

## Economy, Management

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### Formation of the transport infrastructure of the Russian sector of the Arctic in the XXI century<sup>1</sup>



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#### Abstract

Large-scale of the economic development of the North and the Arctic zone of Russia must be preceded by the establishment of the transport frame, consisting of two latitude and six radial strategic railways. For the possible effective interaction between different modes of transport only in the north of the country should be established (or reconstructed) to ten major ports, which may be the key hubs in the development of the Arctic. These sites should be focused on the state logistics centers. Forming the base of the transport framework creates opportunities for accelerated and efficient development of thousands of large mineral deposits in Siberia, the North and in the Russian Arctic.

**Keywords:** *geopolitics, transport, Northern Sea Route, the optimization, the North of Russia and Siberia, strategy, nodes, networks, logistics centers, the transport frame.*

The transport development of the Arctic zone is the key to the implementation of the strategic plans of Russia for the commercializing of the huge natural raw materials and other economic resources of the Arctic, as well as the use of the advantageous of the geopolitical location of the country and the transport potential of the Northern Sea Route (NSR).

It is obvious that the solution of this problem in the XXI century (especially in the first half) will be given increased attention, which, in turn, will not only expand the scale of the economic activity of Russia in the North, but also increase the credibility of our country and its influence in the world community.

Transport development of the North of Russia (Sub-Arctic and Arctic regions) and the creation of the large-scale production is to be seen in the unity of the aspirations, together existing efforts to build the expanded transport infrastructure of the zone, functionally and economically closely related to the existing transport network of the country. Formation of the transport infrastructure of the North Russia should implement the program consistently, gradually forming and

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<sup>1</sup> References on the published works of the authors, in which he refers to other sources.

developing all components of the system, rationally developing all forms of the transport, consistently increasing capacity and carrying capacity expandable transport and increasing the power of all the basic infrastructure components.

The formation of the expanded Russian transport infrastructure in the Arctic requires consistent programmatically create transportation resources with the maximize benefits of the different types of transport, organizing centers where they are based, as well as nation-wide approach to the logistics of cost-effective use of the transport potential of Russia in this area.

### ***The principles of the formation the transport infrastructure of the North***

The key to the formation of the transport infrastructure of the North of Russia should be the use of the most important principles of the effective state of the economic development:

- ✚ development and optimization of the transport networks and the transport resources (capacity) of the traditional type (species), which are basic to the development of the North: the railway and road, sea and river transport, and air (aircraft, helicopter and balloon directions), are under increasing pressure to the process of the economic development of the northern territories;
- ✚ Database optimization of the placement transport transportation resources in the Russian Arctic zone, logistics in the connection with the problems of the economic development of their increasing both in the aggregate and for the individual transport modes. To optimize the costs of the creating and efficient use of the transportation resources created in the north of Russia should be a unified state (not corporate) the logistic system with branches in the key transport hubs. Obviously, in the north along the Russian Arctic coast (SLO) is to be created up to a dozen of these strategic transport hubs, combining the traditional forms of the transport: sea, river, rail, road, air, and new or well-forgotten old modes of transport, such as pipelines for the transport of dry cargo and solid, capsule-container-transportated. Naturally, piping chilled and liquefied natural gas (LNG and OPG), termoplany, ekranolyots (ATLA) recent, modern the modifications, nuclear-powered vehicles (Apts), and others currently in the use and emerging types of the traffic reports [4, 8, 15];
- ✚ optimally effective, efficient use of the advantages of the different types of the transport, depending on the scope and objectives of their application: inter-regional and inter-state transport of the cargo transportation with the distances of more than 1 thousand km, intraregional (mostly inter-farm) and local, mostly-internal [12, 19];
- ✚ establishment of the strategic transport hubs of the Russian North unified the state logistics centers, as only they can conduct policy lowest-cost and the most efficient use of the existing

transport resources and benefits of the different types of the transport in some basic areas of the transportation hubs, and in general all area of the northern zone of the country. Already, at the beginning of large-scale development of territories and resources in the Arctic, it is clear that in the Far North importance of this factor increases dramatically [29, 30, 32];

- ✚ Ensure the environmental cleanliness in the transport development of pre-Arctic and Arctic areas of Russia [14, 17, 24, 27].

Compliance with the above principles in the field of the transport development of the Arctic zone of Russia from the standpoint of the public logistics will, in my opinion, to ensure the minimization of the costs, and therefore reduce the cost of a private investment and government spending in general, the development of natural resources and raw materials in the Arctic:

- ✚ ensure the minimization of the investment in the creation and further modernization and expansion (development) of transport resources;
- ✚ the minimizing of the material costs for maintenance of the transportation facilities and the implementation of the transport operation;
- ✚ minimization of labor, material and energy costs at all stages of the implementation of the strategic plan (program) of the transport development of the North and the functioning of the entire transport system of the Russian North in the technological unity with the other parts of the transport sector of the country.

