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PROSPECTS FOR THE NORTHERN SEA ROUTE DEVELOPMENT IN CONTEXT OF FOREIGN TRADE CONDITIONS

PERSPECTIVAS PARA O DESENVOLVIMENTO DA ROTA DO MAR DO NORTE NO CONTEXTO DAS CONDIÇÕES DO COMÉRCIO EXTERIOR

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Abstract
The paper considers peculiarities of the Northern Sea Route use of in context of international economic cooperation between the Russian Federation and other countries. The analysis of key economic indicators of the Northern Sea Route as a significant sea route in frames of foreign trade is conducted. Prospects of maritime cooperation between Russia and China for the coming years are considered. Basic problems of the Northern Sea Route exploitation accounting natural, technical, infrastructural and economic barriers, are investigated. In conclusion, the paper identifies main vectors of the Northern Sea Route development, which include the need to increase number of nuclear icebreakers, large-scale modernization of Arctic ports, improvement of supply infrastructure for seaports, development of favorable maritime transport logistics within the framework of international cooperation, as well as correction of price policies and conditions, to rise attractiveness to carriers and customers.

Keywords: Northern Sea Route. Shipping. Foreign Trade. International Cooperation of Russia and China.

Resumo
Este artigo examina as peculiaridades da utilização da Rota Marítima do Norte no contexto da cooperação econômica internacional entre a Federação Russa e outros países. É realizada uma análise dos principais indicadores econômicos da Rota Marítima do Norte, enquanto rota marítima significativa no âmbito do comércio exterior. São consideradas as perspectivas de cooperação marítima entre a Rússia e a China para os próximos anos. São investigados os principais problemas da exploração da Rota Marítima do Norte, levando em conta as barreiras naturais, técnicas, infraestruturais e econômicas. Em conclusão, o artigo identifica os principais vetores de desenvolvimento da Rota Marítima do Norte, que incluem a necessidade de aumentar o número de quebra-gelos nucleares, a modernização em larga escala dos portos do Ártico, a melhoria da infraestrutura de abastecimento dos portos marítimos, o desenvolvimento de uma logística de transporte marítimo favorável no âmbito da cooperação internacional, bem como a correção das políticas e condições de preços, para aumentar a atratividade para transportadores e clientes.

Palavras-chave: *Rota Marítima do Norte. Transporte Marítimo. Comércio Exterior. Cooperação Internacional entre Rússia e China.*

1 INTRODUCTION

The Northern Sea Route (NSR) is a shipping route in the Arctic region. Until the beginning of the 20th century, the name “Northeast Passage” was used. In official Russian

documents, the NSR is defined as "historically established national transport communication of the Russian Federation" (Legal Department of the Federation Council Apparatus under the Federal Assembly of the Russian Federation, n.d., p. 1). It runs along the northern coasts of Russia along the seas of the Arctic Ocean (Barents, Kara, Laptev, East Siberian, Chukotka and Beringovo), it connects the European and Far Eastern ports of the Russian Federation, as well as estuaries of the navigable Siberian rivers.

Global maritime industry is dominated by liner service, where more than 6,000 cargo ships, mostly container ships, follow predetermined routes, calling at various ports for handling. Such a system allows container ship operators to plan routes efficiently and ensure regular delivery of goods. However, the lack of a reliable schedule for the movement of cargo ships along the Arctic coast creates great difficulties for the development of the Northern Sea Route and prevents the attraction of more vessels.

The NSR length from the Kara Gate to the Bay of Providence is 5,6 thousand. km. The route through the NSR is almost twice as short as other sea routes from Europe to the Far East: so, from St. Petersburg to Vladivostok via the Suez Canal it is 23,2 thousand. km, and on the NSR it is only 14,280 thousand. km (which is shorter by 40%). The navigation time is 2-4 months, the use of icebreakers allows to make it year-round (Fedoseyev, 2018).

Nevertheless, from the standpoint of the NSR analysis as a type of sea freight, there are some problems of its operation in context of foreign trade development.

