Problems and prospects for the development of transport systems in Yakutia

Dmitriy Andreev*

Federal State Autonomous Educational Institution of Higher Education "M. K. Ammosov North-Eastern Federal University", 58 Belinsky str, Yakutsk, 677000, Republic of Sakha (Yakutia), Russia

Abstract. The article examines the characteristics of transport systems in Yakutia. The main properties and features of the transport and related infrastructure are highlighted. Key problems and prospects for further development of transport systems are analyzed. The author concludes that there is a need to solve existing transport problems gradually. At the same time, there are specific directions and prospects for further transformation and development of transport in the region. There are a number of program and regulatory documents that formulate goals and objectives related to the modernization of transport, the formation of new transport and related infrastructure. However, the development of transport in the region is quite expensive. The implementation dates of many projects are constantly postponed.

1 Introduction

Transport and its infrastructure are an essential component in socio-economic development. Firstly, modern realities require developing and increasing passenger flows and ensuring a high level of transport accessibility. Secondly, transport infrastructure is important for the economic development of any region (transportation of goods, labor migration within the country and specific regions, etc.).

The development of transport systems ensures an increase in the standard of living of the population and comfort. Production resources are significantly saved. First of the transport costs for the logistics of goods and production resources should be mentioned. Conditions are being created to increase investment attractiveness and attract new investors, including foreign ones.

2 Methods

Methods such as comparative analysis, synthesis, and generalization were used. The scientific publications already existing on the topic were analyzed. The author’s conclusions were drawn on the issues discussed in the article.

* Corresponding author: vervil@list.ru

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3 Results and discussion

Yakutia is characterized by a unique economic and geographical position. Accordingly, the region has its own specific development. Here we can note the increased importance of transport systems. Firstly, this is due to the huge area of the region (over 3 million km²); secondly, with the need to ensure a high level of development of logistics (many nodes of the mining industry); thirdly, the climatic conditions are quite complex - the level of transport accessibility depends significantly on seasonality and weather conditions. In addition, the population distribution is characterized by sparseness. This means that the distances between populated areas and business centers are usually very large.

As already noted, the natural and climatic conditions are quite extreme. Thus, more than half of the territory of Yakutia is located beyond the Arctic Circle. This means that not only is the construction of transport systems itself complicated (usually requiring the use of special technologies), but also their continued maintenance for use is very expensive, even if the roads are not used all year round. In turn, roads that can be used all year round are characterized by low length and density. And during operation, they usually differ in non-standard condition, based on load and throughput.

Accordingly, the issue of transport development is especially important for Yakutia. This region has the following properties:
- low level of development of roads that can be used all year round (roads and railways);
- an area with fairly harsh climatic conditions;
- territorial unevenness in development – large territories, economic development and settlement system are uneven [1].

It is possible to identify the main elements that make up the transport framework of the region:
- waterways of communication - the Lena, Vilyuy, Aldan, Yana, Indigirka, Kolyma, Anabar, Olenek rivers;
- sea routes and corresponding port infrastructure of the East Siberian Sea, Laptev Sea;
- a number of federal highways - “Lena” (Bolshoi Never - Yakutsk), “Kolyma” (Yakutsk - Magadan), “Vilyuy” (Yakutsk - Mirny - Ust-Kut);
- regional roads;
- seasonal roads or winter roads;
- air traffic – the largest airports: Yakutsk, Mirny, Talakan, Lensk;
- railway tracks - Amur-Yakutskaya railway (Yakutsk - Berkakit - Tommot junction; Tommot - Nizhny Bestyakh section, which is in temporary operation);
- main gas pipelines (“Srednevilyuiskoye gas condensate field - Mastakh - Berge - Yakutsk” and “Taas-Yuryakh - Mirny - Morkoka - Aikhal”), a section of the oil pipeline “Eastern Siberia - Pacific Ocean”;
- related infrastructure (airports, service points, ports, etc.).

