

The Northern Sea Route as a Factor of Sustainable Development of the Arctic Zone



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Abstract The socio-economic development of the Arctic region of the Russian Federation is an object of close attention of the state and the scientific community. The most important factors in the development of the Northern Sea Route (NSR), such as permanent presence in the Arctic, the infrastructure development of the NSR, and cooperation with different countries are considered in this chapter. Geopolitical and transnational factors play strategically important roles in the expansion of maritime traffic in the Arctic zone. These factors include control over the territory rich in natural resources, the high value of the NSR transit factor, because its path connects the northwestern and far eastern regions of Russia. Also an important factor is the potential for growth in transnational transit traffic along the Northern Sea Route between European and Pacific ports. High-quality development of the Arctic territories is impossible without the successful implementation of infrastructure projects. The formation of the Arctic transport system is the most important task for the development of the region. The limited transport system seriously hinders the development of the northern regions. The Northern Sea Route is the basis of the economic stability of the North of Russia and the most important element of the Russian and international transport system. Therefore, it is necessary to follow the key factors, reconstruct the current and develop new paths.

1 Introduction

1.1 Motivation

The socio-economic development of the Arctic region of the Russian federation has become the object of close attention of both the government and the scientific

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community. A number of regulatory documents in the Russian Federation have been adopted, the main purpose of which was the regulation of certain aspects of the political, industrial, economic, and social development of this region (Consultant, 2020; RG.RU, 2014; Ruyga & Zyubanova, 2016). The characteristics of the Arctic territories that determine the need for special approaches to their development and development are (Diakov & Kotiev, 2018):

- extreme climatic conditions;
- focal nature of the development of these regions;
- low population density with an insufficient labor force and outflow of the population;
- remoteness from major industrial centers and inaccessibility of regional facilities;
- high resource intensity with a high dependence on the supply of resources from other regions;
- low sustainability of ecosystems with a high presence of waste and pollution from human activities;

Currently the Arctic is in the focus of attention from both Arctic and non-Arctic states due to the presence of both reserves found and reserves estimated of natural resources. Russia, whose history is connected with the Arctic more than other countries, after several years in which there was only a marginal interest in this region, is beginning to pay more and more attention to its Arctic regions. The network of meteorological stations and military bases is being restored, new ice-breakers are built, and new oil fields on the Arctic shelf are developed. But all this is impossible without a developed infrastructure, the basis of which in the Russian Arctic sector is the Northern Sea Route (NSR).

The NSR not only forms the base of the transport infrastructure of the Russian Arctic, since it connects the main northern ports and river transport systems into a single transport corridor and thus the NSR is the only means of supplying some Arctic regions with food and goods (Alekseeva et al., 2019).

In addition, the importance of the NSR as the basis of the Arctic transport infrastructure is emphasized by the need to use it for the export of natural mineral resources (for example, oil and gas) produced in the Arctic. The NSR route (from the Bering Strait to the Novaya Zemlya archipelago) is characterized by severe climatic conditions, which complicates the safe navigation of ships in these waters.

1.2 Outline

Within the framework of the chapter, it is planned to analyze the current state of the Northern Sea Route. It is necessary to define the NSR and indicate its key ports with a short history of its development. The second part of the work analyzes other international projects which improve transport and logistic and their impact on regional developments. The results of the study are a description of the role of the

NSR in the social, economic, and environmental components of the Russian Federation.

2 Basics

2.1 *Definition of the Northern Sea Route*

The Northern Sea Route is a navigable seaway passing along the northern shores of Russia along the seas of the Arctic Ocean (Barents, Kara, Laptev, East Siberian, Chukotskoe, and Beringovo), connecting the European and Far Eastern Russian ports, as well as the mouths of navigable Siberian rivers into a single the all-union transport system. The Northern Sea Route is limited by the western entrances to the Novaya Zemlya straits, that is, by the meridian running north from Cape Zhelaniya, and in the east in the Bering Strait by the parallel of 66°N and 168° 58'37"W. The length of the Northern Sea Route from the Kara Gates to Provideniya Bay is about 3030 NM (Northern Sea Route Information Office, 2021).

Thus, the Northern Sea Route is a seaway passing through the Arctic Ocean, from the Novaya Zemlya archipelago to the Bering Strait, which separates the Pacific Ocean and the Arctic Ocean.

2.1.1 The Main Ports of the NSR

The main ports of the Northern Sea Route include the following key ports (Fig. 1): Sabetta, Dikson, Dudinka, Khatanga, Tiksi, Pevek.

The listed objects of the shipping infrastructure, which are located at the mouths of large rivers (Lena, Ob, Jenissei), serve as transshipment points for cargo ships. The Northern Sea Route is a seaway along which timber, engineering products, coal, building materials, food, and furs are transported. The ports on the Northern Sea Route are adapted to receive large icebreaking ships.

Currently there is an economic project implemented which aims to re-equip the port of Petropavlovsk-Kamchatsky into a port-hub for the NSR. It is located at a very favorable position, which could allow the city to become an important transport hub between Northern Europe and the Pacific region. In addition, the Petropavlovsko-Kamchatsky port, as a component of the NSR, has additional advantages as year-round navigation, non-freezing bay, and possibility of accumulation, storage, and sorting of goods (Pegin, 2017).