2 LITERATURE REVIEW

The Northern Sea Route, its possibilities and prospects of use for the development of trade relations are of great interest to both Russian and foreign scientists. This interest is supported by proposals made on the basis of the study results conducted on possibility of its use as a fast, free, safe and year-round sea passage along the Northern Sea Route, capable to connect territorially remote Asia, Europe and North America, as opposed to the Southern Sea Route and the Panama Canal (Pruyn, 2016; Schoyen & Brathen, 2011).

Some experts noted that for consumers regularity of commodity deliveries is important, which, in turn, depends on the weather conditions of each specific year: spring

opening of ice may shift within a month or two, which disrupts the term of foreign trade contracts (Faury & Cariou, 2016).

A serious problem for the Northern Sea Route is low depth of seaport area, which prevents the passage of container ships, tankers and gas carriers. Shallow Northern Sea Route factories reduce speed of large tonnage vessels passage, which increases transport costs and reduces economic efficiency of using the transport route. For example, the Sannikov Strait limits the transit draught of a ship to a maximum of 13 meters (Erikstad & Ehlers, 2012).

Some scientists have concluded that the Northern Sea Route transits have serious implications for vessels safety operating in the region due to extreme Arctic conditions (Xu et al., 2011).

Other researchers stressed that the Northern Sea Route should be seen as a "niche market" (Stephenson et al., 2013, p. 885) which serves only domestic shipping of extracted minerals and domestic needs (Boe et al., 2009) of hard-to-reach Russian Northern areas.

In another work the driving forces and problems of the Northern Sea Route development are defined: it indicates possible deterioration of the Arctic ice situation and low economic efficiency in the NSR use due to decline in world oil and natural gas prices (Selin, 2016).

3 RESEARCH METHODOLOGY

The study applied the following research methods: comparative and critical analysis, grouping, graphical method. In determining advantages and problems of using the Northern Sea Route, comparative analysis was used, which allowed to attribute such strengths as large number of northern ports, their specialization, absence of restrictions on transported goods tonnage, free passage of ships with permission from the Northern Sea Route Administration, and impossibility of pirate attack due to harsh natural and climatic conditions. Problems have been identified – severe climatic conditions, state of port infrastructure, heavy ice and shallow water factories, which create obstacles to ships passage along the Northern Sea Route. The grouping method made it possible to categorize vessels according to the ice class and the use area for the Arctic and non-Arctic

seas. Critical analysis made it possible to draw conclusions about the NSR development in context of transport load and demand for Chinese goods to countries in Europe, Asia, Africa, Latin America, the USA and Canada.

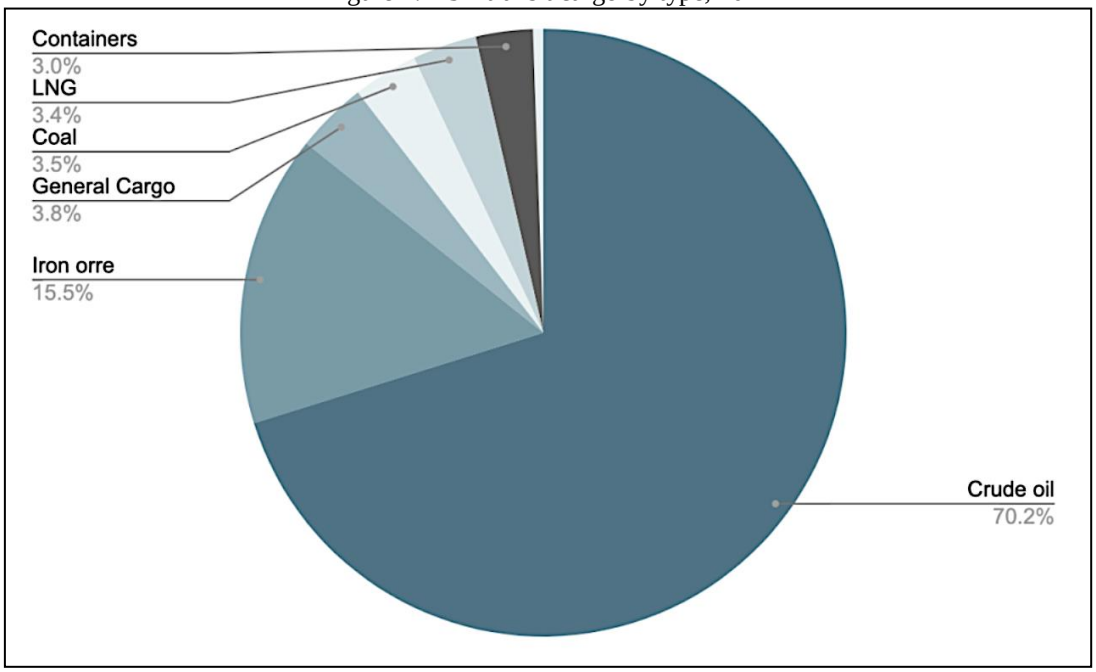
The graphical method was used to visualize analytical material – the volume of cargo turnover along the Northern Sea Route; the use of the Northern Sea Route for the transit of cargo from/to China depending on the country of registration of the ship; and relationship between the number of transits along the Northern Sea Route and price of oil.

