarbon production, which in turn becomes an impetus for the development of transport communications. In this regard, increased attention is paid to the problems of the Northern Sea Route development. Climate change and melting ice open not only new opportunities but also create high risks, which have become visible on the world agenda. Another factor of increased attention to the Arctic region is the military-strategic importance of these territories. Thus, these aspects have led to the strengthening of the Northern Sea Route significance for Russia" [4, Problemy Severnogo morskogo puti].

It must be emphasized that the development of the Arctic in various aspects is becoming one of the critical areas both at the level of federal authorities and for large commodity companies operating in the Arctic region. A unique role in this process is played by transport communications, which provide a vital role in the implementation of Arctic projects. Sea routes make it possible to efficiently build up the development of resources concentrated in the Arctic. In this regard, the need for the further development of the Northern Sea Route is of importance.

Also, in the 21st century, the Arctic zone of the Russian Federation is becoming one of the priority areas for new development since it has significant mineral reserves, which in the future can form the resource base of the global economy. The transport and transit potential of the Arctic is increasing, which becomes the impetus for the development of its main transport artery - the Northern Sea Route. Fig. 2 provides information on freight traffic in the NSR in 1970–2017, according to the FSUE "Administration of the Northern Sea Route"[6].

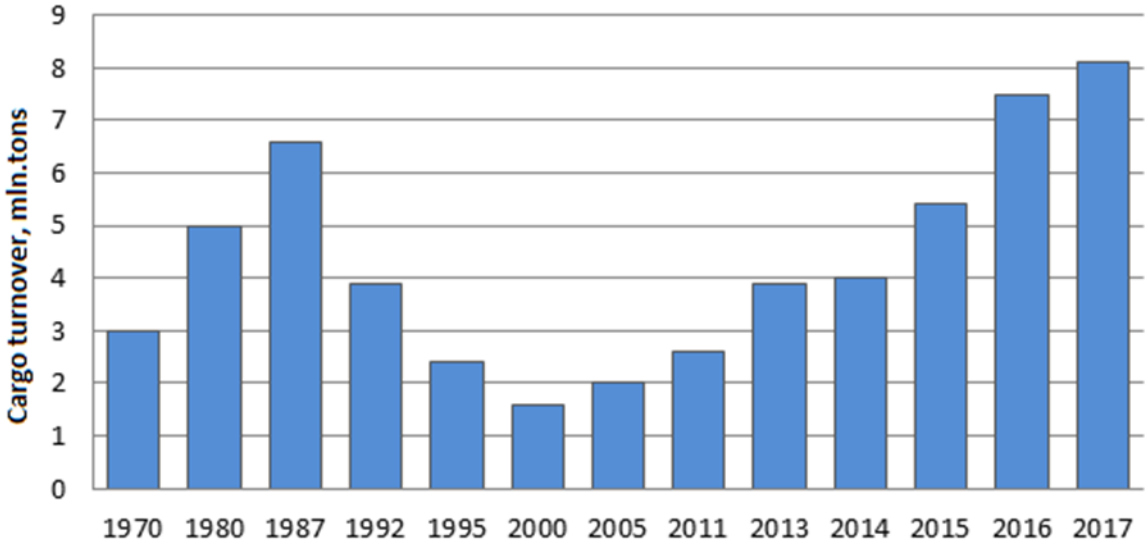

Fig. 2. Dynamics of cargo transportation along the NSR.

[6] Strategiya razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2020 g. [Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period until 2020]. URL: www.minregion.ru/uploads/ attachment/documents/.../200313_2.doc (accessed 04 November 2019).

"The dynamics of freight traffic along the Northern Sea Route indicates its current revival, which is primarily due to the strengthening of Russia's position in the world economic system, ensuring transport security, and economic integration of the Arctic territories gravitating towards the NSR. In 2016, the peak of the 20th century (1987) had been surpassed, and the total cargo turnover reached almost 7.5 million tons"[5, Østreng W., Jorgensen-Dahl A., Nansen F., p. 124].