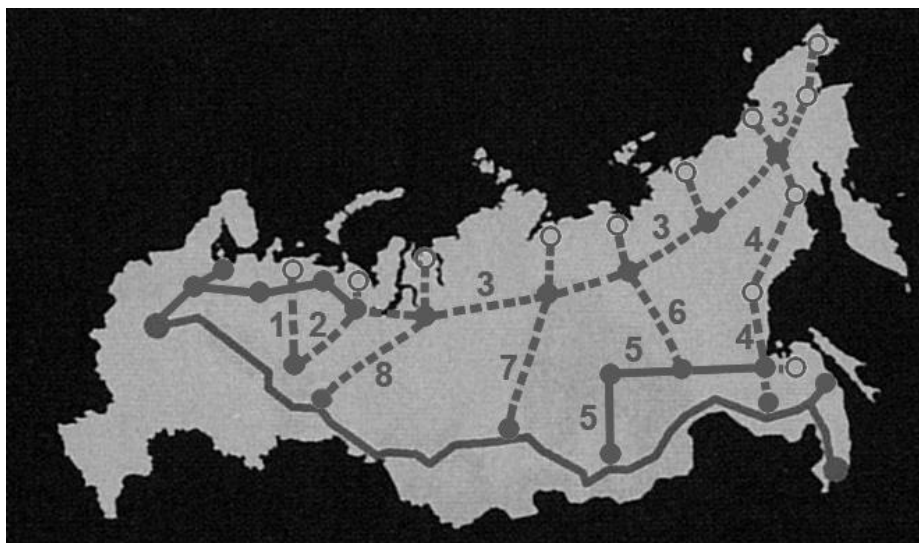
Obviously, to the state program of the development of the Russian North, despite the presence of the individual sections (areas and the use) of each mode of the transport, the activities of each of the stages of the development of the transport sector in the North of Russia provides logistical coordination maximize synergies and complement other modes of the transport in carrying out the functions of the transport development of the territory, accessibility. The implementation of all types of the transport operations should be carried out with maximum efficiency and at the lowest cost, of course, providing the optimal timing of delivery and the absolute safety of delivered goods as well as trouble-free operation in transportation systems in harsh Arctic conditions is essential [29, 30, 32].

The practice of the previous decades of the development of the Russia Arctic zone indicates that no permanent, independent oversight, of which under the present conditions could control the space, it is impossible to manage. And, therefore, in the expected community-based integrated program of the development of the transport infrastructure of the Russian North, without a space, a permanent monitoring system is indispensable. Technically, this is not difficult, in part because the task is solved by our astronauts and the Russian Space Forces features include an option and maintain order in the Arctic zone of the Earth. [32]

Another thing is that this function should be part of a permanent public space monitoring of the business processes in the north of the country, including the transportation component in the process of developing the resources of the Arctic zone. First of all - on the assigned territories to Russia. Although we are very important to know what our neighbors and partners, as appropriate, or providing them with appropriate assistance, or acting preemptively, preventing possible adverse, hostile actions by third countries and companies against Russian enterprises and citizens of our country.

In our view, the most rational creatures mentioned above the strategic hubs and placing them in the public logistics centers in the Northern Russia in a place where the main transport routes converge - the main modes of the transport. Today it is the ports at the mouths of the major Russian rivers Ob, Yenisey, Lena and others, partly marked by us on the map (Figure 1). Evidence that:

- 1) First, there can be also deployed air communications ports;
- 2) Second, in these source areas may start road construction, that is, over time, an ever larger scale may be involved motor vehicles;
- 3) Third, it is expected that over time, the data node will approach the railway, which is also indicated on the map are;
- 4) Fourth, it is possible that these hubs will be used as staging bases from its appointment of pipeline systems for other types of transport. It is natural that our thoughts and logical construction of the scheme is only one of the possible transport setestroitelstva in northern Russia.



Picture 1. The scheme of the understanding of the future carcass if the transport infrastructure of the North of Russia

### *The logistics of the railway building in the North*

Many years of the large-scale practice in the development of the global Russian north indicates the dominant role of the railways in the creating the conditions for the further development of the natural resources and raw materials of the transpolar territories with a large amount of the products and a significant turnover. In this regard, we believe that the XXI century will be a century of the unprecedented development of the railways in Russia, bringing together the work of all other modes of the transport and of the economic spheres. Usually transported by rail cargo relatively low cost coal, oil in limited amounts, insufficient for the construction of oil pipelines (or at the very beginning of the development of large oil and gas fields), food, farm, forest, and other cargo, cargo building industry (cement, brick, rubble, concrete products, etc.), without which normal functions of newly established production centers and settlements.

And, as a rule, the larger the newly created productions, the more manifest appear the necessity of combining these centers with the existing transportation network of the railways of the country. Thus, the creation and the development of the more Pechora coal basin in the Komi Republic (DO) were impossible without running Pechora (now - North) railway. Development of the large oil fields in Kazakhstan Usinsk area caused the gasket in the area of the branch of the Northern Railway (station Synya). The decision to create in the early 60's in Syktyvkar large timber industry (AGTC) for construction of a branch from the Northern Railway (station Mikun) to Syktyvkar. A similar objective pursued, when they started to develop a unique, mainly pine, forest resources of Trinity-Pechora area (RA), hoping in the future to continue this railway to the South Urals (the station or stations Midnight Solikamsk. At present, both of these options are strategically interesting, perspective for the consideration.).

Obvious that the concept of the Arctic transport must lie the idea of the forming strategic reference framework transport, creation and development at its base transport infrastructure of the Sub-Arctic and Arctic areas of Russia, working in unity with the logistics nationwide transport network.

The upcoming large-scale offensive in the extreme north of the country and prepare for the development of the Arctic territories and resources of the Arctic Ocean is not possible without the creation of a support network of railways in the northern part of the country. Forced us back to the idea of the leading theoreticians of the transport development in Russia (N.N. Kolosovsky, N.N. Baranskii, etc.), which in the early 40's presented logically arrayed to create a grid of main railways in Siberia and the Far north as a key element of a transport development of the huge northern territories. Their ideas are relevant to the present day.