If we analyze the data on the distribution of use of transport systems, there will be significant disproportions here too. Thus, about 75% of the volume of cargo transportation is accounted for by road transport; railway transport accounts for much less - only about 14%. Further, inland water transport accounts for only about 8% of the volume, pipeline – less than 5% and, finally, air transport – less than 1% [1].
At the same time, the development of transport systems and the elimination of existing imbalances will lead to a significant reduction in transport costs, a reduction in transportation times and will ensure an increase in the competitiveness of the region as a whole.

Next, it is advisable to consider in more detail the features of individual types of transport. Thus, river transport in Yakutia is the leader in the transportation of domestic goods. Moreover, the main volume falls on the short northern navigation period. Cargo turnover is 60%. Water transport is used in the Lena River basin. Moreover, the shipping period on average can be only up to 130 days. In the basins of other rivers, for example, the Yana and Kolyma, navigation also occurs, but it is very limited. Moreover, today winter roads are increasingly used to deliver goods to destinations. This leads to an increased burden on the budget, because maintaining winter roads entails significant costs.

It is worth mentioning separately about the Northern Sea Route: in order for navigation along this route to be effective, firstly, it is necessary to ensure the safety of navigation; secondly, it is necessary to fully restore the service infrastructure, including the creation of effective aviation services (modernize the airport network, develop small aviation).

As for air transport in the region, the situation is as follows: this type of transport plays a huge role for socio-economic development, since ground transport routes are underdeveloped and are significantly removed from the central part of the Russian Federation. Thus, Arctic airports play an important role in social security: air transport is the only mode of transport that can be used all year round in remote areas. At the same time, here too there is a problem of the unsatisfactory condition of the airport facilities, which are engaged in servicing local air lines. For this reason, a situation arises where a number of remote territories are cut off from the central part of the region.

In general, the transport infrastructure of Yakutia is characterized by significant technical and technological lags; imbalance of development. In particular, the imbalance is especially acute in the fact that the level of development of roads does not correspond to traffic. As a result: transport systems are not efficient, cannot be used all year round, and are significantly dependent on weather conditions [2].

The central regions of the region are best provided with transport infrastructure. As you move away from the center, the concentration of population, production capacity and, accordingly, transport infrastructure decreases.

The following transport hubs in the region can be distinguished:

- a complex transport hub, which is formed by three federal highways: Lena, Kolyma, Vilyuy, as well as the Berkakit-Tommot-Nizhny Bestyakh railway and the waterway along the Lena River Ust-Kut-Lensk-Yakutsk-Tiksi " At the same time, if you build a bridge across the Lena River in the area of Yakutsk (the so-called Lena Bridge), then there will be an increase in connectivity by 18%, and a federal transport corridor “Magadan-Yakutsk-Irkutsk” will also be formed;

- southern transit transport hub of Neryungri (Yakutsk - Aldan - Neryungri). This node serves the city of Yakutsk all year round. It is formed by the Lena federal highway and the Berkakit-Tommot-Nizhny Bestyakh railway. This transport hub connects to the all-Russian transport network;

- western base transport hub of Mirny (Ust-Kut - Lensk-Mirny-Udachny - Olenek - Saskylakh). It is formed by several types of transport systems at once - water, road transport, as well as winter roads, which are seasonal. If the construction of the Lena Bridge is successfully completed, an interregional transport corridor may be formed;

- eastern transit interregional transport axis (Yakutsk - Khandyga - Ust-Nera) - winter roads are involved, with which you can get to the industrial Arctic regions. However, the resolution is seasonal;
The development of transport systems in Yakutia is primarily determined by production needs. New transport systems are being formed as the mining industry develops and new territories are developed on a production scale. Separately, it is worth paying attention to the fact that the Lena Bridge in the future will provide a connection to latitudinal transport routes. We are talking about the Trans-Siberian, Baikal-Amur Mainlines and the Northern Sea Route. In addition, the connection of federal highways (Lena, Vilyuy and Kolyma) will be carried out.