"The development of the Northern Sea Route in the 21st century can be divided into several stages. So, the period 2000-2007 can be called the period of stabilization of the main parameters of the NSR. Initially, it was necessary to suspend the decline in the main parameters of the Arctic marine transport system. It was achieved through the implementation of "Priority Measures to Ensure the Sustainable and Safe Functioning of the Northern Sea Route". That time, financial issues, economic and legal aspects of the NSR sustainable development were developed. It was completed under the "Program for the comprehensive development of the NSR and its commercial use"[7].

In the Concept of State Support for Economic and Social Development of the North Areas, approved in 2000, the Northern Sea Route was noted as a priority object of state support for Arctic projects.

"Also, there is a clear intention to attract foreign freight carriers to the NSR routes, thereby turning transport communication into an international transit corridor. However, it is stipulated that international shipping will be carried out according to the rules provided for by federal legislation or international treaties of Russia. And, even though the NSR will be widely used for intercontinental transportation of goods, it will remain the national transport route in the Arctic"[6, Heininen L., p. 208].

In 2015, the project "Feasibility and Reliability of Shipping on the Northern Sea Route and Modeling of an Arctic Marine Transportation and Logistics System" was created to conduct a comprehensive analysis of the current state and prospects of the transit traffic on the NSR. The project brought together several partners and numerous participants representing industry, government bodies, and research groups from Europe, Asia, and Russia, which provided a unique and comprehensive review of the subject. Firstly, the project provided an exhaustive study of existing regulations and support services for the NSR. Secondly, its combined information on the current state of the route with feedback received from interested parties during the discussion of the project, to create several possible future operational models for transit traffic along the NSR. The most likely of the analyzed operational models is a combination of reinforced ice-class vessels and independent ice cargo vessels. This model requires a reduction in the severity of ice conditions to ensure year-round commercial shipping and further development of maritime infrastructure. Also, the creation of transshipment nodes at each end of the NSR with ice cargo vessels passing between them is considered a viable option in the future [7, Milakovic A.-S., Gunnarsson B., p. 53].

The Russian Federation, paying attention to the development of the Arctic, represents a set of interests and priorities in the Arctic, which is determined by the resource, transport, and military-strategic

[7] International Northern Sea Route Programme. URL: http://www.fni.no/insrop/defaultINSROP.html (accessed 04 November 2019).

potential of the Arctic territories. "The new version of the State program "Socio-economic development of the Arctic zone of the Russian Federation for the period to 2020 and beyond" is called upon to become a vital tool in implementing the integrated development of the Arctic zone. In the framework of the new edition of the state program, it is planned to provide for the allocation of financing, and target indicators will be determined to monitor its effectiveness. The issues relate to the refinement of the list of priority integrated investment projects with significant multiplier effect and capable of becoming "drivers" of the integrated socio-economic development of the macroregion, their integration with national, sectoral and corporate strategies, programs and plans" [8, Smirnova O. O., Lipina S.A., Kudryashova E.V., Kreidenko T.F., Bogdanova Yu.N.].

At the federal level, the NSR development is also supported by subprogram 2 "Development of the Northern Sea Route and the provision of shipping in the Arctic" of the state program of the Russian Federation "Social and Economic Development of the Arctic Zone of the Russian Federation". There it was called upon to create conditions for the NSR development since it was a national transport highway of the Russian Federation in the Arctic. The subprogramme is implemented in two stages. Phase I is planned for 2018–2020 and phase II - 2021–2025. The financing of the subprogramme at the expense of the federal budget is 35,423,031.9 thous rubles. Among the main expected results of the subprogram, it is worth highlighting the securing the interests of the Russian Federation in the capacity of the Northern Sea Route for international trade.

"The State Program of the Russian Federation "Development of Shipbuilding for 2013–2030" provides for state support measures aimed at creating conditions that stimulate high-tech production of civilian marine equipment for the domestic market. The construction and modernization of the icebreaker fleet, the creation of new ports, the modernization of port infrastructure, the development of necessary production and port infrastructure are one of the priorities of the Transport Strategy of the Russian Federation for the period until 2030. The subprogram "Sea and river transport" includes measures to provide waterways and hydraulic structures, search and rescue support for navigation, navigation and hydrographic support for shipping on the NSR routes" [9, Plisetskiy E.E., p. 106].

