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THE DEVELOPMENT OF RESOURCE POTENTIAL OF URBAN PLANNING RESERVES IN MEGAPOLISES

The article shows the results of theoretical research in the field of spatial development of the territory and the settlement. Infrastructure provision of the forming Greater Samara megapolis is considered in the dialectical confrontation of internal and external influence factors in relation to the global transport map. There are made practical proposals for the territorial settlement formation system of Samara province based on the development of towns interaction in the structure of the marginal zone of Samara agglomeration with peripheral local systems of rural settlement. The author makes models of multi-modal transport and logistics hubs (Multihubs) in promising "growth poles", which are going to be at the points of contact of the peripheral marginal zone of the Samara agglomeration with local rural settlement systems.

В статье отражены результаты теоретических исследований автор в области пространственного развития территории и расселения. Инфраструктурное обеспечение формирующегося мегалополиса Большая Самара рассматривается в диалектическом противоречии влияния внутренних и внешних факторов во взаимосвязи с глобальной транспортной картой. Вынесены практические предложения по формированию территориальной системы расселения Самарской губернии на основе развития взаимодействия малых городов в структуре окраинного пояса Самарской агломерации с периферийными локальными системами сельского расселения. Автором моделируются варианты размещения мультимодальных транспортно-логистических узлов (Мультиузлы) в перспективных «полюсах роста», которые намечаются в местах контакта периферийного окраинного пояса Самарской агломерации с локальными системами сельского расселения.

Keywords: Urban planning reserves, Transport and communication framework, Megapolis, Town, Contact Points

Ключевые слова: градостроительные резервы, транспортно-коммуникационный каркас, мегалополис, малый город, контактные узлы

Utopia is a projection of a myth into the future.
Plato Aristocles

With the development of urbanization, and the desire of people to live in cities, the proportion of the population living in rural areas is greatly reduced. Every year, the number of people living in rural areas decreases significantly around the world, according to the report titled "Prospects for World Urbanization." This report is annually compiled by a UN special agency, which analyzes the living conditions of people in different countries of the world [1]. The current stage, in the development of urban planning in Russia, is associated with the search and assessment of the resource potential for territorial reserves in the suburban areas of megalopolises. This corresponds to the concept of sustainable development proclaimed at the epoch-making, high-level meeting "Earth Planet," held in 1992, in Rio de Janeiro. It focused on the development of megalopolises.

Urbanization is closely related to many political processes in states. In Russia, since the mid-1960s (during the historical period of the Khrushchev Thaw), there has been an increase in the urban population compared to the rural

population. The prerequisites for urbanization were the development of industry, trade, science, and the growth of transport infrastructure in cities. They also included the development of cultural and political functions, and the agricultural mechanization, while unemployment was also registered in remote rural areas. The process of growth and development of the suburban areas of megalopolises led to suburbanization. Included as a result of suburbanization, the urban agglomerations were formed.

The active development of suburbs are zones located beyond the administrative boundary of the city. They are located at a distance of a one and a half hours drive from the center of the city. These launched the centrifugal process of migration for the urban population. They also helped transfer, to the countryside, forms of economic activity (typical for cities), and they also helped with the construction of industrial enterprises of utility zones, and warehouse territories.

The hourly migration of suburban population to cities has resulted in traffic congestion, which has caused environmental harm, waste of time, and other issues. To combat this, many developed countries are pursuing a policy for the

development of public transport in the suburbs; for example, suburban railway and light rail transport, the network of regional trains in Paris, and the formation of transport hubs with intercepting parking lots.

As of 2018, more than half of the global population lives in cities of Russia (3.9 billion people), and the amount of citizens continues to grow [2]. At the moment, there are 15 cities in Russia, each of which a population within the city limits exceeds 1 million people. The current statistics reveal that in terms of the number of cities with a million-plus population, Russia ranks fourth after China, India, and Brazil [3]. In accordance with the political and administrative macro-zoning in Russia, most of the million-plus cities are located in the Volga Federal District (Samara, Nizhny Novgorod, Kazan, Ufa, and Perm). The Volga region, located at the intersection of the latitudinal axis (Trans-Siberian Railway) and the meridional axis (the Volga River), has significant urban planning resources for organizing modern multi-hubs. These hubs are designed for the transportation and storage of goods, and the transport of passengers, as well as the placement of goods in special storage facilities. In 2018, the percentage of the urban population in the Volga Federal District amounted to 73.7 % (high level of urbanization), and as of 2019, unemployment among the rural population was 1.7 times higher than among the urban inhabitants [4].

