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Transport systems of cities in the processes of new industrialization

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***Abstract*—The article discusses the relationship of transport systems and industrial complexes in years in the context of changes in industrial policy in the direction of new industrialization. Based on the example of Krasnodar, possible directions for the development of the city's transport system for the implementation of industrial policy are considered. Search for the optimal boundaries of the city should be sought not in the physical (territorial) of its borders, but in a combination of factors that ensure the convenience of the residents living in it. This is the key to solving the dynamic structure of the city. An example of the creation of the main street of freight traffic, which will increase the speed of delivery of goods to the main industrial and logistics centers, will solve the problem of routing the main freight traffic bypassing the centrally-loaded streets of the city, as well as residential areas and recreation areas.**

Keywords — Industrialization, transport, freight traffic, transport network, routing, industrial policy, main street of freight traffic

In recent years, fundamental changes have taken place in the sectors of the country's economy, without which further intensive development is impossible. As shown by studies of the Russian Public Opinion Research Center (VCIOM), conducted in 2016, in Russia today a public demand for a new economic policy has been formed: 65% of the country's residents believe that the government needs to develop an economic course , different from the current.

Scientists consider one of the possible instruments for the "struggle" against the consequences of the economic crisis to be the "new industrialization of the country". [1] The proposal of the "new industrialization", according to VCIOM studies, is supported by 26% of the country's inhabitants. At the same time, more than half of citizens do not want to live near industrial enterprises, only 11% of people would like their children to work "in production".

Modern world experience in the development and implementation of industrial policy shows that conceptual approaches, content and tools are radically changing in the direction of new industrialization, which is replacing traditional. [2]

The general principles of "new industrialization" include: the interconnection and interdependence of science, technology and industrial policy; stimulation of relations between universities, research institutes, private capital, state authorities; the formation of scientific and technological priorities at the macro level; stimulating small business; government regulation and control of innovation; continuous monitoring and evaluation of the results of state programs for the implementation of industrial policy. [3]

I. Materials and Equipments

Consider the contribution of transport to the structure of gross value added of the constituent entities of the Russian Federation (Fig. 1). In Russia as a whole, the contribution of transport to gross value added is quite high (9.5%), while transport is viewed as an independent sector of the economy, but road transport is often integrated into the production activities of enterprises in other industries. The transport component in the regional economy varies from 7.6% to 13.2%, which may be due to various factors, such as geographical location, level of development of production, transport networks, urbanization, etc.

Let us consider in more detail the interrelation of transport systems and industrial complexes in the years of Russia. As a rule, large industrial enterprises were historically formed on the outskirts, but the modern rates of urbanization have significantly expanded the boundaries of cities, and the planning situation has changed dramatically (Fig. 2-6). The production capacity has also changed for most enterprises.

According to statistics, about 80% of all industrial enterprises in cities are micro enterprises, about 15% are macro enterprises, and only about 5% are large enterprises. In connection with this, the volume and direction of freight traffic has changed.

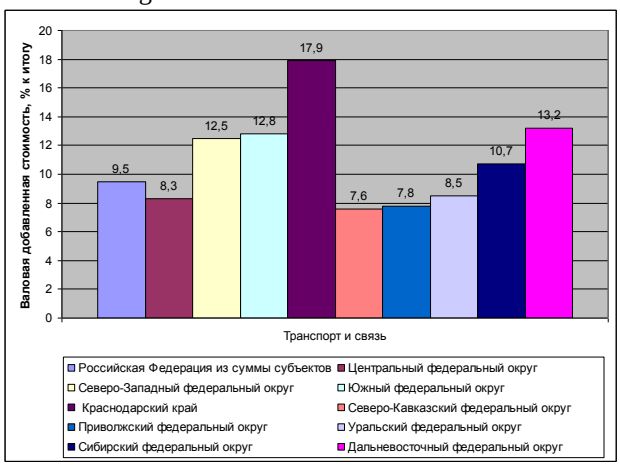

Fig. 1. Sectoral structure of the gross value added of the subjects of the Russian Federation under the section "Transport and Communication"

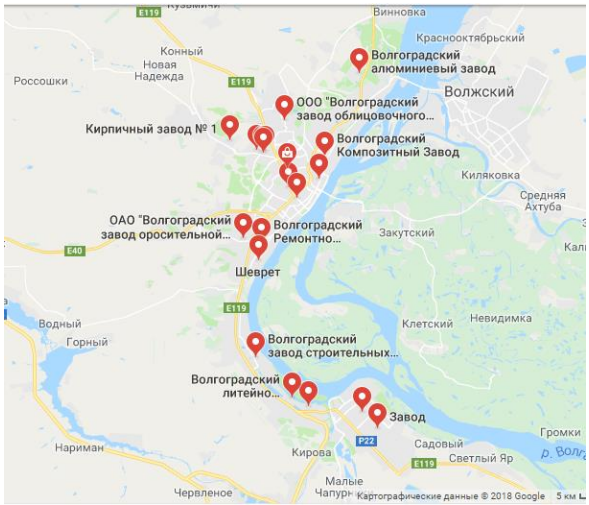

Fig. 2. Placement of industrial enterprises in the cities of the Russian Federation. Volgograd