2.1.2 Brief History of Development

In the eleventh century, the people of Novgorod reached the Frozen Sea. Dvinsky mayor—Uleb—in 1032 mastered the first NSR, stretching from the Kara Gates to



Fig. 1 Map of NSR ports. Source: Østreng, (2010)

Novaya Zemlya. In search of new goods for Novgorod, the explorers moved further and further northward. They opened a sea route to Kolguev, Vaigach, Novaya Zemlya, and other islands (Johannessen, 2017).

In the second half of the sixteenth century, British explorers tried to find a way out to the coast of South and East Asia in the north and tried to go through the Pacific Ocean to the Arctic. The first two expeditions reached Novaya Zemlya Island, the third reached the Kara Bay. Because of the active movement of the ice masses, the sailors did not advance and abandoned this project by moving back to Great Britain. In 1594, Dutch explorers reached Yamal, and a year later they went to the Kara Sea and like their predecessors, they were forced to return. The third Dutch expedition was able to reach Svalbard, the Bear Island, the island of Novaya Zemlya and entered the Kara Sea.

For the first time, the practical significance of the NSR as a transport route was mentioned by the Russian diplomat and politician Dmitry Gerasimov in 1525. The Russian polymaths Dimitri Mendeleev and Mikhail Lomonosov both have been working on the role and use of the NSR.

In 1732, Empress Anna issued a decree according to which Vitus Bering was to go to Kamchatka to explore new lands in Siberia. This expedition was named the Great Northern. As a result, the entire Russian northern coast was mapped.

The results of subsequent Russian expeditions questioned the possibility of navigation in the Kara Sea, but already in the 1990s of the nineteenth century this myth was refuted. For the first time, the entire route of the NSR was covered by a Swedish expedition led by the famous explorer Nordenskjöld in 1879 (NERSC, 2021).

The invention of icebreakers, the radio, and the emergence of the steam fleet led to a further development of the NSR as a transport route. Since the 1920s, the Kara expeditions were resumed and shipping voyages from Vladivostok to Kolyma became a regular practice. During the Second World War, the Northern Sea Route was extremely important for the Soviet Union—warships were conducted along it, the fleet received coal, and the Soviet industry received timber, nickel, and copper. December 17, 1932 is considered the date of the official opening of the NSR as a transport highway (Østreng et al., 2013).

After the end of the Cold War the first foreign ships entered the NSR in 1991. However, this did not become an impetus for the active use of the transport route in international trade. The NSR is characterized by a number of straits with shallow waters which makes navigation for large vessels challenging.

In addition, the NSR is notable for unstable ice conditions, which also negatively affects the “popularity” of this seaway (Highnorthnews, 2021).

2.2 *Defining Sustainability*

The concept of sustainable development involves the harmonious development of three areas: economics, ecology, and social. Thus, the sustainable development of the Arctic zone and, in particular, the shelf development system, suggests an effective balance between economic growth, environmental protection, and social relations. Existing Arctic shelf development projects are often distinguished by a single-criterion decision-making—economic growth to the detriment of other components.

The main directions of sustainable development and strategic priorities in accordance with the draft of the Arctic Doctrine of the Russian Federation for the development and rational use of natural resources are (Zhuravel, 2020):

1. The final establishment and consolidation in international legal acts, including bilateral and multilateral treaties, of the boundaries of the exclusive economic zone and the economic sovereignty of Russia in the Arctic.
2. Improving the structure of production in the Arctic in accordance with the natural, climatic, and socio-economic conditions and the ecological capacity of each specific region on the basis of differentiated principles of regulation of economic activities and with the priority development of industries of national importance.
3. Reconstruction in tax and financial legislation of the current system of rent payments from the use of raw materials in order to increase the self-sufficiency of the Arctic territories, including through the creation of stabilization funds of the heritage.
4. Orientation of the branch of traditional economic activity towards life support, protection of economic rights, and full employment of the indigenous small-numbered peoples of the North.

5. Restructuring of the fuel and energy complex with a focus not only on imported raw materials, but also local energy sources, traditional and non-traditional (renewable).
6. Development and implementation of investment projects for the exploration and development of mineral and hydrocarbon resources of the shelf and coastal areas, the development of aquaculture in the seas of the Western Arctic.

The economic prerequisites for sustainable development of the Arctic are:

- natural resource potential, primarily hydrocarbons. The natural resources of the Arctic shelf are estimated at 100 billion tons of coal equivalent (tce) of which 4 billion are tons of fuel equivalent ready for production;
- the presence of large industrial centers and settlements (Murmansk, Naryan-Mar, Vorkuta, Salekhard, Norilsk, Khatanga, Tiksi, Pevek, Anadyr, etc.);
- relatively developed transport infrastructure, primarily in the European North and Western Siberia;
- it is possible to expand the use of the Northern Sea Route, including for international transport, and unconventional energy sources;
- external economic factors, which include the military-strategic and geopolitical position of the Russian Arctic, its importance as a global ecological reserve.