Megalopolis Big Samara

In 1586, by decree of Tsar Fyodor I Ioannovich, Samara was founded as a border fortress and trade gate of the Russian state to the East. Samara is located on the left bank of the Volga, which is the largest river in Europe. When the city was built, the rivers changed their course and came to the city forming an arrow of rivers, convenient conditions for berths and cargo transshipment was provided, since horse-drawn and river transport were the main transport until the middle of the XIX century.

In 1688, Samara was granted the status of a city. From there, it began to perform the functions of a military border base and a center of trade with the East. Later in the 1730s, the center of the Orenburg expedition (for the development of the southern Ural and eastern lands of the Russian state) was located here. The city developed rapidly, as mills and numerous industries with barns all worked and developed. There were 375 trade shops and about 200 courtyards in the city. The city population exceeded 7 thousand people. In 1780, various state institutions were opened in Samara, such as treasury, courts, city government and other organizations, including manufacturing industries like furniture and weaving factories. In order to

streamline the city development, in 1782, the city administrators approved the general development plan in accordance with the regular "Catherine's" plan.

In 1834, Efim and Miron Cherepanov created the first steam locomotive in Russia. They put into operation the first steam-powered train in Russia, at the metallurgical plant of Nizhny Tagil. From the 1880s to the 1950s, there was an accelerated urbanization of Samara. The city has changed from a fortress and the administrative center of Russian colonization to the East, to one of the largest industrial and cultural centers in Europe. The foundations are being laid for the formation of enterprises for future industrial clusters, such as petrochemical, aerospace, mechanical engineering, automotive, and also a large cluster of the construction industry and building materials. In the 1960s, in view of construction for the backbone organizations AvtoVAZ and Kurumoch airport, the cities of Togliatti and Syzran (which are part of the Samara province agglomeration) are developing in conjunction with each other, but also independently, in many respects.

Currently, after the transition of the post-industrial stage to the information technology society, scientific developments are becoming the main driving force of the economy, and they have formed as the knowledge industry base.

The megalopolis Big Samara is considered in the structure of the Samara agglomeration. Its cores are the largest transport, industrial, cultural and scientific centers (Samara, Togliatti, and Syzran). The Samara agglomeration has a population of 2.3 to 2.7 million people (depending on the options for determining its boundaries), which is the third highest in Russia in terms of population. It is polycentric in the form of spatial organization. The agglomeration also includes the cities of Novokuibyshevsk, Chapaevsk, Zhigulevsk, Kinel, Otradny, Pokhvistnevo, and other small towns.

Samara, the sixth most populous city in Russia, is developing dynamically and spreading extensively in all directions, with the exception of the territories of the Samarskaya Luka National Natural Park (200 thousand hectares). However, the centripetal process of agglomeration leads to the population migration from outlying districts of the countryside [5].

The sub-centers are distinguished as part of the Samara agglomeration, which are small towns and settlements located on the regional transport framework. They are situated close to the local systems of rural settlement (Aerotropolis Kurumoch, Krasny Yar, Kinel, Roshchinsky, Dubovy Umet, Chapaevsk, Kuzovatovo, Privolzh'ye, Obsharovka, Shigony, Klimovka, and Khryashchevka). From them, along the main

directions of azimuths, transport routes (railway and highway) extend to local settlement systems.

Theoretical model and principles of formation of the marginal zone of the Samara agglomeration

The Samara agglomeration has all the prerequisites for construction of any scope. The vehicle-to-population ratio is one of the highest in the country, by virtue of the operation of an automobile plant in Togliatti, where the university, the Zhigulevskaya Valley technopark, the Special Economic Zone, the Territories of Advanced Development, and some of the largest industrial enterprises are situated. The prerequisites for integrated urban development are largely reduced to identification and analysis of internal and external factors that determine the developmental processes. Internal factors include social, demographic, scientific and educational aspects; external factors are represented by migration of labor resources from other regions of Russia and neighboring countries, the advantageous geopolitical location of the Samara province, at the intersection of latitudinal and meridional flows of citizens, for labor purposes.