Considering the desire in the near perspective, to large-scale development of the Arctic zone of Russia, we are obliged to return to the idea of a strategic transport framework, able to phase out the comprehensive development of the economy here, around the clock delivery of large volumes of goods in both directions (to and fro), reliable, all-weather, versatile and relatively inexpensive. Those of the Russian scale, especially in the North, were and remain the rail [5, 15, 18, 29, 30, 32].

Formation of the rail transport in the framework of eight dedicated and we examined arteries [30] allows you to organize the most effective medium of the courts, driving and transit route along the Northern Sea Route through the Arctic over latitudinal, river transport on the largest northern rivers Pechora, Ob, Yenisei, Lena, and are in the process of economic development in the Arctic zone of the other modes of the transport.

We present a brief description of the strategic and key rail lines required to form a transport cage in the northern Russia, the construction of which has already been partially included in the long-term plan of the railway transport in Russia in the first half of the XXI century, in the near future could become the most important part of the railways of Russia, aimed at the development of the natural resources of the Far North, Siberia and the Arctic.

#### ***The railway building on the North of the European part of the country***

In the European part of Russia, the key for the upcoming large-scale attack on the Arctic, in our opinion, for the future of the transport infrastructure of this area are beyond the existing three railway line (Picture 2).

*The most important and therefore the priority is the construction of highways linking the Urals, the Komi Republic, Port Indigo (Indikomur), which allows to organize the shortest path to the exit in the Arctic Ocean to the shipping lanes of the Urals, Siberia, Central Asia, and if need be, and our eastern neighbors: Kazakhstan China, Korea, Mongolia, Japan, etc.*



Picture 2. The west wing of the transport support frame of the Russian North: 1 - Indikomur 2 - West-Ural Railway (ZOOM) A - Belkomur (White Sea - Republic of Komi-South Urals) B - Vorkuta (industrial and transport hub, connecting with ZOOM SZ)

In addition to the factors on which Indikomur in the European part of the country, there is no competition (in the part to the creation of the Western-Urals line (ZOOM)), this line allows you to organize the transportation to export up to 3.4 million tons or more per year of potash produced in Solikamsk largest salt panning Enterprise country, and to provide the export timber cargo volume 2.3 million tons or more, the deposits of which are south-east of Kazakhstan is the leader (of forest resources in the 100-km zone of the line is 2-2.5 times higher than same figures for today is the project Belkomur). On the highway today Indikomur potentially oriented transport more than 10 million tons of other types of cargo a year. With the development of the economy and of the export potential of the surrounding area and thus the growth of the foreign economic relations (WEC) with Europe and Asia Indikomura importance will only grow.

In addition, this line passes through the Timan Ridge, which has one of the world's largest reserves of bauxite, titanium ore, and in particular Yaregskoye Pizhenskoe field already a significant part of export-oriented, as well as large reserves of the minerals.

Among the distinguishing characteristics of the highways «Indikomur» and it should be noted, that the positive create favorable conditions in the Bay Indigo diversified sea port can accommodate vessels with deadweight of 5-10 times higher than it can provide limited by many natural and technical parameters of the Arkhangelsk sea port. Moreover, the extent of sea routes from indigo in western Europe in 600 km shorter, and the countries of East Asia - more than 1000 km (compared to Belkomur). Indikomurs highway is of great national importance for the future of not only Russia and the Arctic, but much more - for the economic development of Kazakhstan. About the same as in the late 30's construction in the Pechora region (North) railways.

In recent years, much is written and said about the need to build a Western-Ural Railway (ZOOM). Lying of the pipeline in the vicinity of the Ural Mountains, of course, complex and costly engineering construction, but the prospect that opens for Russia this line, gives us the confidence that its construction will begin in the next few years. The most important advantage of its creation is the appearance of a particular approach to the thousands of railway open in the Urals near lying ZOOM possible deposits of the valuable ores and minerals development will dramatically reduce the deficit in many minerals, not only in Russia but also in the world that will give a significant

boost to economy in this region of Russia [15-17, 19]. In addition, the highway ZOOM creates another shortest route to the ports Amderma, Khabarovo on the Northern Sea Route and in the priority areas of the development of the Arctic zone of Russia, consistently expand in the future. Create line ZOOM is particularly promising in the case of the expected large-scale development of foreign economic relations (WEC) with the countries of Asia and America.

According to all the shortcomings of hard and not always wisely and objectively impose-my today Belkomur this construction can not be excluded from the perspective and with significant inter-regional importance for the economic development the European part of the country and for the whole of Russia. The importance of this route is that it would create Danie at 600-800 km to shorten the length of many types of cargo transportation, call (Indikomura in these figures are much higher) from areas of the Southern Urals and Povol-husbands, and from Siberia and eastern countries focusing on areas of Arkhangelsk, Karelia, Kola peninsula. With the creation of Belkomur timber about a quarter of production from Kazakhstan and about the same from the Arkhangelsk region will transport output for processing the Archangel promptsentre and for export. A more in-depth study of geology near the highway Belkomur territories can use to organize the production and processing of deposits developed here.

Alternative comparison through SWOT-analysis of the negative aspects of the overactive now promoted highway construction project of this world has represented the country's leadership for the consideration. In our opinion, is not complete and not always in a professional and effective manner of the conceptual idea of building Belkomur and rationale. It seems that the most effective, absolute arguments in favor of the construction of the highway developers missed it, causing it to all key parameters inferior to its main competitor - the construction of a highway project Indikomur.