4 THE NORTHERN SEA ROUTE NOWADAYS: KEY ECONOMIC INDICATORS

Global containerized carriers seek to maximize their trajectories, given the densely developed port network with extensive transport links (river and rail) that ensure efficient delivery of goods. However, the Northern Sea Route, mainly through uninhabited areas, is not able to make such stops, which significantly reduces its attractiveness for container ships. In contrast, ships specializing in bulk materials, such as Sanko Odyssey, follow more flexible schedules, and their routes are closely related to fluctuations in demand for less time-consuming cargo (Gunnarsson, 2021).

The volume of cargo transportation in waters of the Northern Sea Route for 2022 exceeded 32 million tons; the bulk of cargo continued to be cargo from oil and gas projects: oil and oil products (7,224 million tons), liquified natural gas and gas condensate (20,489 million tons). Volume of transported coal was 295 thousand tons. tons, ore center – 43,5 thousand. tons. Volume of general cargo amounted to 4,248 million tons. (Figure 1) (Humpert, 2023).

Figure 1. NSR transit cargo by type, 2022



Source: M. Humpert (2023).

One of the promising alternatives for the Northern Sea Route use is the Ice Silk Road project. It is a sea route that crosses the Arctic Circle and unites North America, East Asia and Western Europe. The Ice Silk Road will significantly reduce transport link between North-East Asia and Western Europe, and increase the level of economic and trade cooperation in the region (Larchenko, 2020).

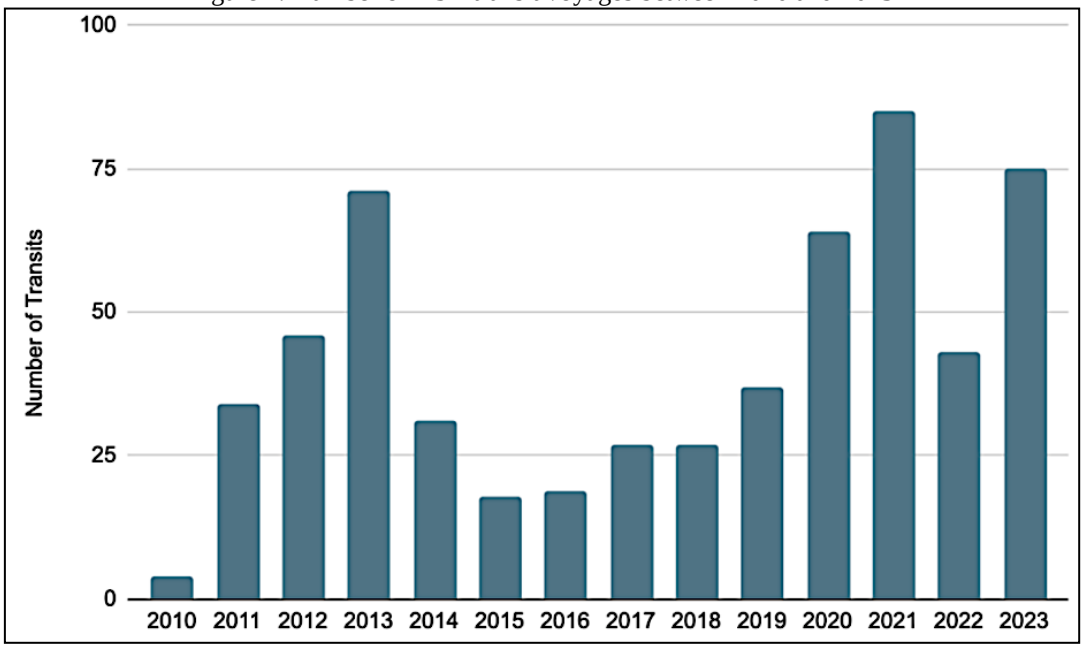
The Ice Silk Road project is an investment and development project, including exploration and development of natural gas and gas condensate, development of natural gas, liquefaction of natural gas, sea transportation and sales of goods.

