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Formation of Transport Infrastructure in Siberia: Historical Experience and Future Development

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***Abstract*–The paper discusses Siberian transport infrastructure formation in the context of the country's history. The construction of new train routes, namely Transsib and BAM, led to the rapid economic development of the territories. Siberian vast areas did not militate against the construction of oil and gas pipelines as a precursor of the complex intergovernmental One Belt, One Road initiative. Solving problems in infrastructural development will lead to steady growth and dynamics of economic advancement of Russia and neighboring countries.**

Keywords–transport infrastructure of Siberia, Transsib, BAM, ESPO, Power of Siberia, One Belt – One Road, Arctic development, Russia's spatial development

I. INTRODUCTION

The modern understanding of Siberia as an extensive geographical region is based on the definition of N. M. Yadrintsev. The publicist and ethnographer believed that it occupied the entire north of Asia, extended from the Ural Mountains to the Pacific Ocean and bordered China in the south. Nowadays, Siberia is accepted to be the part of North Asia within the borders of the Russian Federation. Its area is 13.1 million square kilometers (about 40% of Asia and about 77% of Russia). Its population is about 25% of the country's peopling. The active expansion of Russians to Siberia began in the 16th century. Waterways were the main routes to get there. Russian settlements of the 17th century, namely Surgut, Turukhansk, Yeniseisk, Yakutsk, Irkutsk, and others, were founded near the major Siberian rivers, which served as transport arteries both in summer and in winter. Even in the 20th century, more freight transport was carried out via rivers compared to seas. In 1940, 32.9 million tons of various cargoes were transported by sea. The country's river transport carried 73.9 million tons in 1940 [1]. Up to 1985, that number reached 633 million tons [2]. The rivers in Russia have always been not only of economic but also of strategic importance, especially in the conditions of Siberian off-road and its sparse population.

Commercial exploitation of Zauralye required the development of land transport. Peasants and business people moved eastwards along the Great Siberian Road. The construction of the long distance railway – Transsib – was the basis of the modern transport infrastructure in the region since the economy of the southern regions of Siberia and the Far East began to develop rapidly with the advent of this railroad. The construction of the Baikal-Amur Mainline (BAM) in the 1970s quickened more northern areas and contributed to the development of natural resources. In the context of globalization and integration of the world economy in the 21st century, new initiatives including intergovernmental ones, have been developed.

II. PROBLEM STATEMENT

Siberia, including Eastern Siberia, is a place of attraction and possibility of implementing various economic projects for many states. Nowadays, the active and dynamic promotion of any innovations is impossible without modern infrastructural development. Comprehending the experience in this field seems to be very relevant. That will allow people to gain better sight of prospects and find benchmarks of economic growth.

III. RESEARCH QUESTIONS

Transport infrastructure of any country develops historically and depends on many factors. For Russia they are: extensive territory; sparse population; diverse and often harsh nature; dominancy of subzero temperatures. Russia is a continental country. Irkutsk, 'the middle of the earth', is 6 thousand kilometers away from the capitals and Europe. All these circumstances are especially clearly seen from Siberia.

Siberia was developing poorly until the railway construction. In 1891, the construction of the Grand Trans-Siberian railway from Chelyabinsk to Vladivostok, 7.5 thousand kilometers in length, began. First, sections from Chelyabinsk to Krasnoyarsk and from Vladivostok to Khabarovsk were constructed. In 1901, an icebreaking ferry line over Lake Baikal was set. In 1905, the construction of the Circum-Baikal section was completed [3].

The Chinese Eastern Railway (CER), built in 1897-1903 as the southern branch of Transsib, connected Chita and Vladivostok through Manchuria. The railway, as well as the 5-kilometer railway right-of-way, belonged to and were serviced by the Russian Empire. In fact, it was the first serious intergovernmental infrastructure project. The railway spread from Chita to Harbin in China, and then it spread eastwards to Vladivostok and southwards to Dalian (Dalny), China. Harbin owes its rapid development precisely to the CER. In Dalian, the city that was founded on the site of a fishing village, the Russian period lasted seven years from 1898 to 1905. Under the leadership of V.V. Sakharov, the first Dalian city administrator, the urban development plan of K.G. Skolimovsky was implemented. Since the architect was from Saint Petersburg, the

city acquired some features of the Russian capital. More than 160 residential, administrative and public buildings as well as the port were built. There are Russian streets in Dalian even in the 21st century.