### ***Transport axis of the North of Siberia***

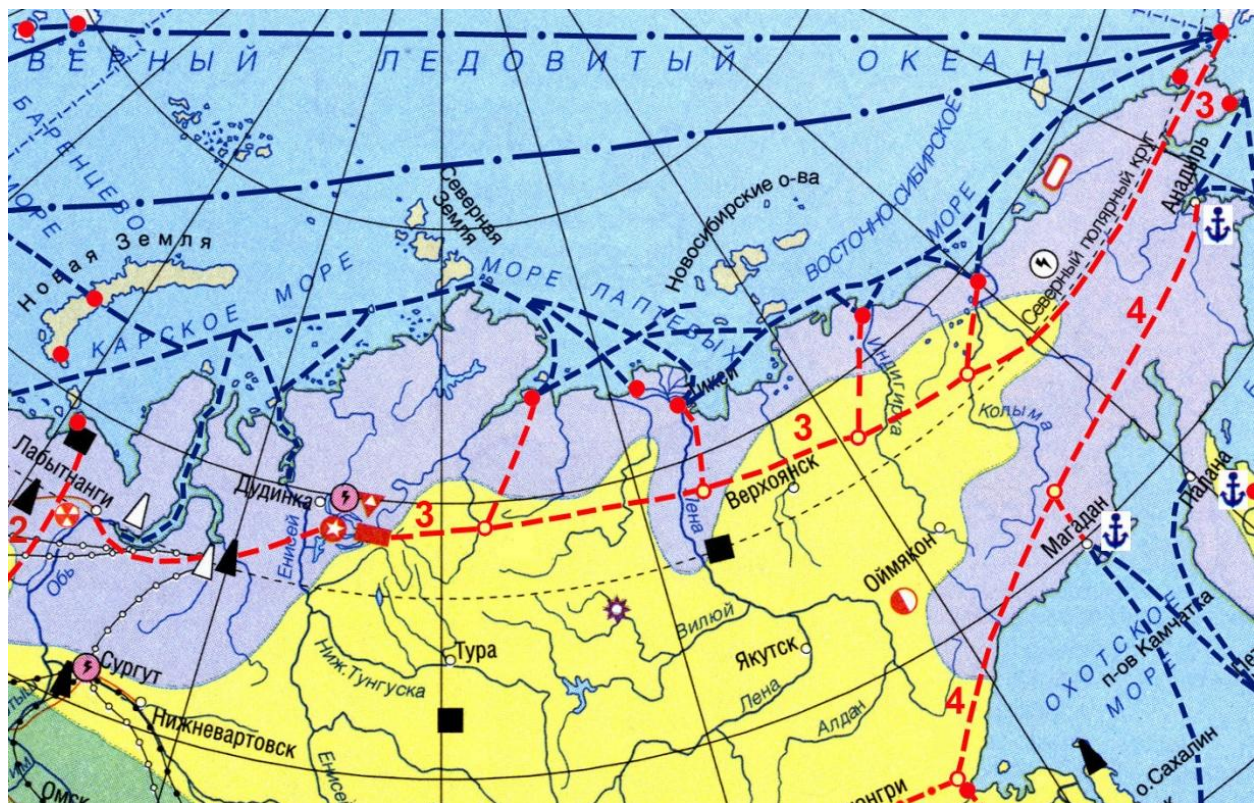
The formation of the core transport network of Russia in the northern part of Siberia (up to Chukotka) is even more technical and engineering complexity and even more technical difficulties for the implementation of the project (climatic, permafrost, geology, the need for hundreds of river crossings, lack of building materials and scrap etc.). This was one of the major reasons for the rejection of the original version (in the early days of railway transport in Russia in the 70's of the XIX century), the Trans-Siberian Railway Station Birch (district center in the north of the Tyumen region) in the eastern direction through Yeniseisk and Yakutia to sea of Okhotsk [29].

The other (which happened at the time more meaningful and logically this is understandable) reason to change the original plan to build the Trans-Siberian Railway and laying it over Tyu-

men, Omsk, Novosibirsk, Krasnoyarsk, Irkutsk, Chita, and so on, that is now the existing route, were the demands of the merchants and Industrialists (within the nationwide referendum) to connect existing major industrial and commercial center of the southern part of Siberia, the shortest and reliable transport route.

Even with the current position can be justified by the then decision rail referendum on the changing of the original version of the Trans-Siberian Railway (TCM). This decision was justified and strategically and economically, because in addition to solve this problem, this highway was built in about half the time, and its construction cost is much cheaper than it would cost the then building originally planned Trans in late XIX - early XX century.

With the increasing attention of the leadership of Russia to the economic development of timber, petroleum, fuel and ore resources of the central and northern parts of Siberia and the imminent onset of the economic scale in the Arctic, the interest in the construction of highways transpolar (Polyarsib) increases dramatically. Especially, when you consider the prospects and the complexity of the economic development of the Arctic Ocean and the growing appetite of many countries to create their own databases for the extraction of raw materials in the Arctic Ocean. In Picture 3, the number 3 marked the possible passage of the highway, state, economic and geopolitical importance of which in modern terms would be no less than the construction of Trans-Siberian Railway in the late XIX - early XX century.).



Picture 3. The northern part of the transport of the reference frame of the Russian North:  
3 - transpolar line (TMP), 4 - trans-Pacific line (TTM)

**Trans Polar Highways** (revival and a new quality of 501 building, begun in 1946 on the personal instructions of Stalin), comparable in importance to the construction of the Trans-Siberian Railway in the late XIX - early XX century, and taps her for the most important seaport on the Arctic Ocean to create a key element of the transport infrastructure for the subsequent development of the Russian Arctic.

