

ECONOMIC DEVELOPMENT OF THE RUSSIAN ARCTIC SPACE BY UPGRADING TRANSPORT AND LOGISTICS SECTOR

Vladimir Selin¹, Fedor Larichkin², Valentina Novoseltceva³

^{1,2,3}Institute of Economic Problems after G.Luzin, Kola Scientific Centre, Russian Academy of Science, Russia

²e-mail: lfd@iep.kolasc.net.ru

³e-mail: novoseltzeva.valya@yandex.ru

Abstract: *The article characterizes the growing interest of the Arctic states and the world community to the development of the vast natural resources in the harsh environment of the Arctic, including the development of programs and the strategy, the importance of international cooperation, harmonization of legal framework of economic activities in the macro-region. The essential modernization and development of transport and logistics complex in the effective development of the Arctic zone is substantiated. A conceptual model for creating the modern transport and logistics complex applicable to Murmansk transport hub, the largest in the Russian Arctic, has been developed.*

Key words: *Arctic zone, natural resources, transport hub, modeling, the transport and logistics complex*

1. Impact of changes in national and global geopolitical and geo-economic situation, the institutional conditions affecting the situation in the Russian Arctic

Importance of the Arctic as a global resource base, as strategic territorial reserve of all mankind, as the reactor of global weather, and as a region having the great economic, cultural and civilizational value, gave rise to growing interest of the international community¹ to Arctic, which has led to the fact that the Arctic states² have developed and adopted at the state level policy documents, expressing their intentions in the development of the Arctic region.

Analysis of strategies of Arctic countries allows to make a conclusion that acceptable conditions for their peaceful interaction in the Arctic world have been developed, which are based on the following key documents:

– UN Convention³ on the Law of the Sea 1982;

- The Arctic Council (1996) - the only circumpolar and political authority on matters relating to the Arctic Coy;
- Ilulissat Declaration of 2008, in which countries agreed to cooperate on the basis of existing international law;
- Transregional integration Education: Council Barents / Euro-Arctic Region (BEAR 1993), Nordic Council of Ministers (NCM -1971), the European Union ("Northern Dimension" -1995), and others;
- Treaty between the Russian Federation and the Kingdom of Norway on maritime delimitation and cooperation in the Barents Sea and the Arctic Ocean (2010-2011);
- Non-governmental organizations: the World Wildlife Fund, the International Arctic Science Committee, the Advisory Committee for the seas, International Work Group for Indigenous Affairs, University of the Arctic, and many others;
- Social structures of indigenous peoples of the North: the Inuit Circumpolar Conference, Aleut International Association, the Saami Council, Association of Indigenous Peoples of the North, Siberia and the Russian Far East, etc.

All this allows us to consider the Arctic in the future as a base for international cooperation, for which we have created the basic institutional conditions. The need for the widest possible international cooperation in the various fields of

¹ Reid A. Chilingarova and planting of the Russian flag on the seabed at the North Pole, to some extent "provoked" simultaneous adoption of strategic documents by all Arctic states.

² Arctic countries: Denmark, Iceland, Canada, Norway, Russia, the USA, Finland and Sweden.

³ "Convention" was ratified by all the Arctic countries except the United States (in real US actions do not violate this convention).

Arctic exploration is largely due to the complexity of natural settings, scale mineral and biological resources, fragile Arctic environment.

Analysis of the situation in the Russian Arctic from the standpoint of its security legal and regulatory system to regulate economic activity and population living on Arctic territories, revealed the following:

- 1) Actually all laws and regulations in force in the territory of Russia, are hardly adapted or not adapted to the Arctic at all, including federal laws, specific for the North;
 - 2) Hitherto fundamental laws are not accepted: "On the Arctic zone of the Russian Federation" and "On special modes of nature and environmental protection in the Arctic zone of the Russian Federation";
 - 3) Russian Federation in terms of legislative support development of the Arctic zone is lagging behind the other Arctic countries;
 - 4) In the last two - three years, the situation began to change in a positive way, and has been a shift from rhetoric and numerous declarations to action:
 - 5) In 2008 were developed and approved "Principles of State Policy in the Arctic for the period up to 2020 and beyond" (Presidential Decree of 18 September 2008, № PR-1969). This document was the recognition that the Arctic zone of the Russian Federation (Russian Arctic) is the subject of a specific public policy because of its nature and specifics that distinguish it from other regions of the country;
- July 28, 2012, the Federal Law № 132-FZ "On Amendments to Certain Legislative Acts of the Russian Federation regarding state regulation of commercial navigation in the waters of the Northern Sea Route," which defines the status and NSR, conditions for navigation along the route, determination of charges (payment), etc;
 - July 30, 2012 adopted a law "On the creation of the federal treasury institution" Administration of the Northern Sea Route".
 - In the near future several important documents should be introduced: they are – long-suffering the law⁴ "On the Russian Arctic zone", and the law "On special modes of nature use and

environmental protection in the Arctic zone of the Russian Federation"; These laws should define the status and boundaries of the Arctic zone, especially budget, investment and social policy in the Arctic, the principles of relations between the state and subsoil users, the relationship of the state with the indigenous peoples small in number, measures to ensure the protection of the environment and security of this territory, and others;

- It is necessary to adopt the Program "Economic and Social Development of the Russian Arctic 2012-2020" [1].