The definition of the marginal zone of the agglomeration is an area within 1.5–2 hours of availability that has two-way traffic (of the inhabitants of the region) to new places of employment and service centers. Despite the significant territory involved in polarization of settlement, the marginal zone of agglomeration is still sparsely-populated, and the agglomeration requires improvement of the transport framework, as well as the creation of capital construction projects.

Since the 1960s, the projects of the Regional Planning Schemes, and the Spatial Planning Scheme of the Samara province, were comprised of project proposals for the targeted interrelated development of Samara, Syzran, and Togliatti. The scientific research of the Samara agglomeration has been conducted, including the involvement of international scientists and urban planners. In the 1990s, scientific communities considered several strategies for the spatial development of the Samara agglomeration, including the formation of a forest-park protective belt. It would neighbor remote satellite towns, the radial beam development of the agglomeration around Samarskaya Luka ("five fingers"), and the linear conurbation [8]. The study was mainly for theoretical significance, the real development of agglomeration, combined simultaneously with several strategies of territorial and spatial development. The priority development was based on the latitudinal transport and communication framework, created by the 1990s, for settlement along the route of the

Kuibyshev railway (an important part of the Trans-Siberian Railway). For a long time, the southern and southeastern directions remained the least provided with a transport infrastructure in the Samara province, for a number of reasons.

The urban development framework for the settlement of the Samara province was formed in the latitudinal direction from the Penza and Ulyanovsk regions to Syzran – Bezenchuk – Chapaevsk – Novokuibyshevsk – Samara – Kinel – Otradny – Pokhvistnevo to Orenburg. In the north-south direction, it was Kirov – Kazan – Togliatti – Samara – Pugachev – Atyrau (Fig. 1). Attention to the southern direction, and the construction of the Kirovsky bridge across the Samara River, enabled the development of vehicle cargo transport in the southeast direction.

The Ministry of Transport of Samara is working on the strategy of spatial development for the Samara province. It has planned to build a high-speed railway link along the route of Novokuibyshevsk – Samara – Kurumoch airport – Togliatti. The marginal zone of the Samara agglomeration is formed along the encircling highway, and it constitutes the main transport frame. Territorial industrial and agricultural areas are discussed [6]. The development of high-speed types of transport, the need for quick and comfortable movement from remote parts of the city to the central one, will significantly develop the planning structure of the city. An important role in the formation of an interconnected transport system of the megalopolis will be played by the development of a network (of high-speed railways and innovative projects) such as Hyperloop.

The freight and passenger transport infrastructure has been greatly improved, taking into account the perspective plans for the spatial development of the Samara province (high-speed electric train Bezenchuk – Samara – Kurumoch – Togliatti – Ulyanovsk and further to the north). It also considers inclusion of the Samara province in the global transport corridors of possible directions (of Europe – Western China and the Arctic – Northern Iran). For these purposes, contact hubs at the points of the marginal agglomeration zone should be formed along the most important existing directions, and along the directions which do not yet have fixed railway and highway transport in the southern and southeastern directions (Dimitrovgrad, Elkhovka, Chernovka, Otradny, Neftegor'sk, Bolshaya Glushitsa, Pestravka, Ishkovo, Novospasskoye, Kuzovatovo, Terenga, and Sengiley) [7,8].

Syzran

The city of Syzran is located in the Samara province, and it is one of the cores of the Samara