Logical view of our future transpolar route line for many reasons: first, the north will take this line, the more expensive it will cost (approximately two to three times or more), and secondly, economically sound is the direct involvement of the transport resource line 150-200 km in the economic development of the adjacent territories, creating a basic transport corridor, it becomes possible to capitalize in the area of other modes of the transport (rail access, roads, pipelines, etc.), and thirdly, the exploitation of the railway each one hundred kilometers to the north of her departure will cause a 15-20% price increase. Although an exception in specific cases despite the economy, for political and strategic arguments (primarily dictated by the interests of the national security - this has already been observed in Russia) may be some deviation from the route of railway construction economically optimal option.

As indicated above, the laying of the transpolar pipeline will help in the immediate vicinity of the (150-200 km) to create the large industrial enterprises, which may be serious shippers and consignees, which will increasingly load line and make it more cost effective. Actually, it was not only in Russia but also abroad. Obviously, there will be development of the areas along the corridor with TBI. The creation of enterprises will be launched already in the process of the building the backbone, other raw materials, which in complex will be developed in the coming years. It will take at least 20-30 years to transpolar highway was built and loaded "to capacity", that is in accordance with the design capacity.

*It is assumed that from SST to existing and newly built seaport, which located mostly at the mouths of the great Siberian rivers, the branch will be made, which will create conditions for the formation of these ports, major transportation hubs and logistics for effective management of which has no analogues in the world by the capacity of the transportation resources, Russia's transport infrastructure in the Arctic zone of the world.*

In Picture 3, we are supposed to access the roads to existing Polyarsiba (Tiksi, Dixie Pevek, etc.) and proposed the marine ports, which can be a conduit of the goods to rail and river transport by sea and vice versa. These ports, in our view should be the major transport hubs, is combined with the positions of state logistics of transport resources as other modes of transport (river, pipeline, road, air, etc.). Here, we believe, should be placed nodal logistics centers, allowing

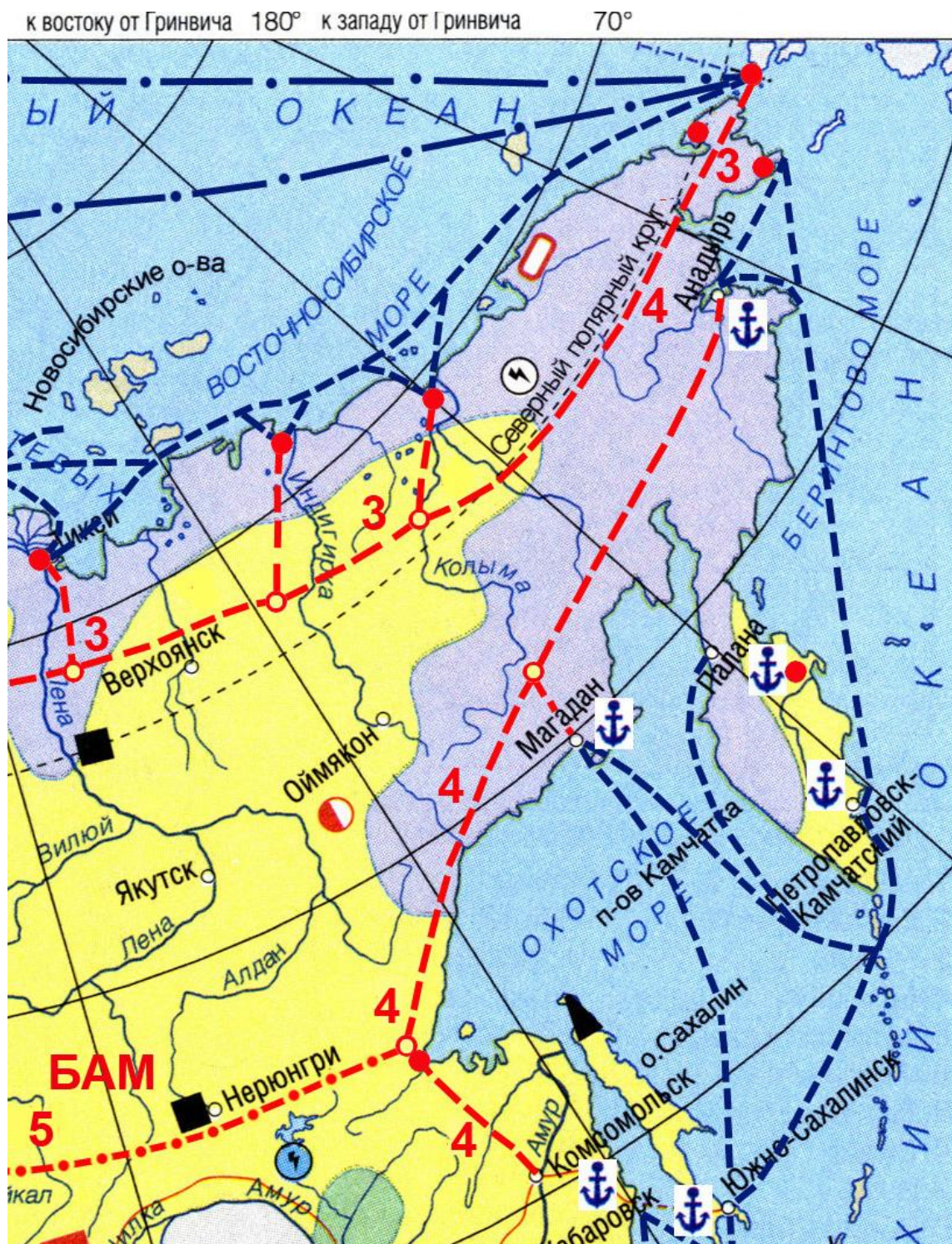
for the most cost-effective schemes to organize transportation of cargo (and passengers), the most of the advantages of using all modes of transport.