Export of the Russian Arctic, transportation of hydrocarbons and natural resources

"The possibility of developing deposits located on the shelf, the seacoast and in the bays of the Arctic seas, remote from the railway and oil and gas pipelines, depends on the development of schemes for the sea transportation of products and the delivery of construction goods. In recent years, stable logistics schemes have been formed, in the implementation of which Russian, local, and foreign shipping companies took part" [10, Brigham L.W., p. 329].

Transportation is carried out in the western part of NSTC with convenient access to the Arctic seas and the flowing navigable rivers of the Russian Federation.

"One of the strategic tasks of the state and subsurface user companies in the framework of projects for the development of mineral resource centers is the acquisition of new competencies and experience in developing unique projects that require innovative technical solutions and further facilitate the

transfer of knowledge and technologies when implementing other projects in the Arctic, including international cooperation" [11, Lipina S.A., Cherepovitsyn A.E., Bocharova L.N.]. The specialized competencies of the crews of the ships, the clear and coordinated work of sailors, and transport workers operating in severe navigational and climatic conditions require the development of the mineral resources of the Arctic region.

Transportation of ore materials and coal:

1. "The export from Norilsk of ore concentrate and metals mined by the Polar Division of PAO MMC Norilsk Nickel is ensured by a fleet of five Arctic class ice container ships built ... at shipyards in Finland and Germany. Part of the products is directly exported by the company's vessels to Western Europe; the concentrate is delivered to Murmansk for processing at the plants of AO Kola Mining and Smelting Company, including Finland ... Due to the negative environmental impact in Norilsk, the Nickel Plant was closed, which led to an increase in freight traffic from 0.7 to 1.5 million tons per year ... In Murmansk, the company opened a second berth ... A twofold increase in freight traffic will lead to the fact that in addition to its vessels, the company is more likely to attract third-party fleet since the construction of ships has not yet been envisaged ... An important circumstance is that the right of independent navigation in winter-spring navigation in the southwestern part of the Kara Sea is granted to ice-class vessels no lower than Arc 7 ... The rhythm and economy of year-round transportation of Norilsk Nickel products can only be provided with Arc 7 ships; the use of other vessels requires expensive ice piloting "[3, Grigoryev M.N., p. 53].

2. VostokCoal Company plans to develop coal in the west of the Taimyr Peninsula, as well as ... the construction of a terminal in the area of Cape Chayka. The projected supply market is the countries of Western Europe ... The company has entered into a long-term agreement with the Danish company Nordic Bulk Carriers AS for the transportation of Arc 4 ice-class vessels, which, following the RMRS rules, can sail only in summer and autumn navigation, and in winter and spring only light navigation conditions accompanied by an icebreaker" [3, Grigoryev M.N., p. 54]

3. PJSC First Ore-Mining Company plans to begin the development of the Pavlovsk lead-zinc deposit in 2020 and the construction of a mining and processing complex on Novaya Zemlya, which will also require year-round export of products by ice-class vessels no lower than Arc 5.

The successful development of the last two projects will allow their operators to finance the construction of high-ice class vessels.

Transportation of hydrocarbons:

"Oil and condensate are exported westward from terminals located in the western sector of the Russian Arctic - on the shelf and coast of the Pechora Sea, in the Gulf of Ob and on the Yenisei River"[3, Grigoriev M.N., p. 56].

1. The Peschanoozero field. Oil is shipped from the raid oil terminal to the island of Kolguyev since 1987. In 2016, two tankers of ice-class Arc 4 of the German company Offen Tankers were exported oil [3, Grigoryev M.N., p. 56].

2. Taimyrgaz ... takes out gas condensate from the Pelyatkinskoye field from the village of Dudinka to Western Europe, using the Arc 7 ice-class tanker owned by MMC Norilsk Nickel year-round [3, Grigoryev M.N., p. 56].

3. “Since 2008, Varandey SMLOP has been exporting oil year-round by three ice-class tankers Arc 6, DW 73 thousand tons, Sovcomflot. Since 2016, transshipment has been carried out on the Kola Bay raid (before that it was carried out in Norway) according to the on-board-to-board scheme to a storage vessel. Oil is exported by Russian and foreign tankers, attracted on a freight basis” [3, Grigoryev M.N., p. 56].