For example, StatOil has a limited operational activity in the Arctic and sub-Arctic. This activity is currently focused on the relatively ice-free areas in the Norwegian Barents Sea and offshore Newfoundland, Canada. They have taken long-term positions in other Arctic basins and these are being matured for future exploration.

Despite the leading company StatOil, there are problems with spills and oil in the arctic. This is due to the extremely cold, ice-covered waters, the darkness of winter, and limited access to cleaning resources. Oil spill response challenges in the Arctic are related to extreme cold, ice-covered waters, the darkness of winter, and limited access to clean-up resources.

An important place in the state policy of the Russian Federation in the Arctic belongs to the social development of the Arctic zones of the Russian Federation. This policy is aimed at improving the quality of life of the population, including those belonging to the indigenous people. From the social prerequisites point of view for the sustainable development of the Arctic, one can single out (Zaychenko et al., 2019):

- ensuring the availability of primary health care, quality preschool, primary general and basic general education, secondary vocational and higher education, services in the field of culture, physical culture, and sports in settlements located in remote areas, including in places of traditional residence and traditional economic activities of indigenous peoples;
- providing citizens with affordable, modern, and high-quality housing, improving the quality of housing and communal services, improving the living conditions of persons leading a nomadic and semi-nomadic lifestyle, related to indigenous peoples;

- the accelerated development of the social infrastructure of settlements in which the bodies and organizations are located which perform functions in the field of ensuring national security and (or) the functions of a base for the development of mineral resource centers, the implementation of economic and (or) infrastructural projects in the Arctic;
- creation of a system of state support for delivery to settlements located in remote localities, fuel, food, and other essential goods in order to ensure affordable prices for such goods for citizens and business entities;
- provision of year-round main, interregional, and local (regional) air transportation by affordable prices;
- ensuring that the state fulfills its obligations to provide housing subsidies to citizens leaving the Far North and equivalent areas;
- preservation of the culture of indigenous people, their language, and traditions.

2.3 Current State and Development Prospects

The development of the Northern Sea Route in the past 6 years has been unprecedented, the volume of traffic has increased eightfold in 6 years. It is planned to increase the volume of traffic to 80 million tons in 2024. According to the report at the end of 2020, the volume is 33 million tons. However, the strategic task is to transform the Northern sea route to the international universal transport corridor, which will allow realizing advantages in distance and timing. According to some experts, the prospects for the development of the NSR are largely related to the fact that it can become a full-fledged competitor to the Suez Canal (Fedorov & Medvedev, 2020).

Analysts have come to the conclusion that the NSR is capable of handling about 50 million tons of cargo per year at this moment. Seafarers share this point of view, since they believe that every year the Northern Sea Route will become more and more in demand, especially given the growing activity of gas and oil companies in the Arctic and Yamal regions (Zhuravel & Nazarov, 2020).

The Northern Sea Route, as one of the future key routes of international transport, has many advantages, given the piracy that flourishes along the Horn of Africa. The development of the Northern Sea Route in Russia may also be due to the fact that the country has created the world's largest icebreaker fleet. It is planned to add at least 20 more to the operating nuclear-powered ships. The latter should be financed by resource-extracting organizations.

In other words, the Northern Sea Route has a huge potential to, if not completely replace other transport arteries, then become highly demanded in terms of delivery of certain types of freight. The fact of global warming also promises great advantages for the use of the NSR, since the routes, which were previously covered with a significant layer of ice, today become navigable without icebreakers.

The history of the development of the routes of the Arctic Ocean goes back several centuries. A powerful impetus to the development of seaways was given by

the creation of nuclear icebreakers, as a result of which navigation became possible throughout the year. In the 1990s, the activity on the NSR fell sharply due to the collapse of the Soviet Union. Only large transport facilities were supported by large resource-producing corporations, since they were needed for their smooth operation.

Today, the development of the Northern Sea Route is again among the priority tasks, not only in our country, but throughout the world (Highnorthnews, 2021). Basically, the increased attention to this region is associated with the deposits of the Arctic shelf. And the issue of transportation is key here.

In 2013, the concept of the Maritime Silk Road also known as One Belt One Road or Belt Road Initiative (BRI) was formed in China. The Chinese government proposed routes that can connect the ports of Australia, Indonesia, Singapore, and Malaysia as well as ports in Africa and Europe with the People's Republic of China. If this corridor is combined with the routes of the Northern Sea Route, such a global network will bring many advantages to countries around the world. From an economic point of view, this is very beneficial, since the delivery of goods will be faster, and transport costs will decrease. In the future, it will be possible to reorient all trade routes of the Asia-Pacific region in the direction of the Northern Sea Route (Kozlov et al., 2019).

Traditional routes using the Suez Canal and the Horn of Africa area are becoming increasingly unsafe due to the active activities of pirates, but actually over the last years they became safer due to Operation ATALANTA (Eunavfor, 2021). Therefore, the risks of sea carriers are growing. In this regard, the development of the Northern Sea Route for international trade could become a profitable project.