These documents are mostly complete formation of the basic contours of the Russian Arctic policy and internal institutional environment in the Russian Arctic.

But to ensure sustainable development of the Russian Arctic as a region, geopolitically and economically extremely important for Russia must be comprehensive, large-scale policy in formation of new institutes and mechanisms of their interaction on the whole of the Russian Arctic are required adapted to the realities of the Arctic and geo-economic challenges. In particular, the role of the state and business in the development of the Arctic is not fully defined. The problem is compounded by the fact that the costs and risks of infrastructure and technologically Arctic projects are very high, and they can be successfully implemented only on the basis of the formation and development of the institute partnership of business, government and society.

2. The structure of the traffic and transport system of Russian Arctic

Specificity of the geographical position of Russia, led to the unique design features of the transport system of life support its Arctic territories. There are almost no analogues of the settlements located in these latitudes and comparable in size and level of development of transport systems in the rest of the world. The Arctic in Canada, Alaska (USA) and the island of Greenland, which is part of Denmark can be considered closest to the conditions of the Russian Arctic North [2].

The transport system of the Russian Arctic is represented by rail, road, air, pipeline, sea and river transport, and in addition it includes communication lines, vehicles, ports, facilities and

⁴ This law was submitted to the State Duma as early as 1999.

objects that accompany the transport activity. As in the Arctic regions of leading foreign countries, it focuses mainly on the export of minerals, industrial goods and import of goods for the population, as well as transport services for military facilities located on the Arctic coast and islands.

However, the system transformation of the Russian economy since 1990's, had the strongest impact upon the territories of the Arctic zone, not having a safety margin due to its specifics, for a flexible response to new economic and technical conditions. The absence of active economic policy of the Government in the north of the Arctic zone gradually leads to the degradation of infrastructure, in particular transport, and a precipitous decline in demand in the domestic market has made no alternative way out of the economy of the Arctic regions to the global commodity markets⁵ [3].

In contrast to Western trends of increasing intensity and complexity of flow processes, system and procedure for removal of the main export resources and domestic goods in the north of the Arctic regions of Russia in the last twenty years have not changed significantly. The main feature of the logistics of goods movement is misallocation of transport infrastructure - namely, distancing from the sites of formation of shipments and fading nature of entering the North trade flows.

Dominant in terms of transportation in the Russian Arctic is pipeline transport, turnover of more than 400 million tons. It should be noted that, both home and abroad, the Russian pipeline transport is the main mode for transportation of oil and gas. So now, the rail transportation of oil does not exceed 5% of the volume of production. Railway transported West Siberian oil intended for refining in Khabarovsk and Komsomolsk refineries. Railway provides oil exports in Arkhangelsk and Murmansk ports in the North and in the direction of Blagoveshchensk and Daqing - the Russian Far East. Road transportation of oil is not used, except the cases when oil is transported from individual exploration wells or locations of oil spills.

Among the new projects implemented in accordance with the investment program of the company "Transneft" in the 2nd half of 2012, there is the Project: Construction of Purpe-Samotlor - 45.2 bln RR. The aim of the project "Purpe-Samotlor" is to ensure oil transportation from Vankor field and the Krasnoyarsk Territory to Russian refineries and for export. The Arctic pipeline - Purpe designed to transport oil from new fields of the Yamal-Nenets Autonomous Okrug (YaNAO) and the Krasnoyarsk Territory. Design capacity is up to 45 mln tons / year. The total length of the pipeline is about 500 km. Total costs for the development of trunk pipelines in the period from 2012 to 2015 will be about 400 bln RR.

However, the absence of main oil pipelines in the territory of the Nenets Autonomous Okrug (NAO) leads to problems with the implementation of promising oil projects, as nowadays it ships the extracted oil to the centers of its admission to the main oil pipelines by complicated schemes using field pipelines. It is no coincidence that large vertically integrated oil companies (VICs), such as "LUKOIL" and "Rosneft", are forced to use various schemes of export supplies of crude oil in the Russian North. So "Rosneft" uses rail and maritime transport (via the port of Arkhangelsk) to deliver oil to the Kola Bay (terminal "Belokamenka"). "LUKOil" built Varandeisky ice-resistant terminal for this purpose.

New area of gas production in the North of the Russian Federation is the Yamal Peninsula. For gas extracted in Yamal, Russian gas transportation system is required for delivery into a unified system of gas supply. It shall be supported by building of a total length of 2,451 km, including the new transportation corridor "Bovanenkovo-Ukhta" about 1,100 km long. The result will be gas transportation system "Bovanenkovo-Ukhta-Torzhok". During the years 2014-2029, Yamal gas pipeline network will be built to connect the fields Ob' and Taz Bays.