4. “Prirazlomnaya offshore ice-resistant fixed platform. The growing volume of shipments is provided by two Arc 6 ice-class tankers with a deadweight of 70 thousand tons of Sovcomflot, explicitly built for this project. Tankers operate according to a shuttle scheme, transporting oil to the RPK Nord on the Kola Bay” [3, Grigoryev M.N., p. 56].

5. “Novoportovskoe field (Gulf of Ob). For the export of products, it is planned to build six Arc 7 ice-class tankers - three are being built by Sovcomflot, three by Gazpromneft PJSC (with subsequent transfer to Sovcomflot). Sovcomflot tankers are already working on the line ... Foreign (Turkish and Greek) companies also operate on oil export, using two vessels, each previously built for Lukoil-Arctic with a deadweight of 19.8 thousand tons, ice-class Arc 5 / Arc 4. According to experts, after the commissioning of all six tankers, the need to rent additional vessels will remain”[3, Grigoryev M.N., p. 57].

6. Yamal LNG. “15 gas carriers were built to export products to the DSME shipyard in the Republic of Korea. The lead ship, Christoph De Margerie, was commissioned by Sovcomflot ... The remaining 14 vessels were commissioned by foreign shipping companies that received contracts for the transportation of products until 2045. Six ships were approved by Teekay LNG Partners (Canada) and China LNG Shipping (China), five vessels were built for the Greek alliance Dynagas and China LNG Shipping and Sinotrans (China), the remaining three for Mitsui OSK Lines (Japan) and China Shipping Development (China) ... Besides, an additional 11 ice-class vessels were announced to support the project Arc 4 ... Gas transportation Moisture build-up will deal with Dynacom, two tankers, which are currently being built in Finland and China“ [3, Grigoriev M.N., p. 59].

Thus, about 40 vessels are currently transporting ore materials, coal, and hydrocarbons on the SMTK route regularly; according to the approved construction contracts, the number of vessels will increase in the future. It is necessary to ensure the regular export of products. So, there will still be a need to rent additional ships with a high ice class, and the construction of additional vessels of the ice-class Arc 7 in an amount of at least 20 units will be required.

Cargoes for Arctic projects and coasting

The market of shipowners of the Arkhangelsk Oblast developed many years ago. It is mainly focused on the transportation of goods via the NSR, providing the territories of the Far North of Siberia and the Far East of Russia with essential vital products, as well as the construction and arrangement of various facilities and deposits. Over the past five years, deliveries to the port of Sabetta have become year-

round, which has affected the shipping market. In 2014–2018, local shipowners purchased 18 new vessels with a displacement of 8 to 18 thousand tons of ice-class Arc4 and Arc5. Currently, the total fleet in the region is about 300 units, including river-sea vessels, tankers, icebreakers, etc. Of these, about 45 cargo ships of Russian shipowners perform year-round navigation.

Arkhangelsk and Russian enterprises are directly involved in Arctic projects.

The Yamal LNG project had a significant impact on the development of the industrial and transport infrastructure of the Arkhangelsk region. It allowed regional companies to gain experience in participating in a large international project in the Arctic. The project operator and general contractors in the early phase interacted with professional associations. For example, with the Association of suppliers of oil and gas industry "Constellation" regularly, technical meetings were held "Contractor Days" on the issues of work, the supply of materials, building an optimal logistics scheme for year-round cargo delivery by sea. More than 150 local enterprises were involved in the Yamal LNG project. They completed the construction of port infrastructure facilities, erected technological workshops at the LNG plant site, manufactured large-size reinforced concrete and metal structures, and delivered equipment and construction materials. Between 2014 and 2018, annually, there were about 160 flights Arkhangelsk - Sabetta, on average, for this project. Eight hundred thousand tons of cargo per year were delivered through the Arkhangelsk transport hub.

In the next project of Novatek - Arctic LNG 2, the regional enterprises - members of the Sozvezdie Association, shipping companies of the Arkhangelsk Oblast are aimed at increasing the cargo flow. It is associated with the logistics features of the project and the implementation of high-tech work on equipment production and expanding its participation in the construction of large-capacity construction center facilities marine structures.