For Russia, efficient operation and development of transport infrastructure on the northern coast could mean dynamic economic growth. In general, a number of main goals for the development of the transport component for the Northern European part of Russia can be named:

1. Creation of a common transport space.
2. Provision of affordable and fair services in the field of transport logistics of cargo transportation.
3. Provision of affordable transport services for the population at the level of quality standards.
4. Entering the world transport space and maximizing the possibility of transit traffic.
5. Increase in transport safety indicators.
6. Reducing harm to the environment.

2.4 Problems of the NSR Development

A serious obstacle hindering the development of the Northern Sea Route for shipping are the difficult climatic and ice conditions. Most of the NSR passes through zones of thick multiyear ice. Due to this safe navigation for most of the Northern Sea Route is only possible for a few months usually from July to October.

On some routes where nuclear ice breakers are used a longer navigation period is possible. In the next 10 years, Russia intends to increase the icebreaker fleet and bring navigation along the Northern Sea Route year-round. Russian experts believe that modernizing the infrastructure of the Russian Arctic will require significant financial and labor investments (Ilyinsky et al., 2020). It will be necessary to improve the work of hydrography and meteorology services, to establish a system of aerial reconnaissance of ice movement, to create state structures responsible for environmental control. It is necessary to increase the resources of the Ministry of Emergency Situations, to improve the infrastructure of ports.

Another challenge is communication. Foreign ships that have conducted test voyages state that satellite communications of the operators Inmarsat, Thuraya, GlobalStar do not work above 70°N to 75°N.

3 Analysis

3.1 Analysis of International Experiences of Regional Development by Means of Development of the Transport and Logistic Systems Development

3.1.1 Trans-Siberian Railway

This is a railway across Eurasia connecting Moscow with the largest East Siberian and Far Eastern industrial cities of Russia. The length of the tracks is 9288 km and this makes the Trans-Siberian Railway the longest railway in the world (TravelReal-Russia, 2021).

It passes on the original route through Ryazan, Samara, Ufa, Zlatoust, Miass, Chelyabinsk, Kurgan, Petropavlovsk, Omsk, Novosibirsk, Krasnoyarsk, and Vladivostok and thus connects the western, northern, and southern ports of Russia. The railway has further connections to St. Petersburg, Murmansk, Novorossiysk, and to the Pacific ports Vladivostok, Nakhodka, Zabaikalsk.

Today TransSib consists of four branches (Wikivoyage, 2021):

- The original route (red line on the map)—with the above cities.
- Baikal–Amur Mainline (green line): Taishet—Bratsk—Ust-Kut—Severobaikalsk—Tynda—Komsomolsk-on-Amur—Sovetskaya Gavan.
- Northern route (blue line): Moscow—Yaroslavl—Kirov—Perm—Tyumen—Krasnoyarsk—Taishet—and then the transition to the Baikal–Amur mainline.
- Southern Route (the black line shows the section of the Southern Route where it differs from the other routes): Tyumen—Omsk—Barnaul—Novokuznetsk—Abakan—Taishet (Fig. 2).

The decision to build the Siberian railway at the expense of the treasury was made by the tsarist government back in the 1880s. In 1887, three expeditions were organized to find places for laying the route for the South Ussuriysk, West Baikal,



Fig. 2 Map of Trans-Siberian Railway. Authors' Creation

and Central Siberian lines. The construction of the Trans-Siberian Railway began in the 1890s of the last century. The decision to carry out work on the construction of the Great Siberian Route was made in the winter of 1891. Construction began on both sides—from Vladivostok to Chelyabinsk (TripSib, 2021).

The following shows some milestones of the construction of the Trans-Siberian Railway:

- 1893—the construction of a road from the Ob to Irkutsk;
- 1894—the beginning of the construction of the Northern Ussuriyskaya road;
- 1897—the beginning of the construction of the CER. 1898—the section from Ob to Krasnoyarsk was accepted;
- 1900—a decision was made to build the Circum-Baikal Railway;
- 1906—surveys were carried out for the laying of the Amur Mainline;
- 1911—laying of the section from Kerak station to the Burey river with a branch to Blagoveshchensk;
- 1916—commissioning of the bridge across the Amur.

The construction of the railway was significantly influenced by the demographic situation in the region. The flow of immigrants to Siberia has noticeably increased with the Trans-Siberian Railway. With the construction of the rail, the principle of settlement began to change. In earlier times the population settled along the river Ob, its tributaries and along the Moscow highway, now it began to concentrate along the main railway line and along the railway branches built on the eve of the First World War.

At the turn of the nineteenth and twentieth centuries, the industrialization of Siberia accelerated due to the Trans-Siberian Railway.

The inflow of capital and labor from the European part of Russia increased, and foreign capital began to flow into the region.

By the beginning of the twentieth century, Siberia was a supplier of raw materials. In the second half of the nineteenth and early twentieth centuries, the main goal of

the Russian government was the production of agricultural products. The agricultural sector employed up to 90% of the population at this time.

The railway provided access for settlers to agricultural areas and the chance to transport the output of agricultural products to the sales markets. This influenced not only the growth rate of agricultural production, but also the change in the structure of which crops would be cultivated.