Thus, as part of the project implementation, the first line of the liquefied gas production plant “Yamal LNG” in Sabetta village was officially put into operation at the half-line Yamal, which is the world’s largest Arctic liquefied gas production plant, located beyond the Arctic Circle.

This important project is the first super-large overseas project since China’s Silk Road Economic Belt initiative.

Overall, volume of the NSR cargo has increased almost tenfold over the past decade, both through domestic transport (bulk) and partly through exports and international transit (Figure 2) (Grigoryev, 2021).

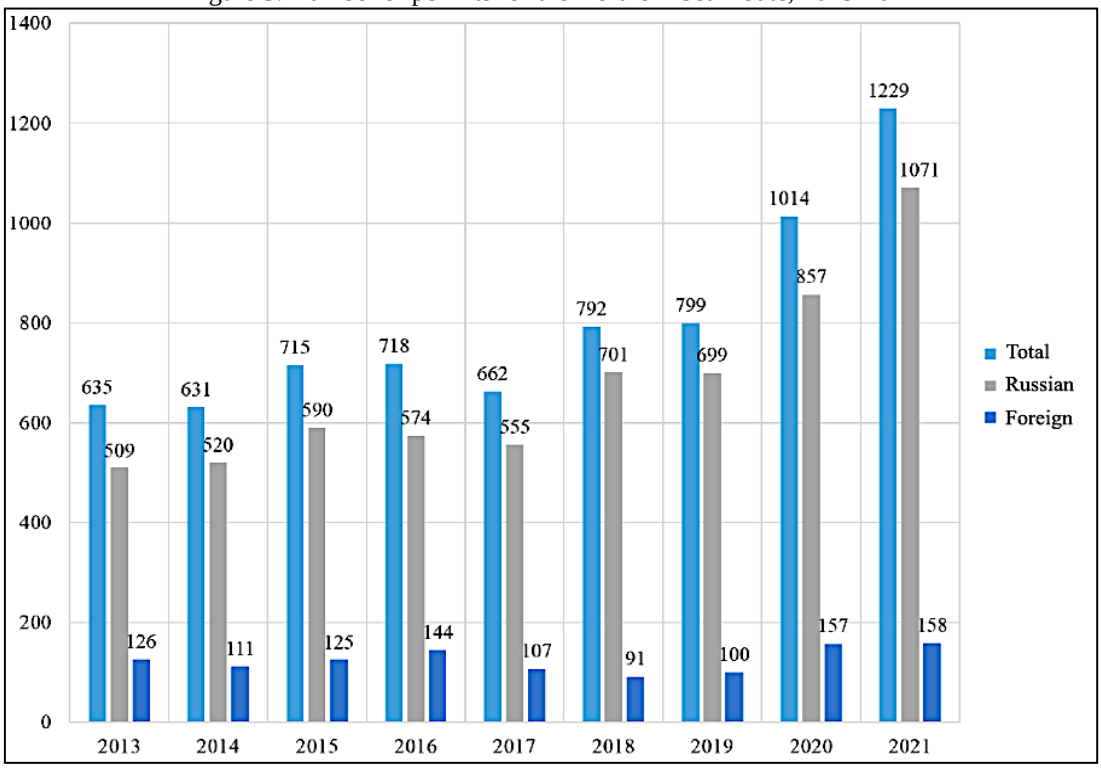
Figure 2. Number of NSR transit voyages between 2010 and 2023



Source: M. Humpert (2023).