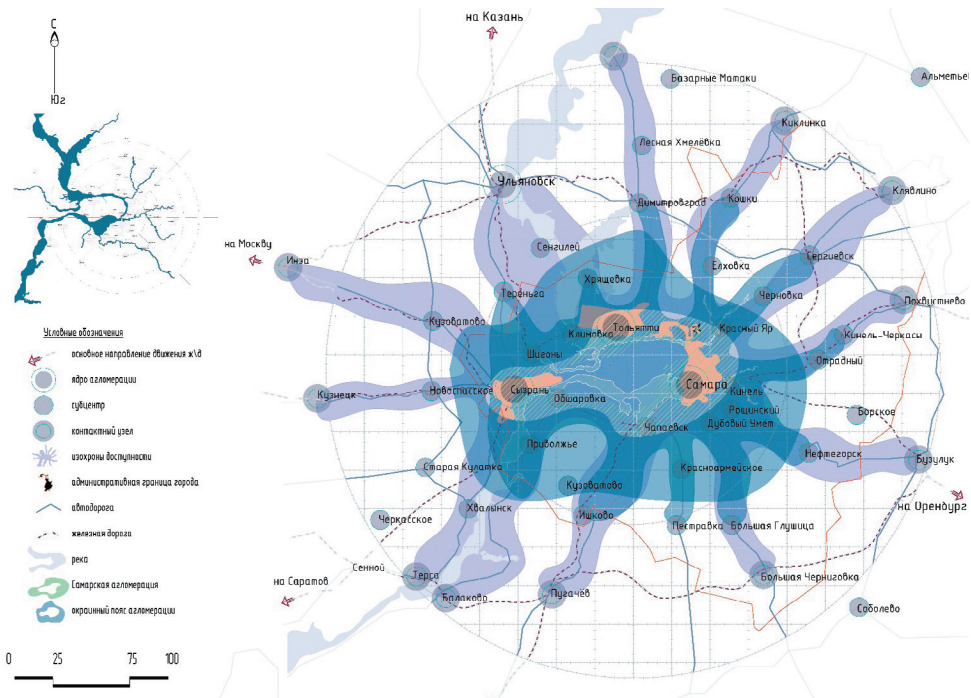


Fig. 1. Development of resource potential in the Big Samara megalopolis

На Казань	To Kazan
На Москву	to Moscow
Базарные Матаки	Bazarnye Mataki
Лесная Хмелевка	Lesnaya Khmelevka
Киклинка	Kiklinka
Ульяновск	Ulyanovsk
Димитровград	Dimitrovgrad
Кошки	Koshki
Сенгилей	Sengiley
Хрящевка	Khryashchevka
Елховка	Elkhovka
Сергиевск	Sergievsk
Тереньга	Terenga
Черновка	Chernovka
Инза	Inza
Кузоватово	Kuzovatovo
Тольятти	Togliatti
Климовка	Klimovka
Красный Яр	Krasny Yar
Шиганы	Shigany
Отрадный	Otradny
Кузнецк	Kuznetsk
Новоспасское	Novospasskoe
Сызрань	Syzran

Обшаровка	Obsharovka
Самара	Samara
Кинель	Kinell
Рошинский	Roshchinsky
Дубовый умет	Dubovy Umet
Чапаевск	Chapaevsk
Приволжье	Privolzh'ye
Старая Кулатка	Staraya Kulatka
Барское	Barskoe
Красноармейское	Krasnoarmeyskoe
Нефтегорск	Neftegorsk
Хвалынский	Khvalynsk
Ишково	Ishkovo
Черкасское	Cherkasskoye
Сенной	Sennoy
Терса	Tersa
Балаково	Balakovo
на Саратов	to Saratov
Пугачёв	Pugachyov
Пестравка	Pestravka
Большая Глушица	Bolshaya Glushitsa
Большая Черниговка	Bolshaya Chernigovka
Соболево	Sobolevo
С	North

Юг	South
Условные обозначения	Graphical symbols
основное направление движения ж/д	main direction of railway traffic
ядро агломерации	agglomeration core
субцентр	subcenter
контактный узел	contact unit
изохроны доступности	availability isochrones

административная граница города	administrative boundary of the city
автодорога	highway
железная дорога	railway
река	river
Самарская агломерация	Samara agglomeration
окраинный пояс агломерации	marginal agglomeration zone