Structural changes have also taken place in the industry of Siberia. The mining industry, which was previously dominant, began to give way to the manufacturing industry. In 1900, the mining industry produced 65% of the value of all products in Siberia and the Far East of Russia, but in Western Siberia the manufacturing industry already gained a foothold.

With the construction of the railway, the demand for bricks, cement, and wood-working products, which were supplied mainly by local enterprises, increased sharply. The sales market for these industries also expanded in connection with the development of construction in cities and rural areas.

The Trans-Siberian Railway became the main transport artery connecting Siberia with the center of the Russia as well as with the eastern parts. Machines, equipment, metal, and manufactured goods were imported from the European part of the country and from the Urals. At the beginning of the twentieth century, the railway network of Siberia was significantly expanded. On the eve of World War I, the Altai railway was built (from Novonikolaevsk to Barnaul), and the construction of the Kolchuginskaya and Achinsk-Minusinskaya roads began. Although the latter passed through the territory of the Yenisei province, partial logging for its construction was carried out in the Mariinsky district.

The construction of the railway gave a powerful impetus to the economic modernization of the region and contributed significantly to the development of education and culture, for example, the number of primary educational institutions in Siberia increased by 167.2% from 1894 to 1911 (TheTransSiberianExpress, 2020).

The economic modernization of the region, in turn, entailed profound changes in the social structure and composition of the population. The formation of new classes and groups (the bourgeoisie, the proletariat, the intelligentsia) began, whose representatives were increasingly involved in the social movement in its various forms. A network of educational institutions and libraries began to take shape in the region, education, and culture developed. The Trans-Siberian Railway influenced all spheres of public life in Kuzbass, and workers and employees of the road took an active part in the social and political life of the region (Goarctic, 2019).

The main role is that the Transsib connects the European part, the Urals, Siberia and the Far East of Russia, the Russian western, northern and southern parts, as well as rail links to Europe, on the one hand, to Pacific ports and rail links to Asia. TransSib electrified double-track line, fully equipped with modern communication and information facilities. The technical equipment of the railway allows transporting more than 100 million tons of cargo per year at a maximum permissible speed of 90 km/h. The advantages of the line, among other things, include the absence of the need to cross any state borders.

As for One Belt One Road, it is providing sales markets for Chinese products and expanding the routes of supplying these products abroad. Moreover, this is the formation of a space within the Eurasian continent, in the economic and financial sense tied to China.

3.2 Trans-European Transport Network (TEN-T) in Europe

The Trans-European Transport Network (TEN-T) was initiated by the European Commission to facilitate more trade within Europe by easing the transport of goods (TEN-T, 2020).

TEN-T is a policy which targets the creation of a logistical network consisting of railway, roads, inland waterways, and sea routes as well as the sea ports, rail terminals, and airports to improving economic but as well social and geographic cohesion in the European Union (TEN-T, 2020).

The development of TEN-T as an economic and social policy dates back to the Treaty of Rome in 1957 but the implementation was so slow that the Treaty of Maastricht in 1992 included the need for the European Commission to prepare guidelines to implement this (Vallecillo, 2018).

So in 2011, the European Commission changed the program from voluntary to mandatory for the EU member states and TEN-T got a multiyear budget and also this budget was increased significantly (Butcher, 2012).

The TEN-T policy as a whole can be accessed in the Regulation (EU) No. 1315/2013 (EU, 2013). TEN-T should not only help to improve the real infrastructure of the member states of the EU but also help in the development of improved and innovative ways to transport goods within the EU using new technologies and digitization (Weenen et al., 2016).

This means that the networks of all EU member states should be contributing to the TEN-T according to the EU treaty and finally become one integrated European Network (Steer Davies Gleave, 2011).

The TEN-T program consists of two parts: the core network and the comprehensive network. The first one is set to be finished by 2030 [28] and includes the projects with the highest priority which brings the highest benefit to TEN-T like, e.g., the cross-border sections of TEN-T (Khúlová & Šprochová, 2016).

The budget for this program was planned at 26 billion EUR for the years 2014–2020 by the EU (TEN-T, 2020).

TEN-T consists of nine corridors: the Atlantic corridor, the Baltic Adriatic corridor, the Mediterranean corridor, the North Sea Baltic corridor, the North Sea—Mediterranean corridor, the Orient/East-Mediterranean corridor, the Rhine–Alpine corridor, the Rhine–Danube corridor, and the Scandinavian Mediterranean corridor (TEN-T, 2020).

The following figure shows the geographical distribution of these corridors on the European map (Fig. 3).

