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J. Geogr. Inst. Cvijic. 68(3) (405-414)

Research note

UDC: 910.2:625(002.71)(47)
DOI: https://doi.org/10.2298/IJGI180613005V

TRANSNATIONAL TRANSPORT CORRIDOR OF THE NORTHERN SEA ROUTE BASED ON SABETTA SEAPORT: CHALLENGES OF REGIONAL DEVELOPMENT FOR RUSSIA

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Received: June 13, 2018; Reviewed: August 31, 2018; Accepted: September 29, 2018

Abstract: The article investigates the opportunity of the development of a new transnational transport corridor on the base of the NSR, which is much shorter and faster than the usual one. The basis of this project is Sabetta seaport, which is considered as a potential transnational transport hub. The authors investigated the opportunities for the development of intermodal terminals and new services/goods for the East-West and North-South international transport corridors. They design this idea on the base of multi-modal transportation approach for the development of a global innovation project of NSR Transnational Transport Corridor. Using classical methods of analysis, they conclude that the port of Sabetta, as well as other ports in the Yamal Peninsula currently does not have direct rail access to the Central Russia regions and it can be good potential for regional development in Ural and Siberia. The research was limited by the official statistics about NSR dynamic of cargo volume. The results of research can provide the development of new multimodal transnational transport corridor and can be the basis of regional development in northern Russian regions. The implementation of the idea can provide a significant amount of new jobs and an enormous amount of international investments. Mainly in international scientific literacy authors examine the question of North Transport corridor by logistic and geographical aspects. The article investigates this question in more complex aspect by a multimodal approach with involvement in the NSR another means of communication like a river, railway and motorway transportation.

Keywords: transnational transport corridor (TNC); transnational transport system; transport corridor; the Arctic region; the Northern Sea Route (NSR)

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Introduction

Transportation infrastructure is a key element of global infrastructure, also being one of the most attractive opportunities for investment. Global investment projects, in turn, form basis for economic development at regional and national levels. In the age of depleting non-renewable natural resources, the Arctic zone with its enormous oil and gas deposits becomes very attractive from the point of global development (Solvang, Karamperidis, Valantasis-Kanellos, & Song, 2018). The actual problem of infrastructure limiting development of the Arctic was investigated by the number of authors, who pointed that development of transportation and logistical infrastructure of the region will positively affect other economic segments there (Unger, Galipp, & Krebs, 2014; Lyfar, 2017; Poulsen, Ponte, & Sornn-Friese, 2018). For example, Dubai and Singapore demonstrate successful cases, where a sea port with efficient government support can successfully evolve into the global transnational transportation hub (Akhavan, 2017; Ziadah, 2018). Therefore, the sea port of Sabetta with its large transportation and logistics potentials can also become an attractive and successful new global transport infrastructure project.

Navigation over the Northern Sea Route (NSR) takes 35 days, which is 37% less than 48 days required to take a current route through Suez Canal. This difference provides enormous benefits to business and Russian government, making connections with Arctic Zone more dynamic and effective. Another important fact is that the increased traffic on the NSR has made navigational safety very important from a number of different perspectives (ecological, human, political and rescue operations planning). The estimated risk of maritime incidents on the NSR is significantly less than in the global ocean (Marchenko, 2014). However, there are several risks connected with the NSR, which hamper its development along with political reasons. These risks are connected with seasonal nature of NSR navigation due to ice, but they can be mitigated with modern technologies. Possible mitigation methods were described by Dalaklis, Drewniak, and Schröder-Hinrichs (2018). During the navigation seasons of 2010–2012, one of the NSR routes mapped to the north from the New Siberian Islands became usable. Results of modern research related to NSR and current climate dynamics created significant expectations of navigational perspectives for this route (Marchenko, 2014).

The Northern Sea Route: History of Development

Development of the plans for the northeastern passage by the Russian State began as early as the 16th century. The real transformation of the North-East

Passage into a navigable line began at the end of the 19th century due to the use of steamships and icebreakers (such as "Yermak", built in 1898). From 1908 to 1912, three icebreakers have been built in Russia ("Taymyr", "Vaigach", and "Pyotr Veliky"), and purchased four foreign ones. These vessels were able to cross the sea ice and navigate in Arctic waters. The peak of NSR development happened in late 1980s. However, during the 1990s the total amount of cargo haulage decreased consistently (Figure 1). Overall, the amount of traffic and activities in the Arctic reduced significantly, when Russia was undertaking its transition to market economy. Ice navigation almost ceased, except for the Murmansk — Dudinka route. At the same time, Russian Arctic infrastructure degraded continuously (Marchenko, 2014). Today there is a wide field for development in the areas adjacent to the NSR (Kaiser, Pahl, & Horbel, 2018). Multimodal approach to this development can act as a strategic driver for local economies of the Urals and Siberia (Milaković et al., 2018), especially for projects in the areas of inland water transport and logistics. In the beginning of the 21st century, it became obvious that Russian economy cannot function normally without Arctic resources.

