Transport logistics and its role in the balanced territorial development

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Abstract. Transport logistics as a complex system combining many organisational, technological, technical, and other elements is now becoming one of the fundamental factors in the development of any spatial socioeconomic system, since the criteria of success in modern activities are the quality, speed, reliability, continuity of the provision of production-technological, social, research and development and other processes with all the necessary resources, which can be ensured due to the presence of well-established transport infrastructure and logistics of its maintenance, which directly affects the socioeconomic performance and the balance of territorial development. Remote territories feel the lack of transport infrastructure and logistics of their service which directly affects the socioeconomic performance and violation of the territorial development balance.

All of the above determines the relevance of the study of transport logistics in the context of its role in the balanced development of the territory. The purpose of the study is to analyse the role and place of transport logistics in the balanced development of the territory. The objectives of the study include generalisation of the terminological bases of the study of transport logistics of the territory; analysis of official statistics data on the state of the transport system of the region; study of the state of transport logistics and spatial location of priority projects to modernise the transport infrastructure of the region; identification of the role of transport logistics in the balanced development of territories. The methodological basis of the study is a set of general and private scientific methods, the use of which allows to achieve the goal of the study (methods of scientific knowledge, analytical, statistical).

1 Introduction

Transport logistics plays an important role in the modern economy (global, national, territorial, etc.) as the world is becoming a single space, saturated with various elements of transport systems to a greater or lesser extent technologically equipped and to a greater or lesser extent large in composition and volume.
The concept of "transport logistics" is interpreted in different ways by theoretical scientists, researchers-practitioners, designers, developers and other individuals involved, which confirms the importance of this concept and phenomenon, the versatility of approaches to research and design methods, the significance in the construction of modern life support systems and the relevance of addressing the study of various aspects of improving transport systems [1-22]. Thus, according to R.R. Galyautdinov "transport logistics is a section of logistics dealing with the organisation of delivery, i.e., transportation of any material objects (products, substances) from one point to another along the optimal route" [3, 4]. I.O. Garifullina claims that "transport logistics is the organisation of functioning and management of material flows and the corresponding supporting and accompanying flows in the process of goods movement, which consists in the movement of products by means of transport according to a certain technology, routes in the supply chain, and consists of logistics, technological, operations, activities and functions including forwarding, cargo processing, packaging, transfer of ownership of the cargo, threat prevention, insurance of rice, etc." [5]. From the point of view of V.N. Filina "transport logistics is a sphere that is responsible for organising the transportation of ordered goods to a certain place in the time agreed with the customer, and along the most optimal path designed to reduce financial costs. This includes three main points: low-cost delivery; the use of modern communication devices and equipment to control the process at all its stages; and the transfer of information about the cargo to its customer" [14, 15]. Thus, transport logistics is the process of managing the movement of material flows when providing the enterprise with material resources and delivering finished products to the consumer. Modern transport logistics includes not only the selection and coordination of different modes of transport, but also the management of warehousing, packaging and labelling of goods, cargo handling and storage, as well as the optimization of all these processes to achieve maximum efficiency [8, 16]. The goal of transport logistics is to deliver the right goods of the required quality and quantity at the right time and place at the right cost. The main tasks of transport logistics include the choice of mode of transport (road, rail, air, etc.); the choice of transportation mode (transportation type); the choice of carrier and other logistic partners; determination of rational delivery routes; ensuring the technological unity of the transport and warehouse process; optimisation of transport process parameters (increasing the transportation speed, reducing fuel consumption, etc.) to organise the optimal combination of all the above to deliver the object of movement with a given time and place. In conditions of increasing cargo and passenger traffic, the need for cargo and passenger delivery infrastructure with specified parameters of speed, quality, reliability and efficiency, as well as for a system of organised actions to ensure the movement of cargo and passengers, is increasing. The Republic of Bashkortostan, from the position of its convenient geographical location at the junction of Europe and Asia, the presence of a large logistics centre in Ufa (airport, railway and river stations, dense network of good quality roads), proximity to the borders with the CIS countries, can be positioned as a region optimally suited for the formation on its territory of a powerful world-class logistics centre with all the relevant components. However, the existing transport infrastructure, the quality of roads in the region as a whole, and the lack of a systematic approach to the formation of conceptual foundations for the development of transport infrastructure and its logistics support do not fully meet the stated ambitions. The Republic of Bashkortostan has adopted a number of regulatory and legal acts aimed at supporting the development of the region's transport system. In terms of transport services to the population the main regulatory act is the Law of the Republic of Bashkortostan dated 17 December 2008 № 77-z "On the organisation of transport services to the population by motor transport and urban land electric transport on the territory of the Republic of Bashkortostan".
The state programme "Development of the transport system of the Republic of Bashkortostan" was adopted by the Resolution of the Government of the Republic of Bashkortostan dated 22 January 2014 № 18 [9]. One of the latest adoptions by date is the Law of the Republic of Bashkortostan from 15 September 2023 № 764-z "On Amendments to the Law of the Republic of Bashkortostan "On the organisation of transport services to the population by motor transport and urban land electric transport in the territory of the Republic of Bashkortostan" [6]. This law regulates various transport services to the population, which was a consequence of the presence of a large number of aspects of taxi activity, both urban and intercity, not taken into account by the norms of law.