It is notable that the total number of vessels increased from 635 in 2013 to 1229 in 2021 (accounted under the number of permits to stay in the waters of the NSR per year according to "Administration of the Northern Sea Route" state organization) (The Northern Sea Rout Administration, n.d.), of which 85-90% in all years were vessels under the Russian flag (Figure 3):

Figure 3. Number of permits for the Northern Sea Route, 2013-2021



Source: The Northern Sea Rout Administration (n.d.).

However, despite a two-fold increase in the total number of vessels on the NSR since 2013, presence of foreign-flagged vessels in the Russian Arctic has increased only slightly, and in some years even decreased. During the period under review, a total of 45 countries applied for a permit to enter the Northern Sea Route area, but only a few of the foreign shipowners have in recent years consistently used the NSR as a route for their vessels or increased the number of shipments. For most countries, this experience is still isolated, including many European countries.

Russian vessels registered in foreign jurisdictions are also formally included, which is very common in international shipping (Bahamas, Cyprus, Liberia, Marshall Islands and others). Thus, the real presence of foreign shipping companies in the Russian Arctic can be estimated no higher than 6-7% of the total number of ships (The Economist, 2018).

5 DEVELOPMENT OF THE NSR IN FRAMEWORK OF COOPERATION BETWEEN RUSSIA AND CHINA

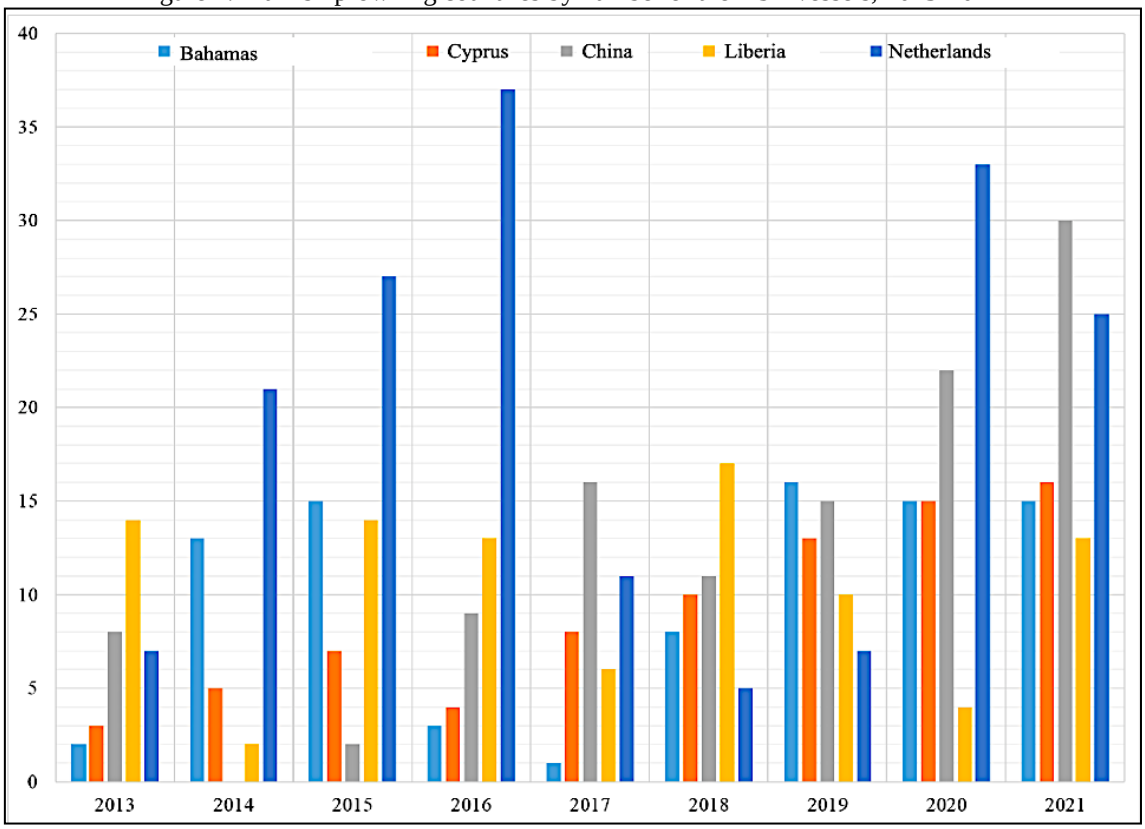
Apart from the international ship-owning “harbours”, whose flags are flown by ships around the world, China has been the most active among foreign nations in increasing the number of its vessels on the Northern Sea Route.