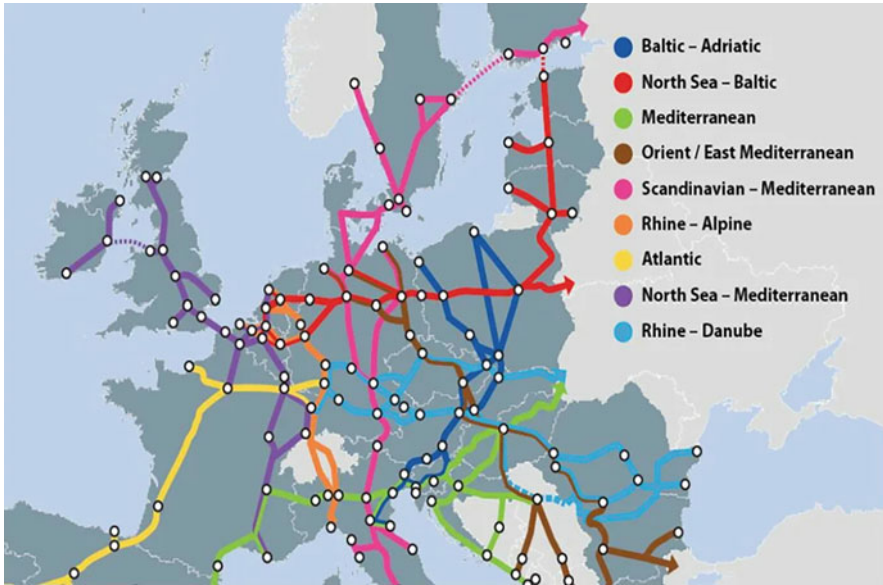


Fig. 3 The Core Network Corridors of TEN-T. Source: TEN-T (2020)

The following example shows some of the measures which are done by the Port of Hamburg within the TEN-T framework: there is extension of the tracks at the railways yard at Maschen, where more than 3000 train cars are handled every single day set to be finished by 2025 as well as several smaller projects (Biermann & Wedemeier, 2016).

Gutiérrez et al. did a study where they discuss the European value added value which was generated by infrastructure projects by using the TEN-T projects and verified this approach by the TEN-T priority project 25 (Gutiérrez et al., 2011). The authors also state that: “projects or project sections that generate intense spillovers would have high European added-value, so they would be contributing to the goal of improving the network interconnection, particularly in the case of border sections” (Öberg et al., 2018). They also state that another goal of the TEN-T project is to promote territorial cohesion within the EU. This means to balance the different development within the EU.

Cross-border projects like TEN-T can transform areas at the edge of a particular country into a centralized area (Öberg et al., 2018) and thus strengthen the economic capabilities of these areas.

Khúllova and Šprochová show this notion at the example of the Visegrad countries (Poland, Slovakia, Hungary, and the Czech Republic) (TEN-T, 2020). Of these four countries only Poland has direct access to the ocean whereas the other three are landlocked. Of the nine corridors, five are crossing the aforementioned countries directly and consist of different transport modes (rail, road, inland waterways, seaways, and air) (TEN-T, 2020).

Regarding the sustainable factor of TEN-T, Öberg et al. did a study where stakeholder of TEN-T projects was interviewed (Öberg et al., 2018). Here the authors came to the result after analyzing the interviews and reasoned that interviewees who gave a positive answer to if the corridor approach can promote sustainability “that a corridor approach combine resources and long-term planning effort, and provide opportunities for more effective and environmentally friendly transportations” (Öberg et al., 2018).

TEN-T will transform the logistics networks in Europe, especially in the periphery of the EU in a positive way.

3.3 *Belt and Road Initiative (BRI)*

Another very important project which will have a big impact on logistics and societies worldwide is the Belt and Road Initiative (BRI) or One Belt One Road by the government of the People’s Republic of China (Dunmore et al., 2019). The primary goal is to connect the People’s Republic of China via South East Asia, the Central Asian states and the Middle East with Europe (Hilger, 2018).

This initiative was launched in 2013 by the president of the People’s Republic of China Xi Jinping and is a thoroughly ambitious project. It consists of the construction of transport connections via land between Asia and Europe, the development of a belt of economic integration between China and other countries and additionally maritime routes between China and all other continents (Hilger, 2018).

There is currently not a defined framework but the concept is rather fluid. Currently there is also not an official database nor a list of which countries are participating but according the government of the People’s Republic of China 65 countries with 60% of the world’s population and 30% of global economic output are involved (The Belt and Road Initiative, 2020).

The following maps show the BRI (Fig. 4).

Within the scope of the BRI the Russian government proposed and the Chinese government promoted a Silk Road on ice which should be developed by the two countries jointly. It should start in the Sea of Japan, entering the Arctic Ocean via the Okhotsk Sea and the Bering Sea and then follow the NSR to the ports of North-western Europe (Lin, 2021). Lin (2021) describes how a big data infrastructure is built up in the Ice Silk Road to gain more insights and thus makes it easier to acquire, store, and process the necessary data of this seaway (Yang et al., 2018).

The BRI will have an impact on logistics in Europe and also the shipping lines for Europe. The New Eurasia Land Bridge is connecting Chinese cities by rail with Europe through Kazakhstan, Russia, Belarus, and Poland. For example, there is already a direct train service between Chongqing, PR China and Duisburg, Germany (Stamouli, 2016).

The Port of Piraeus, Greece is considered a gateway port to Europe. COSCO will operate the Port of Piraeus and will invest 552 million Euros in the port (WSJ, 2016) “to make Piraeus the biggest transit port in South Europe” (Zhuravel & Nazarov,



Fig. 4 Map of the BRI. Source: The Belt and Road Initiative (2020)

2020). This will lead to new transport routes by rail from Southern to Central and Northern Europe by rail, e.g. from Piraeus, Greece to Budapest, Hungary (WSJ, 2016).