The construction of the Trans-Siberian Railway, which was mainly completed in 1916, intensified the economic development of Siberia. Coal, mining, shipbuilding industries began their rapid development. Railway workshops appeared at major stations. Agriculture and trade were also in progress. The active investment of the Russian government to Manchuria contributed to the beginning of the regular steamship communication with Shanghai and the growth of tea trade. Several hundred Russians lived in Shanghai and the Russian Consulate General operated there. In absolute terms, the rapid and explosive growth of Chinese cities of Harbin, Dalian, Shanghai and the development of Siberian territories are examples of the synergetic effect of transport infrastructure growth. However, it is necessary to note the negative political influence since the Russian-Japanese and the First World War leveled the positive dynamics of the region's development. In the 20th century, in our opinion, the development of railway transport in Russia was rather slow. In 1922, the length of railways was 71.9 thousand kilometers; in 1970 it counted 135.2 thousand kilometers [4]. In the pre-war period, there were some attempts to construct a railway from the Timan-Pechora coal basin towards Western Siberia. Today, however, only its individual sections operate. The Baikal-Amur Mainline was also projected, but those projects were only partially implemented because of some definite reasons, such as precarious international situation that forced people to prepare for war and enormous human and material losses during the Second World War. After the war, roads were mainly constructed in the regions with acceptable climatic conditions and dense population.

Nevertheless, needs of the national economy developed and inspired a renewed interest to Siberia. In the 1960s – 1970s, hundreds of large industrial facilities were built in Western and Eastern Siberia. Networks of motorways also developed: 143 thousand kilometers of hard surface roads in 1940, 489 thousand kilometers in1970, and 724 thousand kilometers in 1980 [5]. That was not still enough. In 1974, the construction of the Baikal-Amur Mainline from Taishet to Komsomolsk-on-Amur began. The railway was introduced in constant operation in 1989. Its construction was to ensure the integrated growth and development of natural resources of the neighbouring areas. The All-Union meeting in July 1984 was devoted to that issue. Much attention, for instance, was paid to the development prospects of the copper industry since ore reserves of half of the aging deposits were depleted. Thus, the development of the Udokan copper deposit in the Chita region was the main promising direction. In the 12th five-year period, the construction of transport accesses to Udokan was to begin [6]. In addition, 10 copper and 4 gold deposits, as well as the Katuginskoe rare-metal, the Charskoe iron-ore, and the Apsatskoe crozzling coal deposits were found. 4 new mining and processing plants (GOK) were to be built in the Chita region. In total, about ten territorial-industrial complexes (TIC) were to be located and formed in the BAM zone [7]. A 'capillary' feeder was supposed to be brought to each deposit and GOK. Measures to speed up the construction of the Zhireken molybdenum plant were sounded [8]. Unfortunately, most plans came to nothing because of insufficient funding and poor transport accessibility of the richest deposits. The length of the country's railways in 1985 made up only 144.9 thousand kilometers [9]. Thirty years later, the South Yakut TIC (coal), the Udokan GOK (copper), and the Zhirekensky molybdenum plant were actually formed and operated. In the 2000s, large Russian companies showed interest to the BAM region, but they are in many ways still constrained by weak electric power base, considerable remoteness and lack of transport infrastructure.

In the 1970s, the needs of the economy and the change-over to hydrocarbons as the main source of energy led to a significant increase in oil and gas production. In 1970, 353 million tons of oil and 198 billion cubic meters of gas were mined in the USSR. In 1981, oil extraction reached 608 million tons, and gas extraction reached 465 billion cubic meters [10]. That period, the main deposits were in Western Siberia. Therefore, the delivery of raw materials to consumers and the need for export led to a significant increase in the length of pipelines. In 1970, there were only 37.3 thousand kilometers of oil pipelines and 67.5 thousand kilometers of gas pipelines. In 1980, the number of both oil and gas pipelines increased and amounted 69.7 thousand kilometers for oil and 132 thousand kilometers for gas [11]. In the 1990s, Russia started its turn to the East under the changed geopolitical conditions. China's growing economy needed a lot of raw materials. China-Russia relations in the political sphere have been steadily improving for the last twenty years. Oil and gas deposits, once explored in Eastern Siberia, began to be used. In the 21st century, there came a time of serious common with the Middle Kingdom initiatives. In 2009, the first 2694-kilometer long stage of the Eastern Siberia-Pacific Ocean oil pipeline (ESPO) from Taishet to Skovorodino was introduced into service with a capacity of 30 million tons per year. In 2012, the second stage from Skovorodino to Kozmino with a branch to Mohe, the most northern town of China, started to operate. In 2017, the Mohe-Daqing pipeline branch was completed on the Chinese territory [12]. Consequently, oil began to be destined for China. In 2013, at the G20 summit in Saint Petersburg, the pacing items for natural gas supply via the eastern route were discussed. The construction of the Power of Siberia gas pipeline began. Gas from the Chayanda and Kovykta fields of the Irkutsk Region will flow to China through Yakutia, the Amur Region, Heihe and further on to Shanghai with annual deliveries about 38 billion cubic meters. On the Russian territory, the gas pipeline will be partially connected with the second ESPO branch under construction and will be terminated in Vladivostok. Hence, pipeline transport in Eastern Siberia is developing at accelerated tempo linking together not only Russian territories but the cross-border zone too. These projects spotlight problems as well. For instance, P. A. Minakir aptly notes realities and expectations not to always coincide. Further economy restructuring and adjustment of the economic system as a whole are required [13].