Chinese partners are interested in development of the Northern Sea Route, as evidenced by their participation in the following investment projects:

1) In 2015, Russian-Chinese talks were held on creation of a joint Russian-Chinese shipping company, which will develop the Northern Sea Route and transport commercial cargo. The eastern route of the Northern Sea Route - to China and South-East Asia - is considered as premium for liquified natural gas, and deliveries from Yamal to Japan are only 16 days, twice as fast as those via the Suez Canal. The “Atomflot” estimates that, at year-round loading of the eastern part of the Northern Sea Route, transport costs for liquified natural gas deliveries to Japan (compared to the Suez Canal route) will be $30 lower per ton;
2) In 2017, China Poly Group Corp. has expressed a desire to invest $300 mln in development of the Murmansk Russian port capacity, which could become a base for receiving and servicing Chinese ships;
3) The Chinese Railway Corporation has started working with Russian partners to build the “Obskaya - Bovanenkovo – Karskaya” railway so that the drilling companies on Yamal, as well as Chinese investors, get more advantages. It is expected that Russian, Chinese and Western companies will jointly develop oil and gas projects in the Arctic.

Although in some years the number of Chinese ships in the NSR waters dramatically decreased (2014-2015), but in general it can be said that China is emerging as a leader in the navigable development of the Russian Arctic. In 2021, the NSR administration issued 30 permits to enter the NSR waters on appeals of Chinese shipowners - more than any other country. China is ahead of the Netherlands in terms of the number of vessels that have consistently led the international presence on the NSR in recent years (Figure 4):

Figure 4. Main ship-owning countries by number of the NSR vessels, 2013-2021



Source: T.T. Martins (2023).

According to the results of 2021, China occupies almost 19% of the total number of foreign vessels on the NSR (the Netherlands - 16%), while in 2013 the share of China was only 6.3% (Martins, 2023).

The structure of Chinese shipowners differs somewhat depending on whether ships are assigned to ports in mainland China or the Hong Kong Special Administrative Region. In the first case, the main owner is Cosco Shipping Specialized Carriers - the largest in China and one of the world's largest transport companies. Tankers transporting liquefied natural gas from the Yamala fields to China and other countries, as well as cargo ships of Coscol Investment & Development and a number of international carriers, are assigned to the port of Hong Kong.

6 DEVELOPMENT CHALLENGES

The main drawback of the Northern Sea Route is difficult environmental conditions (in particular, in summer temperature in the Laptev Sea does not rise above 1

Celsius degree); it limits timing of navigation. Year-round operation of the NSR is only possible with provision by atomic icebreakers, which increases its cost. The NSR development is constrained by low depths on traditional routes: large vessels require deep-sea high-latitude routes north of the Novosibirsk Islands.

At the same time, width of the channel required for passage through the ice of large Panamax and Snesmax (40 and 50 m respectively) and gas tankers, requires construction of icebreakers with large displacement. Ice-breaking vessels currently operating in Russia provide a channel width of 33-34 m.

Infrastructure of most Arctic ports, with exception of Dudinka, requires extensive modernization. It is necessary to repair or construct new berthing facilities, realize dredging works for receiving modern vessels, installation of modern navigation systems etc.