About 36% of the cargo of the Arkhangelsk transport hub is comprised of coastal freight in the Arctic basin, which suggests that the Arkhangelsk transport hub has an established profile of activity - transportation in the Russian Arctic. This specialization is highly demanded and, in many ways, unique. In the media, analytical reviews, including foreign ones, the focus is primarily on transit and export traffic. However, the changing world market conditions may instantly jeopardize these types of transportation. At the same time, cabotage has an equally vital function to ensure the interests of the state in the Arctic, although it is often underestimated.

In particular, the facilities of the Ministry of Defense located in the Arctic zone of the Russian Federation, polar stations, national parks are served through the port of Arkhangelsk and its transport hub, and goods are also imported for the construction and maintenance of oil and gas projects. In recent years, traffic volumes and the need for products not only did not decrease but also increased many times. Arkhangelsk enterprises are successfully fulfilling this function — the coastal shipping service today. Favorable conditions have been created in the Arkhangelsk transport hub to carry out the transshipment of cargo in the seaside direction in an expanded volume. Local stevedoring companies and terminals are currently ready to receive, store, and transship more than 1.5 million tons of additional general cargo categories without significant investments.

Today, the fleet of shipping companies in the region and the Arkhangelsk branch of Rosmorport are gradually updating.

The owners of these ships are the Arkhangelsk transport enterprises of OJSC Northern Shipping Company, LLC Reskom Tyumen, which owns the Northern River Shipping Company, as well as Eco Shipping, a member of the Arctic Consulting Service group.

In 2013 - the beginning of 2018, new names appeared among the Arkhangelsk shipping companies: TK Severny Proekt LLC, Sevnor Management LLC, and Arctic Shipping Company LLC. They dispose of ships of reinforced ice class, with classification documents of the Maritime Register, which passed modernization, equipped with cranes with a lifting capacity of up to 60 tons.

An essential participant in various Arctic projects - OJSC Northern Shipping Company - is one of the largest Russian companies in the North-West of Russia, carrying out sea transportation not only in the Russian Federation but around the world. One of its first and promising directions is the Northern Sea Route.

"The mission of OJSC Northern Shipping Company is to take a leading position among sea carriers with a tonnage of up to 8,500 tons in the waters of the Northern Sea Route with the consolidation of leading positions in the North-West region of Russia.

The advantage of the Northern Shipping Company is a wide range of activities. The company provides linear, multimodal, and coastal shipping, cargo delivery to unequipped shore, towing of various facilities, technical management. It also includes simulator training for crews, carries out corrections of navigational charts, manuals, and guides for navigation, supplies navigational vessels with navigational charts of inland waterways.

The fleet of the Northern Sea Shipping Company mainly has ships designed for light ice conditions. Some of the vessels are reinforced, which allows the company to remain the leading year-round carrier in the port of Arkhangelsk, ports of Scandinavia, the Gulf of Finland, and successfully operate on the Northern Sea Route regularly. The presence of an ice-class allows vessels to operate in areas with severe ice conditions. Accordingly, all these advantages will enable the work in the Arctic, on the NSR routes. Currently, regularly, the company's fleet carries out sea transportation in the Arctic, performing unique flights and tasks professionally and competently, considering all challenging weather and technical conditions.

The experience of the participation of OJSC Northern Shipping Company in Arctic projects using the NSR routes allows the company to efficiently and efficiently provide shipping services in this segment. The fleet of the Northern Shipping Company has all the necessary characteristics for the placement and safe transportation of general cargo, bulk cargo, oil cargo, containerized cargo, as well as rolling equipment in the Arctic"[8].

Since 2007, the vessels have been involved in arranging the Bovanenkovo-Ukhta gas trunk line system; they deliver concrete pipes to the Baydaratsky Bay of the Kara Sea.

[8] OAO «Severnoe morskoe parokhodstvo» [OJSC "Northern Shipping Company"]. URL: http://www.ansc.ru/ru/company/info.shtm (accessed 04 November 2019).