Eurasian transport arteries were formed gradually. The 21st century has become a time of switch from local initiatives to more voluminous and comprehensive ones. The history itself

sometimes suggests people to be able to implement old ideas at a new technical and technological level. In 2013, Chinese leader Xi Jinping voiced the ideas of the Silk Road Economic Belt (SREB) and then of the 21st Century Maritime Silk Road (MSR) initiatives which were later combined in the One Belt, One Road initiative. This great initiative is not yet sufficiently structured notwithstanding it is aimed at the creation of trade, transport, and economic corridors connecting most of the countries of Eurasia. The scientific and expert community is actively involved in the discussion of the initiative. O. N. Pryazhnikova defined the goals and interests of the participants in her paper [14]. S.G. Lousianin and A.V. Afonasyeva presented some political and economic aspects [15]. In the initiative implementation, China sees a direct link with its historical past following its traditional soft power approach in relations with neighbors [16]. A number of Russian experts drew attention to environmental aspects of the initiative; the issue is in the degree of nature damage from the increase in traffic load and the construction of numerous infrastructure facilities [17]. Perhaps, the authors are right to some extent speaking about the possibility of China to therethrough become one of the world leaders [18]. Within the Silk Road Economic Belt, the construction of new Eurasian railways and the reconstruction of old ones are provided. The initiative is also a possibility for Russia to modernize Transsib and BAM. China realizes its northern neighbor to have an extensive scientific base in Eurasian geology and reliable data on proven reserves of minerals and metals. The country hopes for joint development of adjacent territories and their inclusion in the Silk Road transport and logistics corridors. China sees the construction of high-speed rail lines touching Siberian territories to be one of the focus areas [19].

Despite the name, One Belt, One Road initiative provides dozens of options for transporting everything from east to west, from Asia to Europe since there are both land and sea transport corridors. Today, sea container shipping amounts to three quarters of freight traffic in the world. Therefore, China has drawn its attention to the Northern Sea Route along with the southern seas and the possible construction of new canals. The country tries to engage in the development of the North to the extent possible [20]. Russia has performed a lot in the Arctic over the past decade. Based on the needs and opportunities to use the short North Route from Asia to Europe, it is building dozens of new icebreakers including nuclear-powered ones. In 2017, the Port of Sabetta was constructed. Near Arctic, Russia began to actively produce gas and build liquefied natural gas terminals. Novatek initiated the Yamal LNG Project. Construction of several new seaports in the eastern part of the Arctic, rehabilitation of old ones, mineral exploration, resource development, and defense projects are in plain view. All these issues require the creation of an integrated transport infrastructure. Nowadays, separate sections of railways are being connected, new air and motor routes are being built, fiber-optic communication lines and the Internet are being run. The development of river navigation and small aircraft has been called attention to. Hence, Siberia has ceased to be inaccessible.

Due to its unique characteristics, Siberia has a special place in the country. On the one hand, it has enormous potential. On the other hand, all the problems are intensified due to its extension. That also applies to the formation of transport infrastructure. A number of researchers have repeatedly pointed out this state of affairs [21, 22]. To some extent, the scientists' achievements were taken into account in the Russian Spatial Development Strategy for the Period up to 2025 adopted in February 2019. Siberian development also takes place within the framework of the Eurasian Economic Union (EAEU) formation and within the building of Eurasian integration processes on the One Belt, One Road platform. Outdated infrastructure hampers the development of the region's and the country's economy. Therefore, it should be paid special attention in the future.

IV. PURPOSE OF THE STUDY

The paper is to summarize the historical experience of creating and developing Siberian transport network. An attempt to identify a number of factors affecting the modern configuration formation of the infrastructure in North Asia has been made.

V. RESEARCH METHODS

While working, both general scientific methods and methods of historical research were used: chronological, historical genetic, and comparative historical. The study justified the use of statistical and historical sociological methods as well as the method of structural analysis. Such diversity of methods allowed recreating an extensional view of the past and present.

VI. CONCLUSION

The authors can summarize all the foregoing as follows.

1. There were examples of successful expanse exploration in the history of Russia. They can serve as a source of inspiration and motivation for future generations.

2. Through the lens of economics, integrated development of territories obviously leads to a synergistic effect and allows efficient use of resources,

3. Siberian transport infrastructure was formed in accordance with the needs and capabilities of the country. Geopolitical circumstances are necessary to be taken into account and the power equation with neighboring countries is necessary to be formed.

4. In its rapid development of technologies, the 21st century increases Eurasian aggregate capabilities in terms of steady and dynamic development. Joint initiatives of several countries bring in new expectations and plot growth points. Transport infrastructure formation should be given special attention.

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