In context of future Russia-China cooperation, in general, barriers and challenges to the Northern Sea Route development can be divided into natural, technical, infrastructure and economic ones.

Main natural barrier to promote stable transit navigation on China-Europe and China-Russia route through the NSR, is unpredictability of climatic and ice conditions. As a result, it is not possible for Chinese shipowners to build logistics chains with precise delivery dates. Unpredictability of navigation also affects cost and duration of a sailing. For China, the NSR route to Europe is significantly shorter than traditional southern routes through the Strait of Malacca and the Suez Canal (up to 20% saving distance on the Shanghai-Rotterdam model route). However, in an unfavorable ice environment, distance gains can lead to time delays and higher transport costs (which is predominantly fuel and icebreaker costs). The NSR navigation is seasonal, which also limits the use of the route as a permanent transit line between China and western markets. Part of the navigation window can be extended by means of an ice-breaking wiring, but this significantly increases the cost of transportation. In 2021, independent passage of tankers with ice reinforcement outside the navigation window was tested, but formation of a stable transit line is not yet possible.

Due to natural and technical limitations, the NSR cannot yet be used for containerized transport, which is critical for China, whose exports to Europe are based on industrial products and electronics (Nitta et al., n.d.), for which special containers are

required. Specially equipped container ships are needed for the transport of fish, seafood, agricultural products both between the Arctic territories and for export.

This is also a drawback for Russia in terms of the NSR transformation into a cost-effective international transport route in foreseeable future. Transport of bulk goods will never have such an economic impact on development of the transport corridor, as the transfer of at least part of container traffic from the southern routes to the north. In the NSR area, the use of container vessels is limited to depth and draught of vessels. The NSR lines are predominantly shallow, with a sediment of 9.5 m for traditional routes. Large tonnage ships may pass the NSR at higher latitudes north of the Novosibirsk Islands. But even in these areas the depth does not exceed 18-20 m.

From a navigational point of view, high-latitude routes are poorly understood and require additional hydrographic studies. Sudden changes in weather can either disrupt the arrival of a ship on time, which means payment of penalties, or require ice-breaking, which will increase the cost of freight in force majeure. In November 2021, 24 ships were stuck in the Kara Sea. Such situations are difficult to predict (Potaeva, 2021).

Conventional container vessels are not suitable for the NSR operations in terms of speed and strength (when passing through ice, the side is damaged). In order to make a profit for container transit through the NSR, average speed of a container vessel should exceed 8 sea knots. This is possible only by pre-laying corridors with icebreakers, which complicates logistics and increases costs. Since June 2022 Russia launches a test container line (one lighter ship, several flights a year), but the Russian Ministry for the Development of the Far East and Arctic today claims that in the first years the line will be unprofitable for an operator, so the state will cover losses (Mikhailov, 2021).

Technical barriers to increase navigational intensity of Chinese vessels on the NSR are also caused by the fact that only ice-class vessels are allowed in the Arctic seas. Their building is 10 to 30% higher than normal cargo ships on southern routes. More substantial engineering (which is thickening of a body, structural support of a rudder and propeller shaft, heat protection for fuel tanks) and the use of special materials and structures (anti-icing) is required. Ice class vessels with reinforced hulls consume more fuel. Maintenance costs for the NSR are at least one third higher than for conventional vessels. The existing Russian fleet of icebreakers is not yet sufficient, in terms of both

number and technical characteristics, to ensure stable year-round ice-breaking wiring, especially for large-capacity vessels.

The main problem for a growth of international transport on the NSR is low level of infrastructure development of the Russian Arctic. There are no deep-sea ports with modern logistics and service. Only ports of Sabette and Dudinka are considered mainly to meet modern requirements. In order to fully attract Chinese shipping companies to the Arctic, it is necessary to comprehensively develop the eastern sector of the NSR and upgrade the main ports in Igarka, Dikson, Tiksi, Pevek, Provideniya (Figure 5):

Figure 5. Main lines and ports of the Northern Sea Route

Source: Articportal.org

Currently, only two options are available for Chinese companies to use the NSR for now. The first is international transit directly from China to Europe without entering Russian ports. It is preferable to go along high-latitude routes to bypass shallow water straits near the coastline, but such routes are poorly studied, communication is unstable, ice conditions are severe. The second option is one-way cargo transportation from the Russian Arctic to China. The problem is the lack of reboot of ships, which significantly reduces economic effect of a voyage.