It is assumed that the trade between East Asia and the European Union will grow by 80% between 2016 and 2040, meaning roughly 2.5% per year. Some of these cargos (ca. 6%) will be transported by using the train (Hilger, 2018).

The BRI will thus have a global impact on the transport networks will lead to the economic improvement of a number of countries.

3.4 Analysis of NSR Development Plans According to the Official Sources

According to the infrastructure development plan for the Northern Sea Route (NSR), at the first stage (until 2024), it is required to increase the volume of cargo transportation, which will mainly be carried out in the western direction of the NSR. Large foreign and Russian companies are already working in this direction (Topwar, 2019).

To increase the volume of cargo traffic, it is necessary to modernize and expand the production capacities of a number of ports, and somewhere to build new ones. The development of the Port of Murmansk is planned. After modernization, its capacity will increase by 18 million tons. Not far from Murmansk, in the Ura Bay, NOVATEK company will build a liquefied natural gas (LNG) transshipment

complex (Garant, 2020). The total investment is estimated at 70 billion rubles, of which the federal budget will provide only 0.9 billion. The number of facilities will also include federal property.

The modernization of the Arkhangelsk seaport has begun. Reconstruction of the Arkhangelsk approach channel is planned. It is planned to build a deep-water area of the seaport of Arkhangelsk. The project will include two specialized (for mineral fertilizers, oil cargo, and gas condensate) and four universal (for metal, bulk, timber, and container cargo) sea terminals with a total capacity of up to 38 million tons, access roads and railways (RG.RU, 2020). The construction cost is estimated at 149.8 billion rubles. The project is planned to be implemented in two stages: 2018–2023 and 2026–2028 (expansion of infrastructure and reaching design capacity).

In the future, the NSR will make it possible to deliver hydrocarbons to the markets of the Atlantic and Pacific Ocean.

Reconstruction of eight Arctic airfields is envisaged: Amderma, Murmansk, Arkhangelsk, Naryan-Mar, Dikson, Pevek, Tiksi, and Chokurdakh. In the coming years, most of the airfields in the Arctic will become all-season and will be able to receive aircraft of all types. Also, 40 Far Eastern airports have been included in the Comprehensive Modernization Plan. The terms of modernization are shifted due to a decrease in funding. To increase freight traffic, a large project is being implemented: the construction of the Northern Latitudinal Railway (SSH). The construction of the SSH is planned to be carried out until 2023 (Thebarentsobserver, 2019). The planned traffic volume will be 23.9 million tons per year (mainly gas condensate and oil cargo). A combined railway and road bridge will be built across the Ob River with a total length of about 40 km with approaches (up to 60 billion rubles). The SSH will connect the towns of Salekhard and Nadym, the village of Pangody with the central part of Russia by rail. The USS will reduce the length of transport routes from Western Siberia to the ports of the Baltic, White, and Kara Seas.

4 Results

4.1 Social

The development of the Arctic regions depends on the availability of resources, existing industry, transport, energy and other infrastructure, and population. GDP per capita of the Murmansk Region and Kamchatka Territory is second only to the oil and gas producing regions, Moscow (21.407 USD) and St. Petersburg (13.081 USD) and exceeds the indicators of a number of the main investment-intensive regions—Moscow (556.4 rubles), Leningrad regions (603.2 rubles), the Republic of Tatarstan (633.8 rubles) (Faikov & Faikova, 2021). This indicates the increased volumes of the economies of the northern regions, which is largely due to the development of the NSR. At the same time, it is in these regions, as well as in the Arkhangelsk region, that the trend towards a decrease in the number of the

population persists. Despite the implementation of large projects, people are leaving, which indicates a decrease in the quality of life, insufficient social development of the regions. In the resource regions, the population is either constant or slightly increasing, but the total number and density of the population in the northern parts of these regions is low.

4.2 Economic

Currently gas, oil, timber, copper, and nickel produced in the north are transported on the NSR, the strategic importance of this seaway is thus high. The importance of the NSR as a unique transport artery is determined by the need for an industrial development of the Arctic region. This is an important factor to ensure the economic security of Russia. The NSR plays a role in the development of a number of Russian regions connected with the Arctic Ocean by large rivers (Ob, Indigirka, Yenisei, Kolyma). In addition, the Northern Sea Route affects the economy, transport links of the northeastern part of Russia, i.e. the Republic of Sakha (Yakutia), Chukotka, and Magadan.

The role of export markets can hardly be overestimated for the development of the economy and economic growth of any state. The development of the economy only at the expense of the domestic market does not allow it to develop dynamically outside the limits of domestic demand and consumption of goods. Export markets remove restrictions on the quantitative demand for goods due to limited domestic demand and provide essentially unlimited opportunities for obtaining additional resources from outside for the development of their own economy. An increase in the produced national income and economic growth lead to an improvement in the well-being of the population. Small and medium-sized businesses make a huge contribution to the development of foreign economic activity of the state. Since the development of this particular sector of the economy is a way to increase the competitiveness of the state economy as a whole.