Shtokman project was postponed several times year after year. It has been suspended now for a later period. Foreign participants - "StatoilHydro" and "Total" - left the Project. Apparently, the development of new areas of gas production in Russia would cover the missing volumes of gas exports through the pipeline "Nord Stream", and the new conditions in the European and global gas

⁵ Shestopalov ME Vector aspirations - the Arctic. Access mode: <http://www.vko.ru/DesktopModules/Articles/ArticlesView.aspx?tabID=320&ItemID=256&mid=2869&wversion=Staging>.

market make LNG supplies from the Kola Peninsula ineffective. As a result, Murmansk region will stay deprived of natural gas, which, in particular, makes the problem of compensation of becoming incapacitated Kola NPP by the year 2030 very acute.

The second largest freight is railway transportation. The total cargo turnover in the Arctic zone of Russia is close to 100 mln tonnes. It also performs passenger traffic flow over long distances (over 500 km). In the eastern Arctic (Taimyr, five Arctic regions Saha (Yakutia), Chukotka) main passenger flows are served by air transport.

A major role all over the country is played by a freight rail transport, whose share in the structure of commercial turnover is almost 90% (excluding pipelines). Increase in the turnover in the domestic Russian report was 5%, 6.5% internationally. In 2011, turnover growth rate of loading indicated the ongoing increase in the average length of haul trucks (2.4% - in the Russian domestic communication, 0.7% - in international traffic).

Cargo mix has changed slightly. The share of domestic shipments fell down from 45.3% to 45%, international rose from 54.7% to 55%, while the share of turnover of export traffic has reduced to 47.6% (export goods through the ports has reduced to 29.4%)⁶.

Increase in loading was mostly achieved through low-income cargoes: mineral construction materials (42.5%), stone UHL (27.6%), iron ore (25.2%). The tendency for increase of cargo turnover during the given period is also characteristic for the Arctic regions.

This study confirms the high level of wear of all types of land vehicles, lack of capacity and poor quality of road networks, as well as the actual decrease of small aircrafts. Thus, the share of mainline freight locomotives designed for driving freight trains in the northern areas with ambient temperature to -50 ° C exceeds 93%. Naturally the malfunction rate of transport increases, and the ongoing renewal of the park can not change the negative trends of its aging. Despite the measures taken in the field of motor transport, there was a

row of imbalances specific for the whole country, and in a more acute form in the northern territories. Identified is a number of contradictions in the organization and distribution of transport and logistics infrastructure, the main of which is significant imbalance between the territorial and resource potential North Arctic regions, and low transport development, and often a complete lack of transport communications. It should be stated that no transportation project north of the Arctic zone has been implemented completely, the original deadlines are revised. The reasons are trivial - the programs are not backed up by sufficient funding sources. The terms and conditions of return of private investments for investors are not finalized. Long-term tariff policy for cargo-investors, etc. is not clear [4].

The main traffic load in most of the north-Arctic regions of Russia is carried out by sea and river transport. Meridional location of the largest Siberian rivers allows them to serve as links between the Trans-Siberian Railway and the Northern Sea Route (NSR). River Lena, Yenisei, Ob and Irtysh are four times the length of railways and eleven times – motor ways, and an extensive system of river tributaries provides access to the most distant points.

Maritime transport can be considered the most promising in the strategic plan, especially in connection with possible warming of climate. The volume of its traffic in the Arctic is currently more than 20 mln tons, but on the Northern Sea Route it does not reach even 5 mln tons (including the transit of less than 0.5 mln tons). Over the past 20 years, only one nuclear-powered icebreaker was constructed designed yet in the Soviet period. By 2020, when a large-scale growth of marine transportation is expected in the Arctic, only it can remain in service in the event of failure of new construction program.

For the effective development of marine transport it is necessary to have legislation for preservation in federal ownership and the strategic development of the icebreaker fleet, navigation, hydrography and hydrometeorology, communications and traffic control as the basis of a single national transport communications of Russia in the Arctic. Analysis of the use of transshipment complexes (by capacity) shows that the ports of the Arctic basin involved only 50% of design capacity. In the major

⁶ Annual Report of OAO "Russian Railways". Access mode: http://rzd.ru/static/public/rzd?STRUCTURE_ID=5128&layer_id=3290&id=3699

sea ports with a capacity of more than 20 million tons, a high percentage of unused port capacities is observed in the ports of Murmansk (33.9%) and Arkhangelsk (30.7%). Increase of downtime, and accordingly, a high percentage of idle capacity of transshipment complexes is observed mainly in ports oriented for transshipment of oil cargo (due to the reduction of oil cargo turnover by 4.2%). In the course of research, expediency of the following activities is feasible [4]:

- in accordance with the Transport Strategy of the Russian Federation, for the period up to 2025, to develop a subsystem of transport infrastructure development of the Arctic zone of the Russian Federation with a complex interaction of sea, rail, river and other modes of transport;
- Develop a concept for the development of the Northern Sea Route as a basic infrastructure in the development and transportation of oil and gas to ensure national priorities;
- create a single agency of control over the Northern Sea Route at the federal level;
- improve the efficiency of the formation and operation of port special economic zones in the Arctic, in particular in ensuring integrated development of the Murmansk transport hub;
- provide a public-private partnership building ice-class vessels of all types, including tankers and gas trucks, as well as a new generation of nuclear-powered icebreakers capable of carrying out pilotage deadweight of 100 thousand tons and above, with placement of orders mainly in domestic shipyards.

The current state of river transport and ports servicing the complex of northern and Arctic regions have been analysed. Large river basins in the Russian Arctic, with their meridional direction of the bed, let them serve as links between the Trans-Siberian Railway and the Northern Sea Route. NSR is a critical part of the infrastructure of the Russian Arctic economic complex, and is a link between the Far East and Western regions of the country.

Among the goods transported, the leading position is after mineral construction materials (sand, gravel, crushed stone, etc.). Next by importance is timber. Relatively sufficient is transportation of oil and oil products, stone coal and grain. Designation of all modern river vessels can be divided into 4 main groups: transportation, commercial, military

and various accessories (including servicing, sports, research, etc.).

River transport is essential to the sustainable development of the Far North and equivalent areas. On the water (sea and river) transport 85% of all freight of the Republic of Sakha (Yakutia) are accounted, 95% of the north-east coast of the Arctic, 70% of Norilsk MMC. The role and importance of transport will increase in connection with the beginning of the development of new mineral deposits in the Far North and on the continental shelf of the Arctic seas. In the past 20 years maintenance of the infrastructure of river transport in the Russian Arctic has not been given due attention. Surveying, dredging and bed straightening works, flood-gate and other hydraulic facilities repair have not been conducted to the full extent. This has led to problems of delivery of vital food and fuel and energy goods to remote areas.

In general, there is a systemic problem of disunity among the various modes of transport. Used transport technologies are not coordinated in a single course of transportation and do not meet the requirements of transport operation. Informatization level of transport processes and information exchange with other sectors of economy remains low. No system for motion control of vehicles on long mileage highways causing big losses of carrying capacity of river transport and quality of transport services.

Crudity of reform of management by development of transport plays a significant role in the ineffectiveness of river traffic. There is no scientific justification for the selected priority of river transport development. River transport services are not focused on their recipients, namely on the needs of the population, economy, as well as the strategic issues of unity, security and defense areas.

Transport and infrastructure complex of the Russian Arctic plays a critical role in the development of its natural resources, and thus contributes to national security. Pipelines take a dominant share of the volume of freight traffic, but in the long term perspective the meaning of marine cargo flow will increase, allowing diversify export cargo. The analysis allowed identify the systemic problem of transport and infrastructure complex in the Arctic: a high degree of physical and, in some cases, obsolescence of fixed assets. There is

disunity among the various modes of transport. Used transport technologies are not coordinated in a single course of transportation and do not meet the requirements of transport operation.

The conclusion is obvious: transportation network is required on a fundamentally different level providing access to vast north Arctic and eastern territories and enabling their effective development. However, it is necessary to consider the multi-
aspect impact of transport on the socio-economic development of the territory, clearly defining it as a development resource or factor limiting it. That is, the development of the transport network should not hinder the development of the economy, preserving archaic configuration of transport communications on the one hand, and not become a goal for the formation of transport infrastructure not having explicit advanced demand, on the other hand.

At the moment, there is a fairly large number of planning and forecasting documents of national, territorial and branch level, outlining the future of transport development and realization of logistics potential. Thus, all of the strategic and programmatic decisions on the development of the Arctic are aimed at establishing a supporting transport framework in the Arctic zone of the Russian Federation (Russian Arctic), including new transport corridors in the meridional and latitudinal directions. In particular, rail transport can select a group of projects that integrate with the development of the Arctic regions of the country (the creation of new transport corridors in the meridional and latitudinal directions), and projects that are entirely devoted to the development of the Russian Arctic [5].

In the western sector of the Arctic - implementation of the Projects: "Northern Latitudinal Route" (station Obskaya - Korotchaevo) - part of the "Ural Industrial - Ural Polar".

BelKomUr (White Sea - Komi - Ural) - straightening railway meridional type Arkhangelsk - Syktyvkar - Gaiyy - Solikamsk, consisting of two parts - the north (in Arkhangelsk region and Komi) and south (from Syktyvkar in the territory of Komi and Perm Krai). For Russia, "Belkomur" may be of strategic importance, linking directly Ural and Komi with the ports of Arkhangelsk, Murmansk and Northern Europe (now this way is 800 kilometers longer), and in the future - providing the

shortest route for the transit of goods to northern Europe and Siberia regions, Kazakhstan and Central Asia.