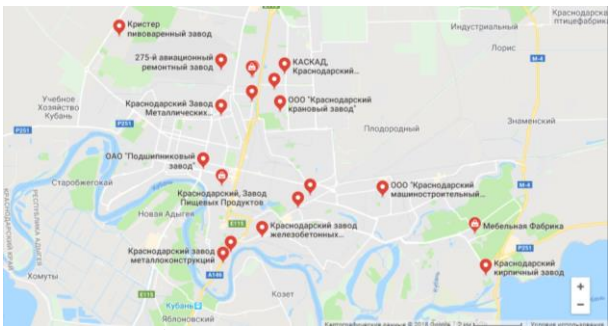

Fig. 3. Placement of industrial enterprises in the cities of the Russian Federation. Krasnodar.

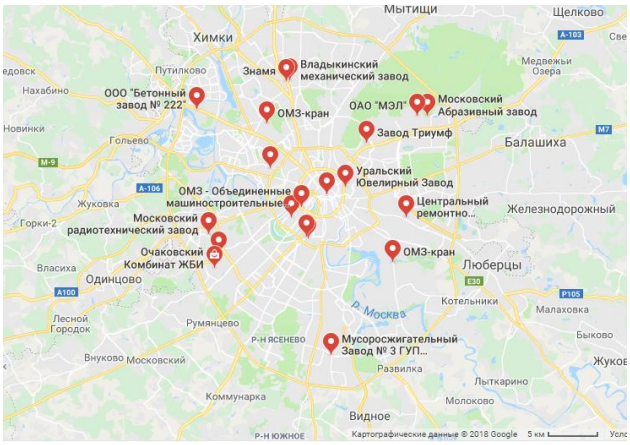

Fig. 4. Placement of industrial enterprises in the cities of the Russian Federation. Moscow.

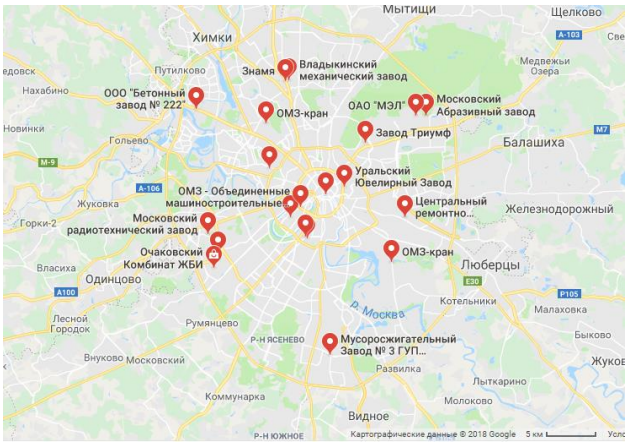

Fig. 5. Placement of industrial enterprises in the cities of the Russian Federation. Rostov-on-Don.

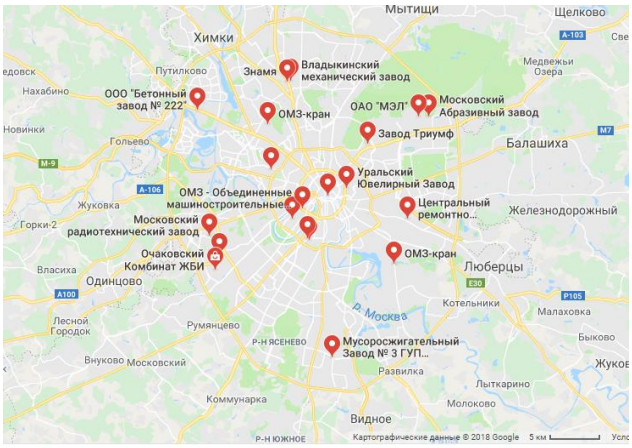

Fig. 6. Placement of industrial enterprises in the cities of the Russian Federation. St. Petersburg.

The old methods of planning and building cities have long come into conflict with the increasing scale of traffic, the capacity of the road network, types of transport and pedestrians. The creation (functioning) of industrial-residential complexes with a closed labor balance will not be able to resolve this contradiction with an expanding technological process of production.

City transport systems are not ready for the beginning of the new industrialization processes, as increasing volumes of cargo transportation, integrating into existing traffic flows, interfere with urban traffic and reduce the speed of freight traffic, which negatively affects the reliability of production systems.

