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STATISTICAL ASSESSMENT OF THE DEVELOPMENT PROCESSES OF THE TRANSPORT INFRASTRUCTURE OF THE REGION (ON THE EXAMPLE OF THE REPUBLIC OF KARAKALPAKSTAN)

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Abstract:

The article analyzes the current state of the transport infrastructure of the Republic of Karakalpakstan, identifies key problems of its development in the context of the transition to a modern market economy. The areas of state and regional support aimed at forming an effective transport network that contributes to increasing the competitiveness of the region are considered.

Keywords: transport infrastructure, automobile transport, Engel coefficient, Goltz coefficient, Uspensky coefficient, Vasilevsky coefficient, freight transportation, passenger transportation.

INTRODUCTION. The main indicators of the functioning of the transport infrastructure are determined and a comprehensive assessment of its current state is carried out. To determine the level of development of the transport system of the region, the Engel, Goltz, Uspensky and Vasilevsky coefficients are used. The article also provides statistical data characterizing the transport infrastructure of the Republic of Karakalpakstan in order to identify the dynamics of its development and possible areas of modernization.

Assessment of the state of transport infrastructure is an important tool for managing regional development and is widely used at various levels of government regulation. In the context of the modern socio-economic system, transport Infrastructure plays a key role in territorial development, determining the degree of integration of regions and their economic competitiveness [1].

The transport sector of the Republic of Karakalpakstan is an important component of the regional economy, ensuring the mobility of the population, the movement of goods and the exchange of information. In the context of deepening integration processes, the level of economic development of the region directly depends on the condition and efficiency of the transport network. The high density of roads and their quality characteristics contribute to economic growth, the expansion of the labor market and the attraction of investments [2].

An effectively functioning transport system helps to improve the socio-economic indicators of the region by increasing the accessibility of markets, creating new jobs and stimulating entrepreneurial activity. At the same time, insufficient capacity of the transport infrastructure or its low reliability can become a deterrent to economic development, leading to additional costs, a decrease in investment attractiveness and a deterioration in the quality of life of the population [3].

The length of roads in the Republic of Karakalpakstan is 3,626 km, and public railways - 374 km [4]. The network of public roads includes both republican and local roads under the jurisdiction of various government agencies.

The structure of the regional road network is largely made up of roads maintained by the Ministry of Transport, including both main national highways and local roads providing transport links between settlements. The ratio of national and local roads determines the accessibility of transport routes and their importance for the economic development of the region [5].

These indicators allow us to assess the current state of the transport infrastructure of the Republic of Karakalpakstan, identify key areas of modernization and determine strategic priorities for the development of the road network.

In the Republic of Karakalpakstan, roads play a key role in the transport system, significantly surpassing air and rail transport in terms of local freight traffic. The average distance for transporting freight is 20 km, which makes the use of air and rail transport economically impractical for most domestic transportation.

Passenger transportation is also largely focused on road transport, which remains the main means of transportation within the region. The efficiency of the transport system has a significant impact on the economy, reducing costs in various sectors. At the

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same time, inefficient transport logistics can increase the cost of production and create additional barriers to economic growth.

Various economic coefficients are used to analyze the level of development of the region's transport infrastructure. The most common among them are the Engel, Golts, Uspensky and Vasilevsky coefficients, which allow us to assess the availability and efficiency of transport flows, as well as identify imbalances in the development of infrastructure [6].

The Engel coefficient is calculated using the formula:

$$d = \frac{L}{\sqrt{S \cdot H}}$$

где:

- L – total length of transport routes,
- S – area of the territory,
- H – population size.
- The Goltz coefficient is defined as follows:
- $$d = \frac{L}{\sqrt{S \cdot \Pi}}$$

где:

- Π – number of settlements.
- • The Goltz coefficient is a modified version of the Engel coefficient. The main difference is that the Engel coefficient may somewhat distort the real picture of the level of transport development of the territory, since it takes into account the population size, which can vary significantly between regions, districts and countries.
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- In turn, the Goltz coefficient gives a more accurate assessment of the level of transport development, since it uses the number of settlements instead of the population size. This allows us to take into account the situation when the same transport network serves territories with different population densities, which makes the infrastructure analysis more objective.
- The Uspensky coefficient is calculated using the formula:
- $$d = \frac{L}{\sqrt[3]{S \cdot H \cdot t}}$$

где t – total weight of cargo sent to the territory.