BarentsKomUr (Barents Sea - Komi - Ural) – the zone of the transport hub will spread to the Urals, Siberia and the Far East. In this case, the length of the route from the Far East to the Barents Sea is reduced by 2,000 km compared to the current road to the sea via Murmansk.

The relevance of these projects is undeniable, since without distant railway approaches to develop the Arctic ports is pointless.

Particular attention is also now being paid to ensuring transport accessibility in the territories of Siberia and the Far East, located in the Arctic zone. The Trans-Siberian Railway (Transsib) is the main railway of the macro-region with tremendous opportunities and potential for transit. Transsib role will increase significantly after the completion of the Russian North-Eurasian railway, which will extend BAM North-Siberian Railway (Sevsib) to the European part of the country and further the railway line White Sea - Komi - Ural or railway Barents Sea - Komi - Ural to northern Russian ports.

The formation of the third latitudinal transport route "Polar" will be also important. The priority portion of the highway (2015 - 2020) Norilsk - Igarka - Urengoy - Salekhard should be considered as land with further transition to the left bank of the river Ob in town Labytnangi. Another important project is the formation of the Lower Yenisei (Igarka, Dudinka, Dixon) transport and logistics hub.

Designed and are in the process of review by expertise are the five rail sections with length of about 280 km on the program "South Yakutia." Discussion of the creation of a single global land transcontinental highway Eurasia - America with a tunnel passing through the Bering Strait is ongoing, the idea originated more than one hundred years ago.

However, not a single project north of the Arctic zone is yet implemented, the original deadlines are reviewed. The reasons are trivial - the program is not backed up by sufficient funding sources are not defined terms of return of private investment for investors who do not understand the long-term tariff policy for cargo-investors, etc. Keep in mind that long-term transportation projects of railway

infrastructure in the north and the Arctic zone of the country, as a rule, refer to freight traffic. And here it is appropriate to recall that the development of the northern territories has always happened abruptly when two conditions both match: the emergency of breakthrough technologies and investment projects in the North, which can be implemented by using these technologies. An example is the icebreaker fleet and polar aviation, which gave impetus to the development of the North in the 30s of the last century. But a major breakthrough occurred only in the 60s and 70s with the advent of nuclear-powered icebreakers and possibility of secure caravan pilotage.

Potential and importance of these projects still require scientific substantiation of practical importance because they relate to the category of leading projects - which have no explicit demand at the moment. The uncertainty of future effects makes them extremely risky.

Therefore, only actual economic development of territories in the extreme conditions, orientation on real tangible result, having significant prolonged effect on the transformation of economic space, will allow realization of the stated railway projects. Undoubtedly, the current configuration of the transport network of the Arctic zone of the country does not meet the long-term geopolitical orientations. But the promotion of well-known projects requires careful consideration of a great number of issues, ranging from adequate forecasts of economic security of the country and ending by the needs to transport goods from the major economic actors.

3. Influence of economic factors and climate change on the development of transport systems in the Arctic

Maintaining the stability of the Russian economy and ensure the competitiveness of the Russian Arctic raw materials in global commodity markets can be achieved primarily by reducing transport costs in prices of export products. Consequently, one of the most important areas of development in the Arctic is a rational, economically sound formation of transport and logistics infrastructure, including the development of transport networks having high throughput and handling freight forwarding processes.

Currently, the transport system of the Russian Arctic is characterized by extremely uneven development and low-level transport development. Most of the Russian Arctic, particularly its eastern regions do not have full ties with Russian transport highways, as well as intra-communications.

The basic element of the Arctic transport system is the Northern Sea Route (NSR)⁷. NSR is a natural transport structure that has the latitudinal strike along the coast and north-south strike formed by the largest European (Pechora, Northern Dvina) and Siberian (Ob, Yenisey, Lena, Kolyma, Indigirka etc.) rivers. Throughout the NSR seaports and airports were constructed, from Murmansk in the West and ending by Pevek province in the East. Meridional direction of the Siberian rivers, moreover, provided a link between NSR and Trans-Siberian Railway (Transsib), that is connection of NSR with the rest of the country.

NSR almost fit the canons of modern ideas about the transport and logistics systems⁸. In fact, all development of the North and the Arctic within the USSR was based on the transport system NSR, including servicing of companies, construction Arctic and northern towns and villages, to ensure viability of the population of the territories at the expense of "northern delivery", etc. The only drawback of this system was the limited availability of seasonal rivers and sea routes in the winter.