The Ministry of Transport and Roads of the Republic of Bashkortostan is taking steps to form a pool of projects to improve transport services to the population, but their number and scope are territorially and financially very limited, which increases the imbalance in the socio-economic development of the entire region. This paper is devoted to the study of the reasons for the current situation.

2 Methods and materials

The aim of the study is to analyse the role and place of transport logistics in balanced development. The objectives of the study are:

1) to summarise the components of the terminological basis of the study of transport logistics of the territory (types, functions, principles);
2) to analyse the data of official statistics of the state of the transport system of the Republic of Bashkortostan;
3) to study the state of transport logistics of the Republic of Bashkortostan;
4) to consider the spatial location of priority projects to modernise the transport infrastructure of the Republic of Bashkortostan;
5) to identify the role of transport logistics in the balanced development of territories.

The methodological basis of the study is a set of general and private scientific methods, the use of which allows to achieve the goal of the study (methods of scientific knowledge, analytical, statistical).

3 Research results

Modern transport logistics, its availability, saturation, quality and reliability is one of the important factors in the development of the territory's economy. The speed and quality of movement across the territory determines, among other things, its attractiveness for investors, and is now becoming an important factor for the population when choosing a place of permanent residence.

Let us consider the state of transport logistics in the Republic of Bashkortostan. The region is located at the crossroads of the most important water, railway, pipeline and motorway routes connecting the European part of the country with the Urals, Siberia and Central Asia.

The developed transport infrastructure and high population density create conditions for the development of logistics business. The population of the Republic is 4 million people, the population of the territories within 500 kilometres of the capital of the region (Ufa) is about 20 million people. At the same time, only in large cities live more than 10 million people: Aktobe - 560,820, Ekaterinburg - 1,539,371, Izhevsk - 620,591, Kazan - 1,314,685, Samara - 1,163,645, Perm - 1,027,053, Orenburg - 539,236, Chelyabinsk - 1,182,517, Uralsk - 236,476, Ulyanovsk - 613,334, Ufa - 1,157,990 [13]. At the same time, the "Eurasian "transport circle - 500" includes, in addition to major industrial centres of our
country, the cities of the Republic of Kazakhstan, which increases the importance of transport infrastructure connecting the two adjacent states, its quality and reliability (Fig. 1).