In 2011, the sea transportation of goods along the Northern Sea Route by the vessels of the NSC acquired a new character due to the uniqueness of the transported goods. So, from Norway to Sakhalin in the polar port of Tiksi, the bulky cargo was delivered by two company ships - equipment for installing a hydrometeorological station. In the fall of the same year, a real Arctic trip was made with national economic cargo along the route: Franz Josef Land, Cape Zhelaniya, Solnechnaya Bay, Dikson, Belusha Bay, small islands of the Arctic Ocean. At the end of 2011, a cargo was delivered to Varandey with heavy equipment for oil projects.

In 2012, the cargo was transported to Yakutia by order of a mining company.

In August 2012, the long-term State program for the ecological rehabilitation of the islands of the Franz Josef Archipelago was launched. Heavy equipment was delivered from Arkhangelsk. For the first time, the Arctic scrap metal was exported from the Franz Josef Land archipelago in October 2012.

Since 2012, the vessels of the NSC have been actively involved in the transportation of goods to the port of Sabetta. And shortly, a significant increase in traffic volumes in this direction is expected. Since 2014, the company's fleet in the port of Sabetta (within the framework of the Yamal LNG project) has acquired a year-round rhythm. The volume of coastal shipping tripled.

The towing icebreaker Nord annually tows various offshore facilities from Arkhangelsk to Svalbard.

In 2013, the "Inzhener Trubin" motor ship took part in an experimental expedition along the route Tyumen - Sabetta - China – Noviy Port, making the first historical voyage from the port of Sabetta under construction.

In 2014, by order of the Ministry of Defense of Russia, OJSC Northern Shipping Company was actively involved in the process of arranging infrastructure in the Arctic, becoming an essential link in an extensive supply chain. As part of this program, the ships "Johann Mahmastal" and "Inzhener Veshnyakov" delivered construction materials to Wrangel Island and the Far Eastern Cape Schmidt. It is important to note that cargo was unloaded in severe climatic conditions on an unequipped shore. For the first time in the history of the NSR on the Novosibirsk Islands in November of the same year, the helicopter unloading of the "Inzhener Trubin" motor ship took place.

In 2015, there was continued growth in coastal shipping in the Arctic. It is realized mainly due to the continuous highly professional work of the crews of the vessels "S. Kuznetsov", "Inzhener Trubin ", "Inzhener Veshnyakov ", "Ivan Ryabov" and others. In November 2015, on the Franz Josef Land, in the region of the northernmost border post of Russia, Nagurskaya from the ship "S. Kuznetsov" carried out unloading by helicopters. A 20-day unique voyage of the ship "S. Kuznetsov "became possible in severe Arctic conditions thanks to the ice-class, it went all the way on his own without icebreaking support.

Yamal port of Sabetta in 2015–2016 provided the most significant volume of coastal transportation in the framework of the Yamal LNG project. During this time, OJSC Northern Shipping Company, due to year-round voyages in this direction, has established itself as a specialized and responsible carriera.

At the end of 2016, the NSC fleet made 36 flights in the Arctic region, more than 160 thousand tons of national cargo were transported. The geography of transportation also included Dudinka, Kha-

tanga, Pevek, Solnechnaya Bay, and Maud Bay, Franz Josef Land, Novaya Zemlya. The motor ships "Inzhener Veshnyakov ", "Inzhener Trubin", "S. Kuznetsov ", "Ivan Ryabov" [9].

In 2016, the "Kapitan Mironov" motor ship, for the first time in the Baltic liner service of a shipping company, made a call to the recently opened Bronka multifunctional sea transshipment complex (Bronka shipyard), delivering equipment, including oversized, from Antwerp.

When servicing the construction of the pier, the unique and only floating nuclear power plant Akademik Lomonosov in the world, the motor ships of the NSC "S. Kuznetsov "and "Johann Mahmastal" in January - November 2017 delivered more than 16,000 tons of cargo to the northernmost Russian port of Pevek from Arkhangelsk.