### ***Railway construction in the Far East***

Another strategic challenge for Russia is to build trans-Pacific Railway (TTM) from the Bering Strait to the junction with the Baikal-Amur (BAM) and the Trans-Siberian (TCM) highways. The idea of the creation of the railway lines are being hatched over 100 years. On a possible route TTM already passed dozens of the topographical and the geological expeditions, parallel studied natural raw materials in the 300-kilometer corridor, which revealed, and in many fields to protect the state reserve a number of minerals (SRC). But even with incomplete data routing of the pipeline will create in this part of the Far Eastern zone of the country and 100 major mining, processing and service enterprises, the output of which the design capacity of the gross regional product (GRP) of the adjoining area to exceed the current TTM gross regional product of the Ural Federal District.

Creating of the ***Trans-Pacific Railway (TTM)*** not only guarantees the reliable transport connections in the vast territory (more than 2 million square kilometers), but at the same time allows to begin the development of the thousands have already explored in the area of the mineral deposits, as well as improve public safety of the eastern borders of Russia.

In addition to the purely economic factor of the economic development of this area, allowing it to withdraw the 10 largest industrial areas of the country, this line has a huge military-political and strategic importance, because it provides a reliable, year-round and lifting transport corridor for more than three thousand miles the Pacific coast, able to take (and cost effective) over most of the freight and passenger sea transport, whose work is complicated in the winter and often require the inclusion in its provision icebreakers. Obviously, in a reasonable distance from the highway, in coils, enabling the relevant conditions can be created major sea ports, some of which we logically presented in Picture 4.

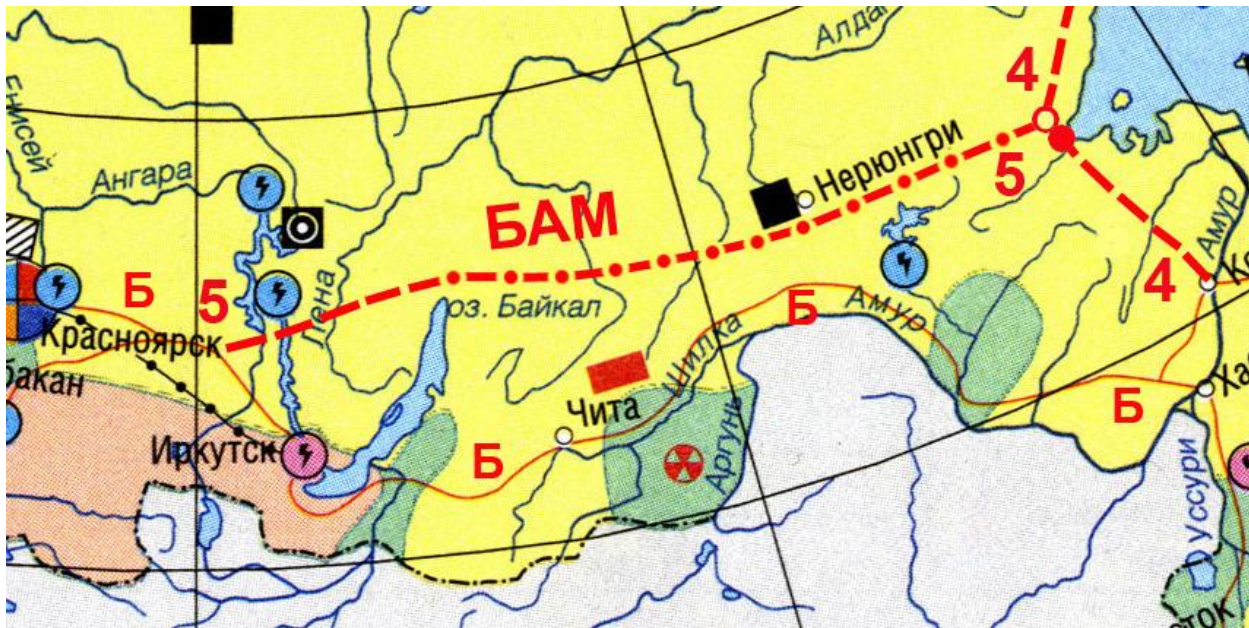


Picture 4. The Eastern and the South-Eastern component of the transport frame of the Russian North:  
 3 - transpolar line (SST), 4 - trans-Pacific line (TTM)  
 5 - The Baikal-Amur Mainline (BAM)

At the beginning of a market adjustment in Russia, but rather in 1993, was deployed active work of the American side to accelerate the construction of the TTM, there was even a Russian-American Association for the establishment of the highway, but then due to some circumstances conversation ceased and already prepared materials were on the shelf. Obviously, should now go back to the idea of the construction of the TTM and revisit the prepared materials to a changed

environment, and the world situation, and due to an increased focus on the development of the Arctic. Create TTM combined with TBI will attach to the process of economic development more than 2 million square feet. km of the northern territories of Russia, approximately equal in the European part of the country.

Considering the economic map of Russia in the first half of the twenty-first century, it is impossible not to draw attention to the growing role of the Baikal-Amur Mainline (BAM) (Figure 5) in the economic development of the Far East.