Fig. 1. "Eurasian Transport Circle - 500" of the Republic of Bashkortostan

Table 1. The Republic of Bashkortostan's ranking in the Volga Federal District and the Russian Federation as a whole in the system of transport system development indicators *

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Indicator value</th>
<th>Ranking of the region in the Volga Federal District</th>
<th>Region's ranking in the Russian Federation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cargo dispatch by public railway transport, mln tonnes</td>
<td>27.1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>passenger departures by public railway transport, thousand people</td>
<td>4019</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>density of railway tracks at the end of the year per 10,000 square kilometres, km</td>
<td>102</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>cargo transportation by road transport of organisations of all types of activity, mln tonnes</td>
<td>45.4</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>freight turnover of road transport of organisations of all types of activity mln t-km</td>
<td>3656</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>6</td>
<td>passenger transport by public buses, million people</td>
<td>297.4</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>passenger turnover, mln. pass-km</td>
<td>3721</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>share of public roads with hard surface, %</td>
<td>91.7</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>share of public roads with improved pavements, %</td>
<td>46.1</td>
<td>13-14</td>
<td>61-64</td>
</tr>
<tr>
<td>10</td>
<td>density of paved roads, km per 10,000 square kilometres</td>
<td>320</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>number of public buses per 100,000 population, pcs.</td>
<td>19</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>12</td>
<td>number of road accidents and casualties per 100,000 population, pcs.</td>
<td>96</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

* Source [10].
The analysis of transport logistics components in the republic allows us to assess its development potential, identify problems and formulate a number of proposals to improve the situation.

The state of transport logistics in the Republic of Bashkortostan can be characterised as follows:

1. Road infrastructure. The Republic of Bashkortostan has a developed network of motorways, including 2 federal highways (M-5 "Ural", M-7 "Volga") and regional autobahns. The length of motorways in the republic is 47,944 km.

   **Advantages.** The developed network of motorways covers the whole territory of the region. According to the indicator "Passenger turnover" the region ranks 1st in the district and 3rd in the country. The region ranks 1 in the region, 4 in the country and 1 in the region and 10 in the country, respectively, by the indicators "Passenger transportations by public buses" and "Specific weight of public roads with hard surface" (Table 1).

   **Challenges.** Federal highways are overloaded practically along their entire length, which leads to a large number of accidents, wear and tear of the roadbed, and disrepair of road infrastructure elements: bridges, overpasses, etc. Some road sections of regional importance need modernisation and repair. Roads of regional importance often become "traffic directions" in the absence of hard road surface or its fragmentary presence. At the same time, the area of the Republic is very large, and places of permanent residence of the population are located throughout the territory.

2. Railway infrastructure. The total length of railways is about 3,000 km. The main railway artery is the Samara-Ufa-Chelyabinsk railway. It crosses the territory of the Republic from west to east and is part of the main all-Russian main line Moscow-Vladivostok. In the area of Ufa, two more important trunk lines adjoin this main trunk line: Chishmy-Ulyanovsk and Karlaman-Magnitogorsk. A number of northern districts access the modern major trunk road Moscow-Kazan-Yekaterinburg. All four trunk roads mainly carry transit cargo. There is also a road of interregional importance Dema-Muraptalovo-Orenburg and several lines of local importance (Ufa bypass, Aksakovo-Belebey, etc.). 30% of the railways are double-track, 70% are single-track, 2/3 of the roads operate on electric traction.

   **Advantages.** The Republic of Bashkortostan is a major railway hub connecting West and East, North and South, Europe and Asia. The region ranks 3rd in the district and 14th in the country by the indicator "Freight dispatch by public railway transport" (Table 1). The unique location in the centre of the country with access to the CIS countries is an opportunity to become a modern, technologically equipped, intelligently integrated into complex logistic world-class railway communication centre.

   **Challenges.** Significant increase in the cost of rail transport in areas where there is no possibility of travelling by electric trains reduces the demand for passenger and cargo transportation, the number of running trains is reduced, profit decreases, and there is no possibility of renewal of fixed assets (rolling stock, railway track, infrastructure support).

3. Water transport. There are small river ports in the Republic, which allow to carry out cargo transportations by rivers. The Belaya River from the mouth of the Sima River to its confluence with the Kama River, the Ufa River from the village of Nizhny Suyan to its confluence with the Belaya River near the city of Ufa and the Kama River are used for navigation during the navigation period. However, the development of water transport is limited by the lack of accessibility of inland waterways.