It is worth mentioning separately the problems associated with the development of passenger transportation in the region. In the region, especially in the northern part, one-way transport predominates. And the seasonal nature, remoteness and difficult terrain sometimes exclude any alternatives other than air transport. The situation is also complicated by the material and technical deterioration of the transport system (up to 80%) [3]. Despite all this, air transport and accompanying infrastructure facilities are very expensive to maintain. This explains the high prices of air tickets. But the solvency of the population is very low.

Winter roads along which passenger transportation is carried out also lag behind modern requirements in terms of development. For example, there are no fuel refueling points, there is no communication along the entire route, and maintenance is also reduced to zero.

Having analyzed the specifics of the transport systems available in the region, it is worth moving on to a more in-depth analysis of the prospects and problems in the development of transport in Yakutia (freight and passenger).

As of 2021, the length of public railways was 964 km; the length of industrial railways was 339 km; the length of public roads is 16,870 km (of which 12,450 km was the length of paved roads); length of winter roads and ice crossings – 8,315 km; the length of inland waterways is 16,522 km [4].

At the same time, it cannot be said that there is no positive dynamics in the development of transport infrastructure in the region. For example, the length of public roads alone has almost doubled by 2023, that is, it has amounted to over 31,000 km. Also, starting from 2022, subsidies for local transportation have been expanded in order to ensure and maintain the affordability of air transportation at the proper level. As part of the state program and national projects, the reconstruction of infrastructure facilities has also begun. Thus, in 2021, the reconstruction of the runway in Yakutsk was successfully completed [4].

As for the provision of transport, high rates are observed in most regions of Yakutia. Moreover, special means are used that take into account climatic conditions (all-terrain vehicles, snowmobiles, boats, etc.). As for buses and trucks, the maximum availability of them is in those areas where there is a high level of employment in the provision of transportation services (freight and passengers). For example, in such areas as Nizhnekolymsky, Bulunsky, Ust-Yansky, etc. Also, passenger transportation is most carried out in areas near which federal roads pass or there are year-round paved roads. Residents of areas where the mining industry is organized have personal vehicles.

Based on some data (statistical and information posted in publications), we can say that according to the level of transport provision, the region in question is divided into several areas:

- territories with the highest level of security are the urban district of Yakutsk. There is a high level of connectivity between all settlements; there is regular communication, the intensity of which is no less than twice a day. Yakutsk itself has a favorable location, since all key transport routes (land, water, air) pass through it. Yakutsk is the center where the all-season backbone transport network of the entire region is being formed;
- territories where there is a high supply of transport - these are cities, urban-type settlements, and, as a rule, the population is involved in the transport or mining industry. Settlements are connected by year-round roads served by buses;
- territories where the availability of transport can be assessed as above average. These are the areas that are the most populated and where extensive economic activity is observed. First of all, we are talking about areas that are adjacent to large cities. But other areas can also be included here. The population in such areas is mainly engaged in agriculture and livestock raising. Passenger services are organized on a regular basis in almost all settlements. However, there are few roads that have a hard surface;
- average wealth – these are areas where the population density is low. Mainly rural settlements. Although some areas host large mining operations;
- territories with below average and low security. These are areas where there are no paved roads. There is a predominance of small rural settlements. There is no year-round transport, and alternative modes of transportation are used (instead of land-water, air or winter roads). There is no permanent passenger service [5].

Accordingly, in order to solve existing problems associated with the development of transport systems in Yakutia, it is necessary to systematically implement the following tasks:
- to develop transport systems that can be used all year round and that will be minimally dependent on weather conditions - all territories should not only be interconnected, but it is also necessary to increase transport accessibility;
- to improve (modernize) existing transport communications, infrastructure facilities - many facilities are so worn out that they cannot be used at all or they are used minimally, which, of course, does not meet the growing needs for transport and roads;
- replace gradually the rolling stock, equipment and other infrastructure facilities, one way or another related to transport and its maintenance;
- to train highly qualified personnel for the most effective, professional maintenance of equipment, transport and structures [5].