A key economic barrier to the NSR development is lack of a secure cargo base, including a transit base, along entire length of the route. Main zone of the cargo base

generation is between the Obi and Yenisei rivers. Apart from “Yamal LNG” and Novoportsky oilfield, no other sources of cargo growth are expected. There is an imbalance in development of the NSR western and eastern sectors. In the eastern sector, which is more important for China (in terms of liquified natural gas and other resource transportation), there are no mineral deposits that have reached level of industrial use. These areas are remote from industrial centers.

Thus, the eastern sector has a purely transit value as a section of the water area between China and industrialized regions of Western Siberia and European North of Russia, which must be passed with minimal expenses. At the same time, the eastern sector is much more complex and unpredictable for navigation due to severe ice conditions, shallow depths, poor hydrographic support for navigation and a weak search and rescue network. There are no connections between port infrastructure and railways (only partially – in the western sector of the NSR and in Arkhangelsk and Murmansk regions), so delivery of goods to the NSR from land-locked fields is difficult. The infrastructure of most ports does not allow for high volume trans-shipment and large cargo ships. Therefore, potential areas for Chinese investment are limited to selected industrial clusters with an infrastructure for exporting raw materials and products (Gao & Erokhin, 2021).

To conclude, it is necessary to note that the volume of Chinese vessels navigating under the Northern Sea Route, although increasing, is still negligible. Thirty permits for passage along the route during a year is an extremely small number against background of more than a thousand documents issued by the NSR Administration to Russian shipowners. China is gradually becoming the main foreign partner in development of the Russian Arctic, not only natural resources, but also infrastructure development. There is a need for careful analysis of how to overcome existing natural, technical, infrastructural and economic barriers to such cooperation.

7 GROWTH PLANS

The main direction of the Northern Sea Route development is connected with ensuring minerals export. According to the Russian Ministry of Energy, recoverable oil and gas reserves in the Arctic region account for 260 billion tons of fuel, or 60% of all

recoverable hydrocarbon resources in Russia. Among 15 active and prospective investment projects in the Arctic (which are Varande oil field, "Yamal LNG", Taimyr coal basin etc.), 11 are related to exploration of oil and gas, and 4 – to ores and coal (Ignatieva, 2019).

The comprehensive project for the Northern Sea Route development of 8 June 2015 provides for implementation until 2030 of measures for navigation, hydrographic, hydrometeorological and rescue support for navigation in the NSR waters; for development of seaports; provision of defense issues in the NSR waters; development and construction of marine equipment, systems and means. By 2025, it is planned to build three universal nuclear icebreakers with a capacity of 60 MW and an atomic icebreaker with a capacity of 110 MW.

Within the framework of the state program "Socio-economic development of the Arctic zone of the Russian Federation for the period until 2024" it is planned to increase the volume of cargo transportation along the Northern Sea Route to 80 million tons per year (Government of the Russian Federation, 2021).

8 CONCLUSION

In order to provide development of the Northern Sea Route and its ports, the following actions are required:

1. Increasing number and characteristics of nuclear icebreakers.
2. Large-scale modernization of Arctic ports, increase in number and length of berths, as well as depths of berths and in ports waters.
3. Development of port supply infrastructure which means construction of railways, airports, warehouses, refueling stations.
4. Increasing depth of main straits on the Northern Sea Route.
5. Creation of favorable maritime transport logistics through forming free economic zones on basis of existing major ports of the Northern Sea Route.
6. Attractive pricing for carriers and customers.

It should be noted that some of these measures are already being implemented, especially with regard to construction of new nuclear icebreakers and development of

larger projects of icebreakers. Work on remaining areas could become priorities for the near future, given contemporary international relations.

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Authors' Contribution
All authors contributed equally to the development of this article.

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