Picture 5. The southeastern part of the transport frame of the Russian North:  
4 - Transpacific Railway (TTM), 5 - The Baikal-Amur Mainline (BAM);  
B - the existing of Trans-Siberian Railway (TCM) (TTM);

Bringing the highway up to the design capacity will solve a number of the strategically important for the country's problems: first, to engage in business turnover of the dozens of already discovered in its area of the adjoining mineral deposits, thus creating another powerful industrial area, and secondly, significantly relieve the current Trans-Siberian Railway, and thirdly, to create another parallel to the Trans-Siberian function of the powerful transport complex, located at a considerable distance from the border of Russia. In this century, to grasp the significance of the BAM for Russia to bring to mind and create a parallel to the existing Trans new strategic transport access to the Russian ports on the Pacific coast, have substantially protect the south-eastern part of the Russian Far East territories for the possible military conflict.

### *Transport development of the Central part of Siberia*

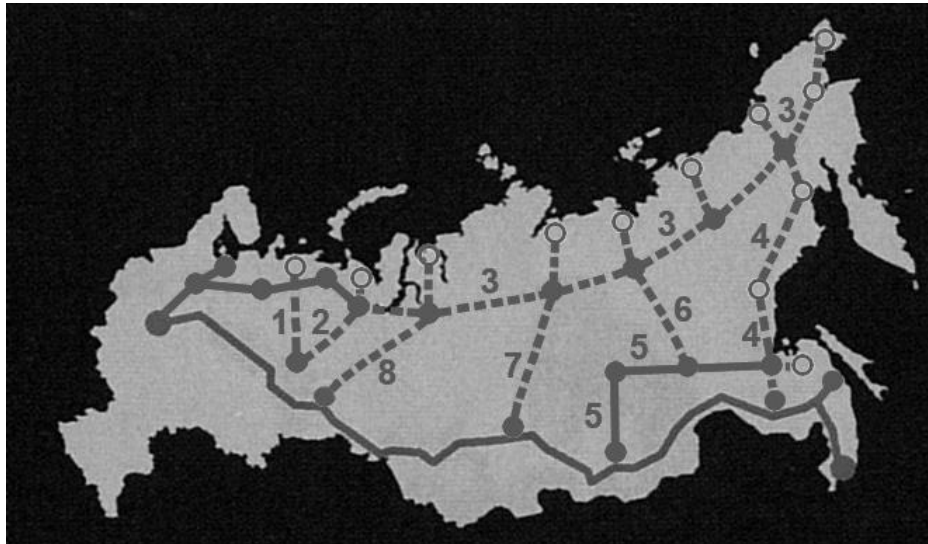
The formation of the main frame of the transport of Siberia and the Far East suggests that after (or even parallel) is the creation of the world maps on the major highways will be the process

of the connecting the Trans-Siberian (acting), and is being built transpolar (Polyarsib) lines by pro-laying meridian strategic railways. For example, one of the first such trails expected laying of the railway from Krasnoyarsk to Norilsk. The idea of building this road belongs to P. Zavenyagin (the first director of Norilsk Mining) and naschi account the more than 80 years, that is, the idea arose immediately after the start of the construction of Norilsk Mining and Processing Plant. The first project of this line was produced in the late 30's, but the outbreak of World War II pushed chalk out plans for its construction. Next return to the idea of the construction of the highway (and preparation) is the end of the 70's, but for a number of the circumstances, and then came the era of the market "reformation" idea of the construction of this road was again postponed indefinitely.

At about the same situation is the idea of laying the railway to Yakutsk Transsib (Picture 6) and then to Aikhal and Mirniy (leading center of the domestic diamond excavation) to connect to Polyarsibom (transpolar routes). The idea of laying of the pipeline, which occurred shortly after the discovery of L. Portugalova "peace pipe" - the first Russian diamond pipe at Ayhale. Currently, the idea is gaining support supporters of the construction and, to our knowledge, is already design order.

The construction (obviously parallel) of the strategic radial railways (Yakutia, Krasnoyarsk, Ob) completes a support rail network in Siberia and organizes the access to the development of many thousands of the fields in the vast territory from the Urals to the Pacific Ocean (over 10 million sq. km.).

The creation of the transpolar, transpacific and of the three super powerful meridian lines: Krasnoyarsk (in Norilsk and Yakutsk), and in the subsequent line of Obskoy highways and from Surgut and up to Obskaya Guba to significantly accelerate process of the economic development of Siberia. Simultaneously with the formation of a powerful rail transport exist a framework creating favorable conditions for the further development of a modern transport infrastructure of the North, Siberia and Far East of the country, there will be conditions for consistent and more of the large-scale development of the Arctic resources.



Picture 6. The scheme representation of the future framework of the transport infrastructure of the North of Russia  
*Symbols:* — existing railways; ■ ■ ■ — projected railways; ● — Railway terminals; ○ — Sea ports (hubs). 1 — Indikomyr; 2 — Western-Urals Highways (WUH); 3 — Trans-polar highways (Polyarisib, ТПН); 4 — Trans pacific-oceanic highways (TTM); 5 — Baikalo-Amyrskaya highways (BAH); 6 — Yakytskiy highways; 7 — Krasnoyarskiy highways; 8 — Ob highways

Geopolitically, forming the base of the transport frame in this mega (North, Siberia and the Far East), allowing it to serve as a platform for consistent, economically and politically sound scale offensive in the Arctic, where all the economic power of Russia will focus on consistent, large-scale economic development of the mineral resources of the Arctic zone.

#### ***Infrastructure elements of the transport complex of the North of Russia***

A key element of the most important part of the economic development in the Arctic zone of Russia is the transport infrastructure, represented by all available and newly created modes. Here, more than ever need cost-effective, not only nationwide logistics transport development, but also a direct interaction between all the modes of the transport within the zone boundaries of cost-effective use of each of them.