During the transformation of the Russian economy to market principles NSR infrastructure, especially in terms of maintaining the Arctic sea ports, airports, meteorological stations was practically destroyed. "Northern delivery" reduced, exploration works, hydro- and scientific

⁷ "Under the water area of the Northern Sea Route is understood expanse of water adjacent to the northern coast of the Russian Federation, covering the internal waters, territorial sea, contiguous zone and the exclusive economic zone of the Russian Federation, and bounded on the east line of maritime delimitation with the US and parallel Cape Dezhnev in the Bering Strait, in the west to the meridian of Cape Desire Novaya Zemlya archipelago, eastern coastline of Novaya Zemlya and western boundaries Matochkin Strait, Kara Gate, Ugra Bow"(article 5.1 - Federal Law № 132- FZ).

⁸ Transport logistic system - a combination of transport infrastructure, transport companies, transport vehicle and control.

meteorological research decreased as well as shipping by the NSR, etc.

The discovery of new oil and gas onshore and offshore Arctic fields along with the forecast of global warming and the possibility of year-round navigation, substantially increased interest in natural resources of the Russian Arctic and the use of NSR. Now NSR can be seen as a real transport route to accelerate and reduce goods delivery period on a national and global scale⁹. This means that the resources of the Russian Arctic, particularly difficult to develop for reasons of profitability, can be all actively involved in the global economic cycle and play an increasingly important role at the national and global markets.

In 2009, actually the revival of the NSR started. It is associated primarily with the beginning of the implementation of oil and gas projects by major oil and gas companies¹⁰. Estimated the Ministry of Transport, the turnover in the Arctic by 2016 can reach 30 million tons (including 15 million tons due to foreign carriers), and by 2020 even 50 million tons¹¹. Restoration of the NSR will require the development of shipbuilding (nuclear and other types of ships), communications infrastructure development (GLONASS and International Space Station/ISS), rehabilitation or construction of new ports and airports, development of rescue and border services, i.e. it will lead to the development and modernization of various economic activities and the formation of demand for innovation and innovative products within the whole countries.

Consequently, the transport potential of the Russian Arctic, including the Northern Sea Route, may, at

its effective use and development, ensure enhancement of the role and status of the Russian Arctic, both at the national level and in the international arena and become one of the tools of system modernization of the country economy. This is particularly important in the context of increasing globalization and the need for integration of Russia into new geo-economic model of global development as a full-fledged global player.

4. Formation of the model transport and logistics sector on the basis of the Murmansk Transport Hub

The weakest point of the NSR is a port infrastructure, which includes more than 20 ports, airports, cities, towns and other settlements. These are essentially transportation connection points, i.e. the necessary part of the transport system. Solution of the integrated development of transport nodes in the NSR will increase foreign trade cargo transportation, improve the competitiveness of the Russian transport system and attract additional financial resources in the coastal regions of the Arctic, much of which is subsidized. When selecting priority projects for the development of NSR port infrastructure, the most acceptable are the principles of spatial development of transport and logistics sector of maritime transport. This definition is most suitable Murmansk seaport.

Transport importance of the Murmansk region due to the region location at the crossroads of transportation routes with year-round navigation and access to the Northern Sea Route, i.e. NAR (North Atlantic region) and Asia-Pacific region. In the Murmansk region the following kinds of transport are well developed: automobile, rail, aviation and marine.

The port of Murmansk was traditionally considered as the beginning of the NSR¹², though in the law on the NSR it is not included. However, because it is the largest transportation hub in the Russian Arctic, the formation of the model of Murmansk transport and logistics complex (MTLC) is quite a relevant task.

Within the framework of the Federal Target Program "Modernization of transport system of

⁹ Northern Sea Route - is free access to the Atlantic Ocean in the west and the Pacific Ocean in the East, this reduction length delivery of goods from Asia to Europe by 25%. NSR is a national marine highway free from the pressure of other countries.

¹⁰ One of the key players is the company "Novatek" realizing the Yamal peninsula project to build a plant for liquefied natural gas (LNG) and the new Arctic port multifunction Sabetta. With the release of the planned power plant the company intends it to carry on the North path 15 million tons of LNG and up to 1 million tons of condensate. Intend to increase the transit through the NSR Company "Eurochem" up to 3 million tons, and "Lukoil", "Gazprom", fishing enterprises from the Far East, "Northern territories", etc.

¹¹ The northern rout, URL:

<http://expert.ru/2011/08/16/severnoyim-putem>

¹² In the law of NSR beginning of the route of this road is New Land archipelago.

Russia (2010-2015)" the project "Integrated Development of the Murmansk Transport Hub" has been developed and OSHC "Management Company "Murmansk Transport Hub" (MC MTH) has been founded. The Shareholders are: OSHC "Murmansk Commercial Seaport" (40%), OSHC "NK "Rosneft"(15%), OSHC "Russian Railways" (25%), the Government of the Murmansk region (5%), FSUE "Rosmorport" (15%). Nowadays total oil exports through the terminals of the Kola Bay is about 12 million tons per year¹³.