This coefficient is a modification of the Engel coefficient taking into account the mass of transported cargo, which makes it more accurate in assessing the transport infrastructure in terms of cargo flows.

The Vasilevsky coefficient is determined by the following formula:

$$d = \frac{L}{\sqrt[3]{S \cdot H \cdot Q}}$$

где Q – total weight of manufactured products.

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This coefficient is a further modification of the Uspensky coefficient, adding the total volume of manufactured products to the calculation, which allows taking into account the relationship between the transport infrastructure and the economic activity of the region.

Table 1. Indicators of the transport network of the Republic of Uzbekistan

Title / units / Region	Length of transport routes (km)	Area (thousand km²)	Number of settlements (units)	Goltz coefficient
Republic of Karakalpakstan	4133	166,6	707	12,04
Tashkent region	14157	15,3	1010	113,88
Samarkand region	6843	16,8	1112	50,07
Navoi region	9444	110,8	435	43,02
Bukhara region	8357	39,4	529	57,89
Fergana region	7521	6,8	1093	87,24

Access to a developed transport network increases the level of population mobility, improves access to resources and labor, and contributes to the expansion of markets for products. For example, regions with high density and quality of road infrastructure, such as Tashkent, Samarkand and Bukhara regions, demonstrate the best indicators of the Goltz coefficient, which indicates the effective integration of their transport networks into the economy. At the same time, regions with a lower coefficient value, such as Karakalpakstan, require further optimization of transport links to increase their economic potential.

Transport plays a significant social, economic and environmental role, and these aspects are important to consider when analyzing its impact. The economic impact of transport includes several aspects, including the physical characteristics of the infrastructure, its operational and geographical factors.

A particularly important aspect is the impact of transport on the cost of goods and services. Improving the condition of transport infrastructure has a positive effect on economic productivity, increases reliability and reduces losses during transportation. This, in turn, allows for the most efficient use of transport assets, accelerating the transportation of goods and passengers and reducing costs. The geographic impact of transport is reflected in how it affects the location of economic activity and the value of land resources. As a result, the transport industry has significant economic value in both macro and microeconomic terms.

At the macroeconomic level, transport directly affects production volume, employment, and income at the national level. In most developed economies, transport costs account for between 6 and 12% of the gross domestic product (GDP). If logistics costs are included, this figure can reach 25% of GDP. The total cost of transport infrastructure and vehicles often becomes a significant part of national wealth.

At the microeconomic level, transport costs directly affect the costs of producers and consumers. In particular, the share of transport costs in household consumer spending varies from about 10 to 15%. At the same time, transport accounts for about 4% of the cost of a unit of industrial output, although this figure varies greatly depending on the specifics of the industries.

The economic importance of transport is not limited to direct costs. It also includes significant indirect effects. For example, transport companies purchase various resources, such as fuel, spare parts and maintenance, from local companies, which stimulates additional economic growth and employment at the local level. These companies, in turn, turn to other local suppliers, thereby creating a multi-level economic effect. Households receiving income from the transport sector spend the money on local goods and services, which leads to further expansion of the local economy.

Thus, the transport sector has both a direct and indirect impact on the economic development of regions, stimulating overall economic demand. The development of the transport network improves market accessibility, expands employment potential, increases the added value of goods and services, and helps save time and reduce costs.

Accessibility and economies of scale, as well as indirect effects in the form of additional employment and added value, arise from the active interaction of transport with other sectors of the economy: supplies of materials and equipment, maintenance and repair services, insurance and consulting companies. Thus, a

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developed transport infrastructure helps reduce prices and expand the range of products and services. Transport also plays an important role in linking the various elements of production and consumption, facilitating the efficient allocation of resources and the mobility of the workforce. Sustainable economic growth directly depends on the level of development of transport infrastructure and the efficiency of its management. Therefore, it is strategically important to develop and implement effective mechanisms for managing transport systems aimed at achieving maximum benefit and minimizing costs and inconveniences.

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