Obviously, in the Arctic region, there is no place now emerging and prevailing in the country of one-sided and ineffective (in terms of the state) enterprise logistics, which should in the most cases give the way to the national logistics significant reduction of the investment, production, material and labor costs per unit of and then consumed products. It follows that the key to Russia's state policy in the Arctic should be maximum economy and the centralization of all activities of the companies involved in the system of the economic development of the resources of the Arctic zone of Russia. This implies need to create a single state logistics center (with branches at the nodal points of the reference frame of the North of Russia) with submission to him of all relevant transport structures and facilities.

Obviously, in the targeted transport construction in northern Russia should be used as efficiently as possible, not only by its huge domestic significance, but also the global experience in the developing of the Far North. In this respect, it seems to me important activity of the Archangel Research Center Branch of RAS and the Northern (Arctic) Federal University named after M.V Lomonosov, the study of the historical heritage of the Russian exploration of the Arctic zone of the Earth.

The most important part of the backbone of the transport network in the Russian North are universal, that is, in a discrete mode which may carry a variety of cargo and passengers (residents and staff) of transport. These modes of transport should include (in order of priority for the entire period of development of the northern region of Russia): rail, sea, river. Naturally, in the course of development of these main elements, universal transport role, involvement of these modes of transport can vary widely. So, at the beginning of large-scale development in the Arctic, in our view, will be somewhat higher value of the sea and river transport is somewhat lower. The establishment and operation of the main railroads in the area and the subsequent economic development of resources will undoubtedly contribute to a gradual strengthening of the role of river transport mode.

To the main modes of the transport should also include the piping systems, "transportation" for the long distances produced in the subarctic and the arctic zones of oil, natural gas and other raw materials, the organization of the transport of mixed products – capsule-wires, pipeline transportation of dry and wet products, product (say, product oil, methanol, liquefied natural gas (LNG), etc.). As calculations and current practices, the effectiveness of the pipeline systems with increasing load factors and the use of the design capacity of these systems [12, 18, 19, 29, 30, 32].

To areal, regional, that is narrower in scope and extent of the transport is used for that purpose main mode of the transport: rail, sea (small and medium cabotage), river, infield pipelines, and also, because of the limitations in the area of roads and their low economic efficiency to a lesser extent, the transport sector. However, the use of the automobiles and tractors on winter roads, ice tracks and the frozen rivers can significantly expand while improving efficiency of its operations in the winter season (November to April). The effectiveness of these services (including productivity, cost of the transport and energy) can be significantly increased, as evidenced by the national practice of 30-50-ies of XX century, through the use of trucks and trailers more that makes this type of transport links rather effective and meaningful to practical application in a series of the economic development of the Russian Far North.

Among the predominant purpose of intra-use should also include the air transportation, especially if they receive the significant development of the aerostatic devices - thermostats, airships and the modern transport systems – thermo-ballastiruemye aerostatic aircrafts (ATLA) [12, 19].

As for the infield transport, the composition and the extent of its use will depend entirely on the type of cargo, their volume, range, which will handle logistics calculations of the economic actors (industry) on the basis of the purposes and principles of the economic efficiency (cost and benefits), that is to be implemented principles of the corporate logistics [12, 19].

In the coming years will consistently increase the load on the Northern Sea Route, which implies the efficient use here as vehicles awaiting modernization and disposal of the nuclear submarines (SSNs). Calculations show that the use of the peaceful nuclear submarines can provide the significant economic benefits, because it allows already in this decade to begin the development of oil and gas, ore and other deposits on the continental shelf of the Russian sector of the Arctic [15-18].

The involvement of the Premier League as a vehicle for the international and transit traffic along the NSR and the more high-latitude routes along the Arctic Ocean will significantly replenish the foreign exchange reserves of the country. Planned construction GTSAPS underwater tankers and transports -are a nuclear-water vehicles (Apts) carrying capacity of 50 tons or more will begin large-scale development of oil and gas and other deposits on the Arctic shelf, which will significantly reduce investment in the implementation of the production projects (at the bottom of the Arctic Ocean) due to appear the unnecessary laying pipeline systems on the ocean floor. At the same time allow the use of Apts highly cost effective development of high-latitude transport investment appeal, including mobile tunable international, foreign, with many countries of the world.

### ***Conclusion***

The framework design of the transport infrastructure in the Russian North in the key, strategic latitude and meridian lines can begin to build a modern transport infrastructure for expanding into the commercial production of raw materials and natural resources, much of Siberia, and in the future and the Arctic..

The organization of the railway outputs are the strategically important sea ports in the Arctic Ocean, which creates the conditions for the consistent development of the Arctic, but also provides for the formation in them of the key transport hubs, bringing together and coordinating the work of all types of the transport.

The formation in the key transport hubs of the public logistics centers (one center or branch) allows for more efficient and effective use of the transportation resources and benefits of the different transport modes, which will certainly contribute to a noticeable decrease in the value of the investment projects in the Russian North, greatly increasing their profitability, competitiveness and investment appeal.

The formation of the transport frame of the Russian North, and subsequently of the full range of the transport infrastructure, provides significant opportunities for accelerated economic development in the vast areas of the Russian North, Siberia and the Far East, the Arctic and contributes to the prestige and influence of our country in the world. Development of the territorial and natural raw materials of the Russian North should be in context, it is for our country radically improves the lives of the people of Russia and a significant leveling of living standards in the region.

Formation of the expanded Russian transport infrastructure in the Arctic presupposes programmatically to create the transportation of the resources and maximize the benefits of the different types of the transport, organizing centers where they are based, as well as nation-wide approach to the logistics of the cost-efficient use of the transport capacity (throughput and transport resources) of Russia in this area.

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