   **Challenges.** Shoaling of the Belaya River and reduction of the fairway along its entire length have led to a sharp reduction in river transport.

4. Aviation infrastructure. There is a single airport "Ufa" in the Republic of Bashkortostan. Its passenger traffic is 3.5 million per year. This provides the necessary capacity for cargo transport and logistics. The main activity of Ufa Airport is to provide services to transit flights (flight reception, aircraft maintenance, passenger services, etc.)
Bashkir Air Lines BAL, a proprietary company founded in 1991 with a large fleet of aircraft, ceased to exist in 2007.

Problems. The absence of its own flying company led to the complete closure of local airlines. Thus, if at the end of the XX century the number of local flights was up to 25 departures per day, today there are simply none. The airport serves as a transit centre for airliners of companies operating international and Russian flights.

To identify the role of transport logistics in the planned development of the territories of the Republic of Bashkortostan, we conducted a study of socio-economic indicators of municipalities of the Republic of Bashkortostan, whose territorial and administrative division includes 895 municipalities, including 54 municipal districts, 9 urban districts, 14 urban settlements, 818 rural settlements [10]. To enlarge the territorial units, socio-economic zoning was used with the allocation of internal economic regions in the territorial structure of the Republic of Bashkortostan, distinguished by a combination of natural and general economic factors [1].

The territory of the Republic of Bashkortostan is divided into seven internal economic regions: the central economic region includes 3 cities, including the capital of the region, 9 districts; the southern economic region - 5 cities, 10 districts; the western economic region - 3 cities, 12 districts; the north-western economic region - 2 cities, 4 districts; the Ural economic region - 4 cities, 7 districts; the north-eastern economic region - 5 districts; the northern economic region - 5 districts.

The most industrially developed are the central and southern economic regions, where most of the industrial enterprises of the industrial complex of the Republic are located: fuel industry, chemistry and petrochemistry, machine building and metalworking, forestry and woodworking, medical and printing industries. These two regions account for 71.3 per cent of the industrial potential, 68.5 per cent of contract works, 76.0 per cent of retail trade turnover, 74.6 per cent of public catering turnover, 78.3 per cent of the turnover of paid services to the population, 66.15 of the output of small businesses. The territory of the two regions is home to 60.81 per cent of the region's population. The least industrially developed are the north-eastern and northern economic regions. They account for 0.3% of the industrial potential, 4.5% of contract works, 1.8% of the retail trade turnover, 1.8% of the public catering turnover, 2.1% of the turnover of paid services to the population, and 0.6% of the output of small businesses. The share of the resident population is 5.36 per cent. The greatest imbalance in the development is noted in the Ural economic region, where with the concentration of the entire mining industry of the republic, the inclusion of the largest agricultural areas in the region by area, 10% of the total population, the industrial potential is 5.9%, the volume of agricultural output - 10.4%, the turnover of contract works - 6.25%, retail trade turnover - 5.6%, public catering turnover - 5.9%, turnover of paid services to the population - 51%, products of small businesses - 5.6% [10].

The Ministry of Transport and Roads of the Republic of Bashkortostan among the priority projects in the field of transport infrastructure development highlighted several particularly significant ones. Among them: (1) construction of a tunnel ("Eastern exit") at the exit from Ufa to the federal motorway M-5 "Ural" (the largest concession project in Russia), (2) construction of a bridge crossing in the Vorovskogo street in Ufa, (3) construction of "Southern Gate of Ufa", (4) bridge crossing in the International street in Ufa, (5) outbound motorway - S. Yulayev Avenue in Ufa, (6) Agidel river cargo port, (7) bypass roads around the cities of Neftekamsk and Birsk; (8) reconstruction of the railway station of Ufa station; (9) overhaul of the Agidel-Neftekamsk railway line; (10) development of the public light rail transport system in Ufa [11].
An analysis of the map of infrastructure project location shows a high density of transport construction in the Central and North-West economic sub-areas, which account for the majority of priority transport investment projects. Considerably less attention is paid to the North-Eastern and South-Eastern direction, which is not quite deserved, since if we consider the Southern direction, we see that the closest distance to the countries of Central Asia is located here, and can contribute to the development of transport networks in the region.