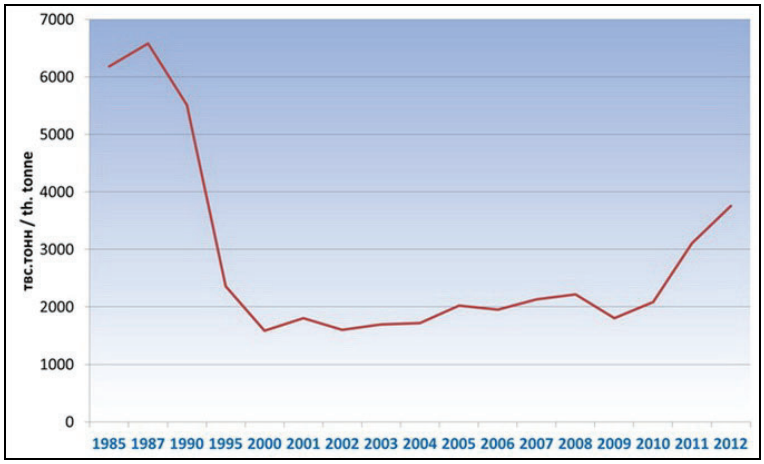

Figure 1: NSR cargo haulage dynamics from 1985 to 2012 – transit and domestic cargo (in thousands of tons) (Source: CHNL IO: CHNL Information Office, retrieved from http://arctic-lio.com/?cat=27)

The key goals, tasks, priorities and mechanisms of national Arctic policy were outlined in the Baselines for the National Policy of the Russian Federation in the Arctic until 2020 and beyond. In this document (made in 2008), Arctic is described as a strategic resource base of Russia, and the use of NSR in the role of national communications route in the Arctic is proclaimed to be a national priority. Russian Arctic Strategy was examined by a number of researchers

(Sergunin, & Konyshev, 2018; Tynkkynen, & Gritsenko, 2018). From the economic standpoint development of the NSR project is attractive for several reasons. It is also important that the NSR project will not have negative impacts on regional environment (Gritsenko, & Efimova, 2017).

Under conditions of growing markets, the issues related to sustainable management of the global waters can be resolved with government support and through a number of special activities. Establishment of a new Russian transnational transport corridor (TTC) along the NSR using Sabetta port as a transportation and logistics hub will help to resolve the number of significant high- priority issues (Gritsenko, & Efimova, 2017):

- Resolving issues related to the existing TTC, by providing an alternative Russian TTC through the NSR;
- Shortage of material resources (construction materials, foodstuffs, etc.), and problems with timely delivery of materials required for implementation of development projects in the Arctic and Antarctic regions;
- Low level of import and export operations for the Ural Federal District and neighboring regions of Russia;
- Low level of transportation connectivity in the Russian North;
- Small amounts of cargo delivered through internal waterways of the Ural Federal District and neighboring regions.

The NSR is the main traffic artery in the Arctic that integrates European and Far Eastern seaports into a single transportation network. One of the key factors that indicate the level of Arctic navigation development is the volume of cargo traffic that in term depends upon the following variables: cargo base, icebreaker support, composition of the cargo fleet, and availability of sufficient transportation and costal infrastructure to support navigation. The Arctic ports are currently a weak link of the NSR. In order to fix this issue, a goal was set in the national Arctic policy to provide navigation safety in the sea ports and at their approaches and develop infrastructure for the sea ports. The key prospect of promoting the NSR is the extraction of hydrocarbon deposits on the Arctic shelf deposits, and development of sufficient shore infrastructure required to intake, store and lift hydrocarbons for shipping to Russia and abroad. The Yamal Peninsula is one of the most important strategic regions of Russia – commercial development of its gas fields and adjacent water areas is essential for substantial increase of Russian gas production after 2010. However, this area is characterized by poorly developed transportation infrastructure, and its industrial development is impossible without improvement of the railways. A new "Obskaya–Bovanenkovo" railroad is being currently built to the peninsula in

order to allow the all-year-round cargo and passenger traffic. Railway design requires consideration of the perennial natural processes; therefore, designers need to understand the long-term processes occurring within the roadbed and track superstructure over several decades. This is especially important for the zones of permafrost, over which more than 5,000 km of Russian railway lines were laid.