Transport and logistics complex (TLC) in the Murmansk region is based on the principles neologistics¹⁴. TLC subsystems are terminal facilities, as well as elements of the logistic transport network. In 2009, a consortium in Murmansk "Murmanshelf Logistics"¹⁵, one of whose functions is to create independent regional system capable of collecting and analyzing information, to create conditions to attract investments for the development of transport and logistics sector.

Among the most promising types of cargo in the development program of MTH, primarily are coal, iron ore and apatite concentrate, copper and nickel production, handling Arctic oil and liquefied natural gas, which are projected for supplies to Europe and the United States.

October 12, 2010 the Government of the Russian Federation signed a decree on the establishment in Murmansk of the port special economic zone (PSEZ). Obtaining the status of Special Economic Zone was directed primarily to accelerate MTH project development and attract investors. In 2011, the engineering design of railway st. Vyhodnoy MTH - st. Lavna, the most important railroad for MTH began. Work started also within the zone of

PSEZ: the concept of creation and development of the port area was developed and approved by the Supervisory Board, a draft plan for the territory of the new cargo area "Lavna" was developed with total planned volume of transshipment (at full capacity) for more than 50 million tons. Status PSEZ stimulates attracting new investors, and should help the development of related activities: shipbuilding and ship repair, processing of aquatic biological resources.

Development of transport complex in conjunction with the terminal complex, the availability of informational center indicates that Murmansk region has the necessary prerequisites for the creation of a modern transport and logistics complex (MTLC), whose structure is shown in Figure 1.

The main constraint for the development of MTLC is low railway infrastructure capacity. In addition, at present there is no common approach to the development of the port, which in fact, is divided into two parts: a new - within the boundaries of PSEZ, mostly on the western shore of the Kola Bay and the old, which will include existing capacity on the eastern shore.

In developing the model of the TLC, the main factors influencing the development of TLC have been analyzed, and significance of each factor have been determined based on expert conclusions.

With the help of the software Powersim a conceptual model of the Murmansk transport and logistics complex (MTLC) has been created (Fig. 2).

Basis of the model consists of four "flow", three "levels", five "auxiliary variables", three streams "Managed by bound variable tempo" and six "Constant". The "flows" mean traffic flows of four modes of transport: air, road, sea, rail. Three streams are "Levels" accumulating changes, i.e. information about the difference in the intensity of flows. If the input and output is the same, then the accumulation of changes is zero.

"Highway" flow does not have "Level", due to the fact that the road serves not only for delivery of goods to the region, but also for redistributed to other carriers. Therefore, in the flow "Motorways" an auxiliary variable is used to calculate the other flows. The same auxiliary variables are contained in the flow of "MCS" and "railway junction". They are involved in the calculation of the elements

¹³ <http://www.rusnorge.com>

¹⁴ Neologistika - logistics second generation, which is characterized by the predominance of an integrated approach to the development of systems based on the goal of achieving maximum efficiency. An integrated approach has been a new development in the form of the concept of "shared responsibility." The criterion for the concept of "shared responsibility" is the maximum ratio of output and costs. In this approach, logistics systems have gone beyond the economic sphere and steel into account the social, environmental and political aspects.

¹⁵ The structure includes: OSHC "Murmansk Shipping Company", "Barents Logistics", "Wilson Murmansk", "International customs terminal", "RambolSturvik."

providing transshipment by all modes of transport and affect the "level" of these flows.