II. Analysis of Simulation Results and Experimental Data

Consider the example of the city of Krasnodar, the possible directions of development of the transport system of the city for the implementation of industrial policy ("new industrialization"). To simulate the volume of transport work in networks with a known placement of cargo-generating and cargo-absorbing objects of the city, it is effective to apply predictive models. Based on the results of the study of freight traffic in Krasnodar [4], it was developed the graph of transport links (Figure 7).

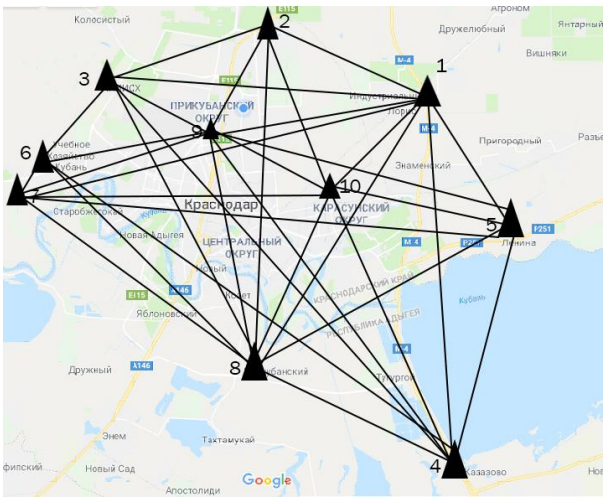

Fig. 7. Transport links of freight transport in Krasnodar

The most significant cargo-forming and cargo-absorbing objects of the city are chosen as nodes of the graph. The use of various calculations performed on this graph allows us to construct the optimal route for moving goods. However, most of the edges of the graph intersect the central part of the city and do not effectively integrate into the street-road network with its temporal and spatial restrictions for freight transport (Figure 8).

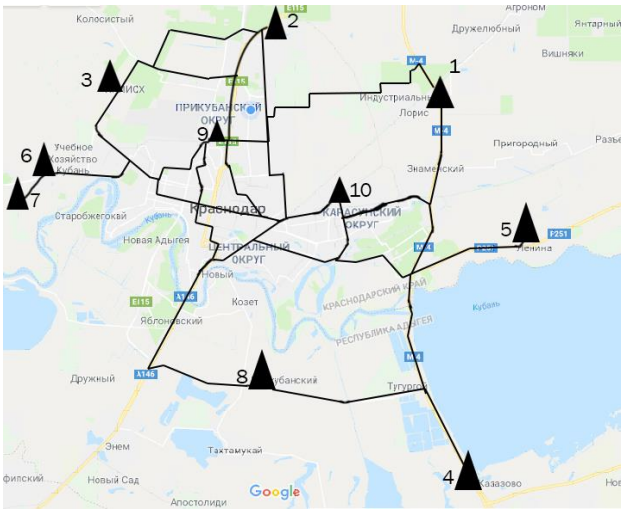

Fig. 8. Estimated route network of freight transport in Krasnodar

When constructing the route network, transit traffic was not taken into account, which has an impact on the tension in the links of the graph (Figure 7). Considering that the total intensity of local and transit freight traffic at the links of the graph located in the northern and western parts of the city exceeds 30% of the total traffic intensity, it is advisable to create a main street freight traffic (Figure 9).

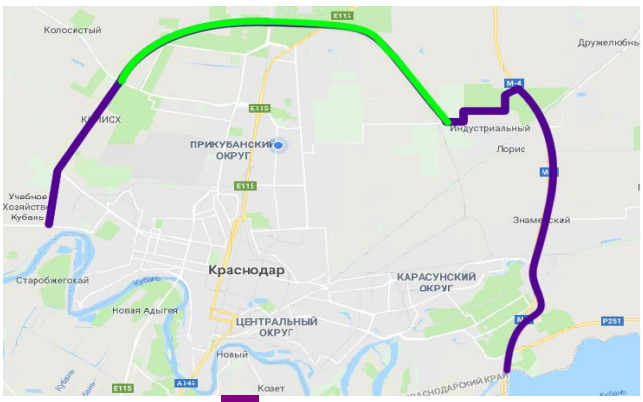

Fig. 9. Driving bypass freeway

III. Conclusion

This main street of freight traffic will increase the speed of delivery of goods to the main industrial and logistics centers. It will allow to solve the problem of routing the main freight traffic bypassing the streets in the city center loaded with local transport, as well as residential and recreation areas.

Search for the optimal boundaries of the city should be sought not in the physical (territorial) of its borders, but in a combination of factors that ensure the convenience of the residents living in it. This is the key to solving the dynamic structure of the city.

Creating a unified system of a city's transport hub (road, water and rail), taking into account the creation and

development of industrial enterprises, can improve service and coordination of all types of transport.

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