Analysis of the situation in the Russian Arctic

Besides the basic transport problems, it is necessary to consider a number of local natural-geological, environmental, and socioeconomic factors related to sustainable development of this important Russian territory. The results of the current research would allow resolving territorial planning issues occurring at the level of Russian Federation constituent entities located along the Arctic coastline. These issues in the long-term perspective include: increase of the living standards, while considering life specifics of the northern indigenous peoples; minimizing air pollution by harmful substances related to development of oil and gas fields, extraction of mineral resources, and transportation of the related cargo; preparation of regulatory documents on the issues related to environmental protection and preservation of permafrost, prescribing measures required to guarantee stability of buildings and structures.

Sustainable development of the Russian Arctic, which is extremely important from geopolitical and economical viewpoints requires comprehensive approach in the area of forming new regional institutes and mechanisms for their interaction. One of the particular areas not yet finalized is the role of the State and business in development of the Arctic. The problem is compounded by the fact that costs and risks related to infrastructure and technology in Arctic projects are very high. These projects can be successfully implemented only by building and development of the institutional partnerships among the business, government and society.

Methodology

The research used methods of branches and borders and random variation for network programming, and graphical models to solve optimization problems with economic criterion for the network model of a new TTC going along the NSR. With regard to the Russian ports along the NSR, these problems were solved for the North-eastern regions of European Russia, Polar and Subpolar Urals, and Komi Republic. The purpose of network programming in this study was to add new arcs. The object of the study was the railroad network of the Yamal Peninsula connected with the seaport of Sabetta (node 23 — common

gate). The Moscow–Vladivostok railroad was considered as a source (node 22). Russian administrative centers were represented by the graph vertices (network nodes) listed in the Table 1. The task of adding new arcs to a unigraph with throughput as well as processing and expenditure costs of a flow unit on the edges and vertices is described using the following parameters:

- V – set of the graph vertices (the number of vertices is n);
- U – set of the graph arcs (the number of arcs is K);
- Ud – set of valid new arcs (the number of new arcs is m);
- Udi – set of new arcs incident to vertex i;
- + Ui – set of arcs outgoing from vertex i;
- Ui – set of arcs incoming into vertex i.

Table 1: Railroad segments of the TTC

	Node	Railroad section	Status
1	Bovanenkovo	Bovanenkovo–Karskaya	operational
		Bovanenkovo–Payuta	operational
2	Pajuta	Payuta–Novy Port	design
		Payuta–st. Obskaya	operational
3	st. Obskaya	st. Obskaya–Vorkuta	operational
		st.Obskaya–Salekhard	under construction
		st.Obskaya–Polunochnaya	design
4	Vorkuta	Vorkuta–Moskow	operational
5	Salekhard	Salekhard–Nadym	under construction
6	Nadym	Nadym–Pangody	under construction
7	Pangody	Pangody–Novy Urengoy	under construction
8	Novy Urengoy	Novy Urengoy–Yamburg	operational
		Novy Urengoy–Korotchaevo	under construction
9	Korotchaevo	Korotchaevo–Purpe	operational
		Korotchaevo–Igarka	design
10	Purpe	Purpe–Noyabrsk	operational
11	Noyabrsk	Noyabrsk–Voynovka	operational
12	Igarka	Igarka–Dudinka	design
13	Dudinka	Dudinka–Norilsk	operational
14	Voynovka	Voynovka–Tyumen	operational
15	Tyumen		
16	Karskaya	Karskaya–Harasavay	design
17	Novy Port	Ob Bay port	
18	Harasavay	NSR's port in the Yamal Peninsula	
19	Norilsk	final station in the Krasnoyarsk region via the port of Dudinka	
20	Yamburg	Ob Bay port	

Table 1: Railroad segments of the TTC

	Node	Railroad section	Status
21	Polunochnaya	designed station in the Khanty–Mansy autonomous district	
22	Sources	Railway stations along the Moscow-Vladivostok line (Novosibirsk, Omsk, Krasnoyarsk, etc.)	operational
23	Sabetta	Bovanenkovo–Sabetta	design

Source: Authors, 2018.

The optimality criterion is the total cost of transportation during a fixed-duration period. The costs include the cost of transportation, transit payments at the vertex of the graph (overhaul), and the cost of creating new arcs.