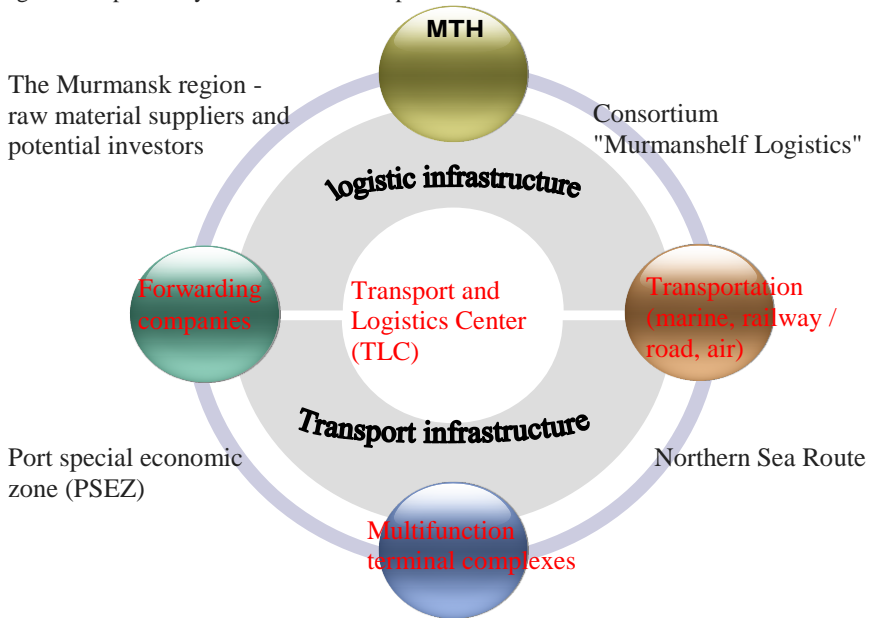


Fig. 1. Conceptual structure of the Murmansk transport and logistics sector

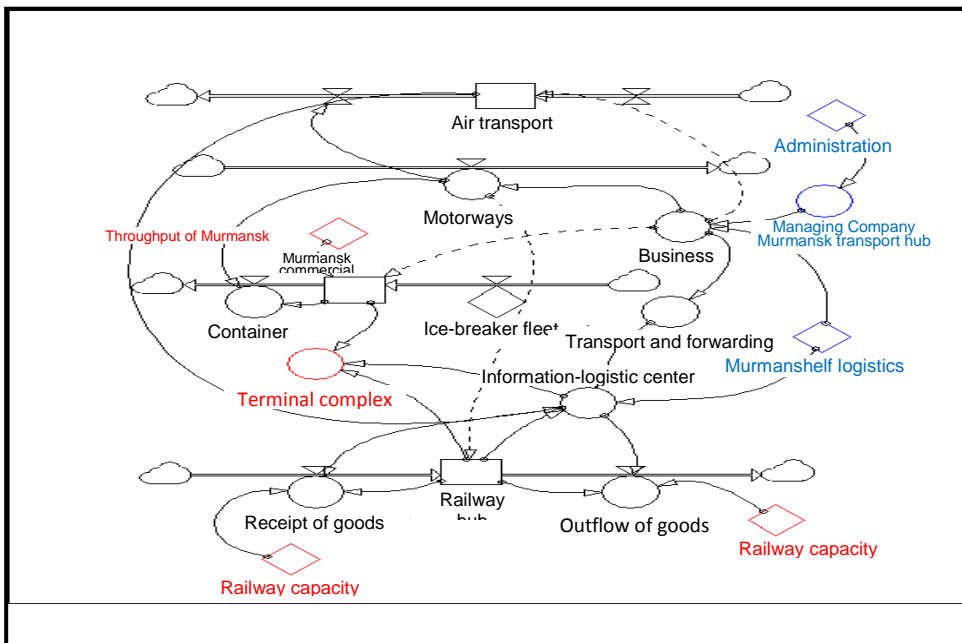




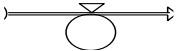
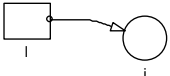
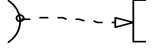



Fig. 2. Conceptual model of the Murmansk transport and logistics complex

Table 1. Symbols and elements used in the model MTLC

Level: type of the variable that stores changes. It's value changes due to flow	
Auxiliary: type of the variable that contains the calculations based on the other variables	
Constant: type of the variable that contains a fixed value	
Flow: type of the variable affecting the levels and changing their values	
Flow with rate: type of the variable affecting the levels, which is usually a reference value	
Link: provides information to auxiliary variables regarding values of other variables	
Initialization Link: gives basic information to align variables relative values of other variables	
Cloud: uncertain source. Means that we - in one of the outer limits of the model.	

Auxiliary variables are the elements: "Business", "Terminal Complex", "Forwarding Company", "Information and logistics center", "MC MTH". These elements do not create a flow, but affect it by their activity (for example, "Business" stimulate investment activities in MTH, "Information and logistics center" accumulates the information which will be required in the future for a decision on upgrading transport hub).

Constants in this system are: bandwidth (railway junction, MMTH), as well as icebreakers, having power restrictions and supply of goods, and Administration "Murmansk Logistics". The last two elements can be taken as not changing as the conditions generated by these elements will operate more than one year, creating a normative data base for future activities OF Murmansk transport hub. All these factors are additive, independent and have the same weight. Therefore, we can combine these factors with the factors of flow by a simple equation relatedness or proportionality. To do this, between elements of the system conducted informational links are created to relate the auxiliary variables in regard of the values of other

variables, with that, the rate of constant will be the starting point or the initial level for the calculation. To make this model dynamic and predicting the development of MTLC, identifying ways and the level of modernization, quantitative and the degree of influence of the system elements upon each other shall be set up. The notations accepted in dynamic modeling have been used for the creation of the present simulation model (Table 1).

5. Conclusions

In conclusion we can say that the energy resources of the Arctic, spatial and transport potential mega region, in particular its basic element - the Northern Sea Route - can with their effective use and development to ensure enhancement of the role and status of the Russian Arctic as a national economic potential and on international arena, becoming one of the important tools of modernization of the economic complex of the country.

Globalization of the economy stimulates the creation of new intercontinental transport routes, including between Europe and Asia. Arctic

corridors, in particular NSR and NWP serve the shortest, and in connection with global warming and comfortable enough (cheap) route, connecting the main world markets: Europe, Asia Pacific and North America. Implementation of the Arctic transport and logistics projects will not only ensure the national security of the country, but also to promote international economic cooperation and integration.

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