In 2018, OJSC Northern Shipping Company continued its active participation in Arctic projects. In the area of Cape Tanalau on the Yenisei River, the ship "Johann Mahmastal" was unloaded on landfast ice. For the first time, 2,500 tons of general cargo was delivered via the Yenisei landfast ice for the development and development of the Payakhskoye oil field in Taimyr. In close cooperation with specialists from the Arctic and Antarctic Research Institute and JSC Taimyrneftegaz, the specialists of the NSC developed the technical side of the cargo delivery project for the Payyakhskoye oil field in Taimyr, taking into account the conditions for the need for ice wiring carried out by Atomflot, tight deadlines for unloading, severe climatic conditions. The clear and well-coordinated work of sailors and transport workers, realized in severe navigational conditions, testifies to the high readiness of the NSC for work in the Arctic region.

Another major participant in Arctic projects is Rosatomflot, its main task, which it successfully performs, is to provide icebreaking support to major national Arctic hydrocarbon projects. Participation in such megaprojects includes work for the nuclear icebreaker fleet for several decades. For example, the contract of Atomflot with Yamal LNG was signed until 2040.

"Since February 2015, Rosatomflot began piloting ships to export oil from the Novoportovskoye field. Currently, postings are made between December and June.

On May 25, 2016, the "Arctic Gate" terminal was opened for offshore crude oil shipment from the Novoportovskoye field. The Arctic Gate terminal, located in the Ob Bay area near the Mys Kamenny, is designed for year-round delivery of oil from the Novoportovskoye oil and gas condensate field to tankers. The terminal is in freshwaters, the thickness of the ice around it in winter can exceed 2 meters - this required the use of unique technical solutions that ensure its reliable operation in the Far North.

The maximum capacity of the terminal for the transshipment of raw materials is more than 8.5 million tons per year; its technological scheme ensures "zero discharge" of pollutants into the water area of the Gulf of Ob"[10].

[9]Strategiya natsional'noy bezopasnosti Rossiyskoy Federatsii do 2020 g. [National Security Strategy of the Russian Feder-ation until 2020]. URL: http://www.scrf.gov.ru/documents/1/99.html (accessed 04 November 2019).

[10] International Northern Sea Route Programme. URL: https://www.fni.no/projects/international-northern-sea-route-programme-insrop (accessed 04 November 2019).

Table 1

Arctic projects with the participation of FSUE "Atomflot"

No	Project and Operator	Project capacity/year	Period, years
1	Yamal LNG, LNG tankers + port fleet	20.0 million tons of LNG and gas condensate	until 2040
2	Arctic SPG-2	20 million tons of LNG and gas condensate	2023–2045
3	Novoportovskoe field of Gazpromneft	8.5 million tons of crude oil	until 2040
4	Norilsk Nickel, Dudinka	1.5 million tons of non-ferrous and precious metals	until 2040
5	Coal of Taimyr Peninsula	3 million tons of coal	2020–2025
		10 million tons of coal	2025–2040
6	Payakhskoe field of crude oil	10 million tons of oil	2023–2040

Conclusion

Thus, the Northern Sea Route is a connecting thread across the country, between its western areas and the Russian Far East, and internationally - between Europe and Asia. The NSR integrates the largest river arteries of Siberia into a single transport system and creates conditions for the infrastructure of seaports, railway, and meridional river communications. It provides normal living conditions in the northern territories of Russia, mining, transportation and export, coastal, and transit shipping.

All studies of the past decade related to the NSR considered it a route where one could save a lot of transit time or reduce the number of ships [12, Xu H., Yin Z., Jia D., Jin F., Ouyang H., p. 543].

In general, based on the analysis, we can conclude that the system of oil and gas transport in the Russian Arctic is quite developed. Nevertheless, some recommendations could be made on the possible directions for the development of oil and gas transport systems in the Russian Arctic:

1. The global and paramount task is the restoration and development of the transport and logistics infrastructure of the Northern Sea Route, the further increase in the capacity of the icebreaking fleet. New development of the hub for the transportation of hydrocarbons along the NSR route on the Gulf of Ob, incl. using the capabilities of the port of Sabetta and involving the already existing infrastructure of the Yamal Peninsula, is seen as desirable. Also, an important and promising direction is the development of the NSR infrastructure on the eastern part of the route.

2. Considering the factor of climatic changes when working out a strategy for the development of the Arctic transport infrastructure based solely on scientifically grounded and reliable theories and scientific concepts developed with the participation of Russian research centers and institutes.

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