The volume of total exports is an indicator characterizing the involvement of a state in the world economy; it should be noted that in most developed countries the share of small and medium-sized businesses in this indicator is about 30–40%. As mentioned above, with the introduction of sanctions against Russia and the closure of traditional European markets, the domestic economy is experiencing an urgent need to search for new markets. Over the past 15 years China and India are developing at high speed. It can be noticed by the value of GDP per capita, which tends to the value of the United States and Europe. In China, the GDP of capita is around 10.500 USD. For instance, USA has 63.000 USD. Asian markets are unlimited in terms of possible export of products. An important feature that contributes to the development of exports and dynamic trade cooperation of the Russian Federation with India and China is the similarity of the models of cross-cultural communication (Arapova & Mujumdar, 2020).

So, the NSR is a strategic sea transport artery that plays an important role in the development of the economy of the Russian Federation. This is a waterway that allows international trade, ensures the security of the state, and fully develops the Arctic region.

4.3 *Ecological*

Environmental threats are one of the main problems in the Arctic. Some opponents of the NSR are arguing that a year-round navigation of the NSR would be dangerous for wildlife there due to a lack of measures to protect the Arctic ecosystems. The implementation of northern maritime logistics should be based on ensuring environmental requirements, and thus green logistics can become the basis of a competitive advantage.

The highest value of which is considered to be the provision of green shipping, the introduction by Arctic maritime logistics into the world economy of technologies that multiply or eliminate greenhouse gas emissions into the earth's atmosphere, especially in its most sensitive zone of the clean ecological Arctic (Glomsrød & Aslaksen, 2006). Taking into account the special environmental pressure when choosing the NSR as a route for shipping, including within the framework of the competition between global carriers, environmental requirements for sea transportation with competitive power plants, for example, nuclear power plants, LNG in the future on hydrogen, with modern digital ship systems and complexes are the most important strategic aspect in the creation of a national Arctic cargo fleet. Therefore, it is an important task to present the NSR as the most environmentally friendly route for the transportation of goods that can bring a synergistic effect to the development of industry in the countries of the Arctic Council and the indigenous population of the Arctic region, to help reduce the global anthropogenic load and emissions as a result of using a shorter route between Europe and Asia, which will also contribute to realizing the goals and objectives of the Paris Climate Agreement. It should be emphasized once again that fuel costs are the most sensitive and critical criterion in the shipping business and an increase in the cost of fuel can provoke a global crisis in the shipping business. In connection with the impending in the period 2022–2025 crisis associated with the IMO 2020 problem, the project for the development of northern maritime logistics based on the NSR using ships with nuclear power plants has its own advantages (Nticenter, 2020). The use of nuclear power plants, on the one hand, increases capital costs in the construction of a ship, on the other hand, we obtain indisputable operational advantages in terms of fuel of the “fill and forget” type, fuel loading once every 5–7 years, unlimited autonomy possibilities, operating costs for nuclear fuel are significantly lower in relation to the annual cost of LNG or conventional diesel. This gives a return on costs within 10–15 years of operation. In particular, it should be taken into account that it is not necessary to create a special infrastructure for servicing ships with nuclear power plants, since it has already been created, like the regulatory framework, but for LNG, such an infrastructure will still

have to be built. Due to the fact that the IMO 2020 problem will affect the instability of fuel prices and will lead to a twofold increase in the cost of fuel costs, the use of nuclear power plants will allow, among other things, to give consumers the stability of the cost of transport/transit services for a long period of up to 10 years (International Approaches to Carbon Pricing, 2021). Also, in terms of their impact on the environment, ships with nuclear power plants have zero CO₂ emissions. That is, it is a 100% vessel with no carbon footprint.

5 Conclusion and Outlook

The socio-economic development of the Arctic region of the Russian Federation has become the object of close attention of both the government and the scientific community. A number of regulatory documents in the Russian Federation have been adopted, the main purpose of which was the regulation of certain aspects of the political, industrial, economic, and social development of this region.

This chapter examines the most important factors in the development of the Northern Sea Route. Among their permanent presence in the Arctic, development of the infrastructure of the Northern Sea Route, cooperation with other countries.

An important role is played by strategic factors related to geopolitical and transnational importance of maritime shipping in the Arctic zone. Such factors are control over sea areas, potentially rich in natural resources, the transit value of the Northern Sea Route as an internal route between northwestern and far eastern regions of Russia. Also an important factor is potential growth opportunities for transnational transit traffic along the highway Northern Sea Route between European and Pacific ports.

High-quality development of the Arctic territories is impossible without successful implementation of infrastructure projects. The formation of the Arctic transport system is the most important task for the development of the region. The limited transport system seriously hinders development of the northern regions. It is necessary to connect the routes of our great Siberian rivers to the Northern Sea Route, reconstruct old and build new branches of railways, highways, and also massively use aviation, then it will be powerful transport and logistics system.

The Northern Sea Route is the basis of the economic stability of the North of Russia and the most important element of the Russian and international transport system. Study The Northern Sea Route is a prospect of interesting and important work.

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