So, in the field of development of road transport in the region, within the framework of relevant programs and projects, existing roads are gradually being modernized, and it is also planned to build new ones, including in conjunction with the introduction of the latest digital technologies.

As for air transport, the infrastructure of a number of airports is being reconstructed, and a gradual renewal of the fleet of aircraft is planned.

The further development of maritime transport is closely connected with the Northern Sea Route. In addition, it is planned to make the village of Tiksi a supporting port for the eastern part of the Route.

Inland water transport will also be affected by changes. Thus, the hydraulic structures of the Lena basin will be reconstructed over time, large river ports are also planned to be modernized, and new ship fleets will be built [6].

A number of current projects the implementation of which will have significant positive effects in the further development of transport systems in Yakutia should be highlighted:
- construction of the Lena Bridge. The project is of large-scale significance, since at the moment the eastern and western parts of the region are connected only seasonally: in spring and autumn, transport accessibility is disrupted for almost 65%
Yakutsk is the only large city that does not have a permanent land connection with integration into the federal network. The construction of the bridge will provide year-round transport links for almost 85% of the region's population. Also, the commissioning of the Lena Bridge can provide a new impetus to industrial development (the introduction into circulation of new assets worth over 1 trillion). At the same time, up to 8 billion rubles will be saved annually on transport costs. The project could be completed by 2027-2030. Figure 1 clearly shows the project for the construction of the Lena Bridge:

- completion of construction and development of the Amur-Yakutsk railway. This road is a connecting link between the Baikal-Amur Mainline and the central regions. Today it is in use, but is not partially completed. It needs to be extended to Magadan. This will ensure the transportation of goods all year round as part of the “northern delivery”, which, naturally, will significantly increase investment attractiveness and also reduce the cost of the gold mining industry. The prospect of project implementation for 2035 is being considered;
- implementation of the eastern training ground of Russian Railways - this project involves the modernization of the Russian main transport infrastructure. The main goal is to clear and eliminate bottlenecks on the railways of Transbaikalia and the Far East. This will significantly increase the volume of cargo transportation. It is planned to fully complete the implementation of this project in 2024 [6].

For a longer term (until 2050), it is also planned to build a number of roads and modernize infrastructure facilities. For example, strategic highways in the Arctic region; provide existing roads with stable communications and other new digital technologies; update transport fleets, introduce modern vehicles that will be resistant to climatic conditions [1].
It should also be noted that projects are being implemented as part of digital transformation. For example: “Smart Ferry” – a special mobile application displays information about the movement of ferries; Digital dispatch and electronic databases are gradually being introduced; The “Digitalization of Public Transport” project is being implemented, within the framework of which a special application is being developed in which, for example, you can purchase tickets online for routes, etc. [1].

4 Conclusion

The following main conclusions can be drawn.

Firstly, Yakutia has a special physical and geographical location and specific natural and climatic conditions. Accordingly, transport plays a key role for the socio-economic development of the region. In turn, all these features cause the presence of characteristic problems with transport and infrastructure. In particular: significant imbalances in transport and its use; low density of roads and other infrastructure; high cost of construction of transport infrastructure and direct maintenance; low length and density of roads and transport systems; problems with connectivity, transport accessibility, transport provision; lack of year-round transport in many areas.

Secondly, today a number of projects are being planned and implemented that involve the development of transport systems and the modernization of infrastructure, including through digital technologies. At the same time, very often the completion dates of projects are shifted indefinitely; implementation becomes long-term and sometimes protracted. Accordingly, we can make an unambiguous conclusion that, of course, there are very good prospects for the development of transport systems in Yakutia. At the same time, it is necessary to overcome resistance, mainly in the form of delaying the implementation of projects and spending money for other purposes.

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