Taking into account the fact that the Centre for System Studies of Sustainable Development of Territories and Quality of Life of Population of Sibai Institute (branch) of Ufa University of Science and Technology, whose staff prepared this article, is located in the city of Sibai, which is part of the Ural Economic Region of the Republic of Bashkortostan, the interest in the development of measures to improve the balance of development becomes obviously appropriate, scientifically and practically significant, important for the future sustainable economic growth of the territory of the Ural Economic Region of the Republic of Bashkortostan.

High population density and the presence of large retailers in the region create a high potential for the creation of large logistics complexes. The development of the logistics sector will make it possible to solve a number of important economic and social tasks, one of which is...
4 Discussion

The research related to territorial development has been carried out by the staff of the Centre for System Research of Sustainable Territorial Development and Quality of Life of the Sibai Institute (branch) of Ufa University since 1994. The results of the research are discussed at scientific conferences, round tables, symposiums on the problems of sustainable territorial development and in other formats of interaction with the scientific community. Thus, at the international scientific-practical conference "Cooperation and Sustainable Development" we made a report "Managerial capital and its role in sustainable development" [20]; the report "Quality of life of the population: the impact of digitalisation" at the I International Forum on Sustainable Development and Innovation [17]; the report "Sociocultural Capital of Rural Areas in the Context of Sustainable Development of the Digital Economy" at the conference "Sustainable Development of the Digital Economy: Global Challenges and Prospects" [21]; the report "Interdisciplinary approach to the study of the capital of territories with unbalanced development: theoretical and methodological foundations" at the conference "International Scientific Siberian Transport Forum - TransSiberian 2023" [22]; the report "Assessment of the quality of life of the population: a comprehensive approach" at the International Forum on Sustainable Development and Innovation [18]; the report "Capital of Sustainable Development of the Territory: the Role and Importance of Cooperation" at the International Forum "Cooperation and Sustainable Development" [19]. All these materials are available in the international citation database Scopus with their subsequent indexing. The research team has a lot of other works, which have received feedback from Russian and foreign scientific teams. The Centre plans to create an interregional Eurasian centre for research of territorial development problems based on the application of various approaches and models. The team is also actively working on grants from scientific foundations, including the Russian Science Foundation. Thus, the work is currently underway under the Russian Science Foundation grant 23-28-00893 "Capital in ESG-models of economic growth of territories with unbalanced development: the role and importance of interdisciplinary approach" [12].

5 Conclusions

The summary of the research results suggests that the level of transport logistics development, along with other indicators, characterises the territory as a place for favourable living of the population, conducting industrial and commercial activities by economic entities, maintaining the indicators of socio-economic development of the territory at a good level and in constant positive dynamics. A high level of transport logistics development is of great importance for the territories that belong to the category of unsupported transport due to remoteness from major cities-industrial centres, transport hubs and communication routes of all kinds. The lack of roads, even with a pavement that is not considered good, today becomes one of the factors determining the decision to change the place of residence, to do business, to return to the place of parents' residence after graduation. As our research has shown, a balanced development of any territory requires provision of its transport infrastructure elements: motorways and relevant service infrastructure; transport logistics elements with the possibility of integrating the road network into the general logistics system of the region; systemic measures at the regional and local levels to develop the road network and road facilities to ensure the long-term effect of the measures taken.
Other entities relevant to the development of the territory should also be involved in this process: representatives of transport infrastructure and logistics companies whose activities are directly related to the transport system of the region; the business community whose business is located in the territory or provided by the territory's resources; and the local population, whose initiatives are now actively supported by the government. Integration of efforts of all stakeholders will contribute to solving the socioeconomic problems of the territory, including transport, in the most optimal way, while creating a multiplier effect for all spheres and industries of the territory, region, and country.

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