Results

A network model of the main railway lines connecting Ural and Siberian regions with the port of Sabetta and ports of the NSR is shown in the Figure 1. The model was based on analysis of the operational railways, railways under construction, and planned railways, and included parameters like length of the railway lines and other indicators. The Table 1 in Methodology section lists the nodes and the Figure 2 demonstrates the following key elements:

Existing administrative center with railway station

Existing administrative point with railway station under construction

Operational spur, branch, or main railway

Spur, branch, or main railway under construction

Planned spur, branch, or main railway

Water routes among the ports located by the Ob Bay

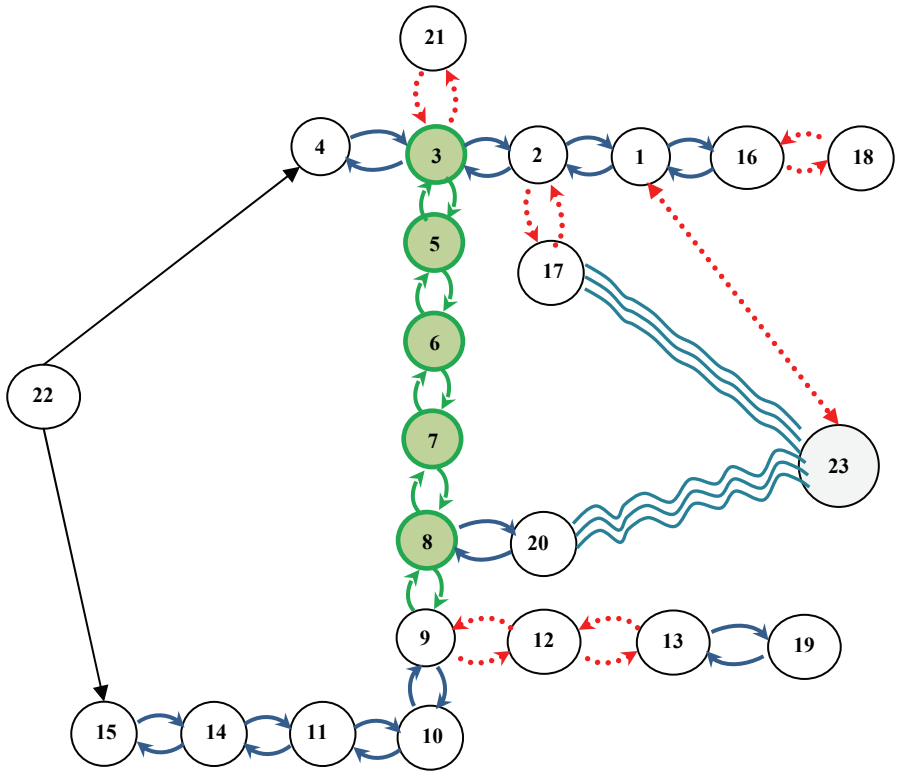

Figure 2: Graphical model of the main railway lines connecting the Urals and Siberian regions with Sabetta sea port, and the Northern Sea Route water area (Source: Authors, 2018)

Development of a network model for the main railway connections of the Urals and Siberian regions with Sabetta port and NSR region revealed that Sabetta and Yamal Peninsula ports do not have direct railway connections with Central Russian regions. The only railway is a branch of Bovanenkovo-Vorkuta line. However, both line capacity and its length do not meet the optimality criterion in terms of total cost of transportation during a fixed-time period. Moreover, this transportation corridor does not meet the optimality criterion in terms of delivery time. Building a railway through Salekhard and Novy Urengoy (Obskaya–Salekhard–Nadym–Pangody–Novy Urengoy) will optimize the railway connections of Siberia and Far East regions with both Yamal Peninsula seaports and the TTC parallel to NSR and will significantly reduce cargo transition time and cost.

Conclusion

Implementation of the NSR project using multimodal approach may boost economy of the Northern Urals and Siberia: new transportation infrastructure will stimulate construction projects in the regions, and result in new jobs and industries within the regions. Results demonstrate that seaports in the Yamal Peninsula are now connected to Russian mainland by the single railroad through Vorkuta, unable to support decent supply of goods. Establishment of a diversified transregional transportation hub in the Ob River region and supplementing Sabetta sea port capacities with river ways, railroads and highways will improve return on federal investments in the region, and create basis for new business development, including commercial and industrial projects with substantial social and economic effects.

Acknowledgements
The research was supported by Ministry of Education and Science of the Russian Federation (Grant No: 26.8660.2017/8.9; 26.6884.2017/8.9; and 17-22-07001) and by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Grant No. III 47007).

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