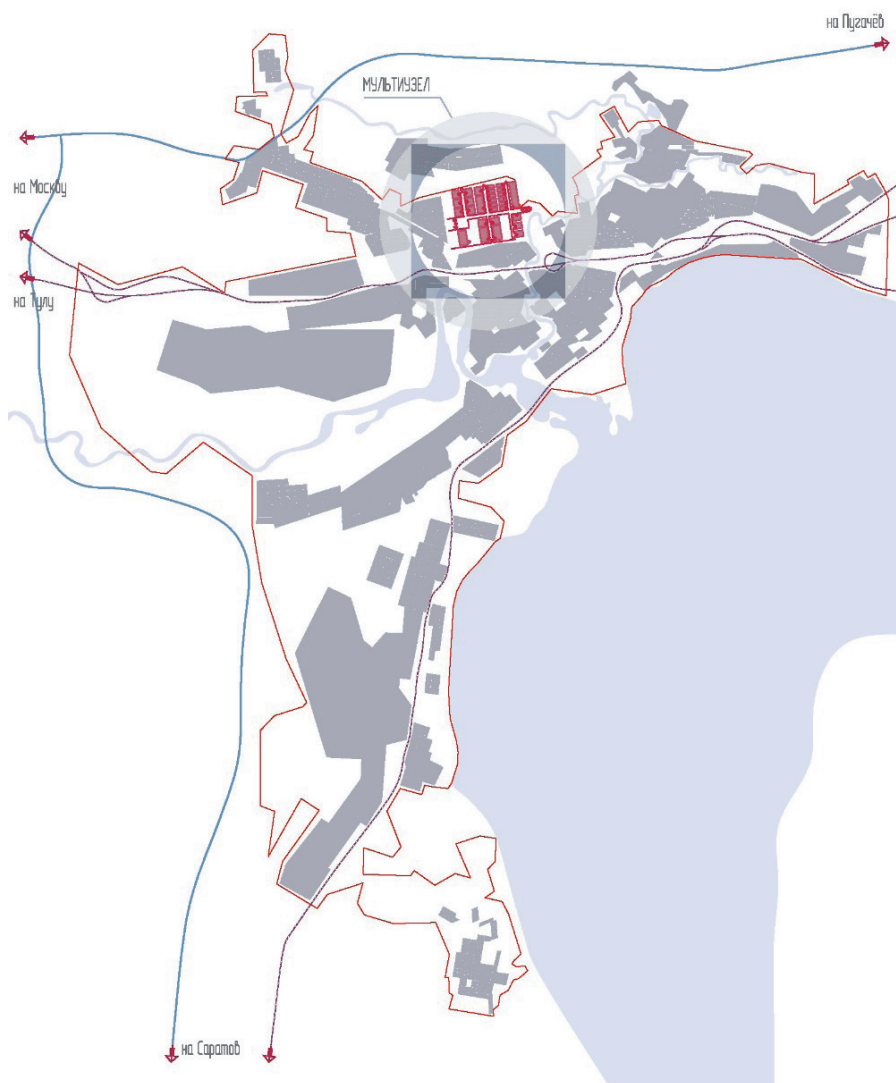


Fig. 2. Variant of placement of the Multi-hub in the city of Syzran

На Пугачёв	to Pugachyov
Мультиузел	Multi-hub
На Москву	to Moscow
На Тулу	to Tula
На Саратов	to Saratov

agglomeration. It is the third most populous city in the Samara province specifically, with the area of 117 sq. km and the population of 173 thousand people.

The city is comprised of a well-developed industrial sector. Syzran is a major railway junction of six directions.

Syzran is very well-suited for the placement of multimodal transport and logistics centers (Multi-hub). The proposed option is located within the city limits, near bypass roads and railways. The territory will include utility and warehouse blocks, as well as trade representations and business centers, food services areas, a sports center, and a number of other innovative clusters (Fig. 2). [9,10].

Kinel

The city of Kinel, Samara province, is located 40 km from the provincial capital. It has been developed due to the construction of the railway

and the extension through the territory of Russia to the east. The area of the city is 36.75 sq. km, with the population of 35 thousand people. By 1916, Kinel was the class 1 station, which was classified as one of the largest stations in Russia at that time. And even then, the railway was considered a city-forming industry for the area.

Kinel combines two key parameters for the location of the Multi-hub. It can become another center for the placement of a transport infrastructure, connecting Samara province to international transport corridors (Fig. 3) [11].

The nearest prospect for the development of a settlement will be attracting the population to the growth poles, and the establishment of a high standard of living in them. This can be obtained through cultural and social services, conditions for education, sports, and health care, as well as creation of opportunities for fast transportation

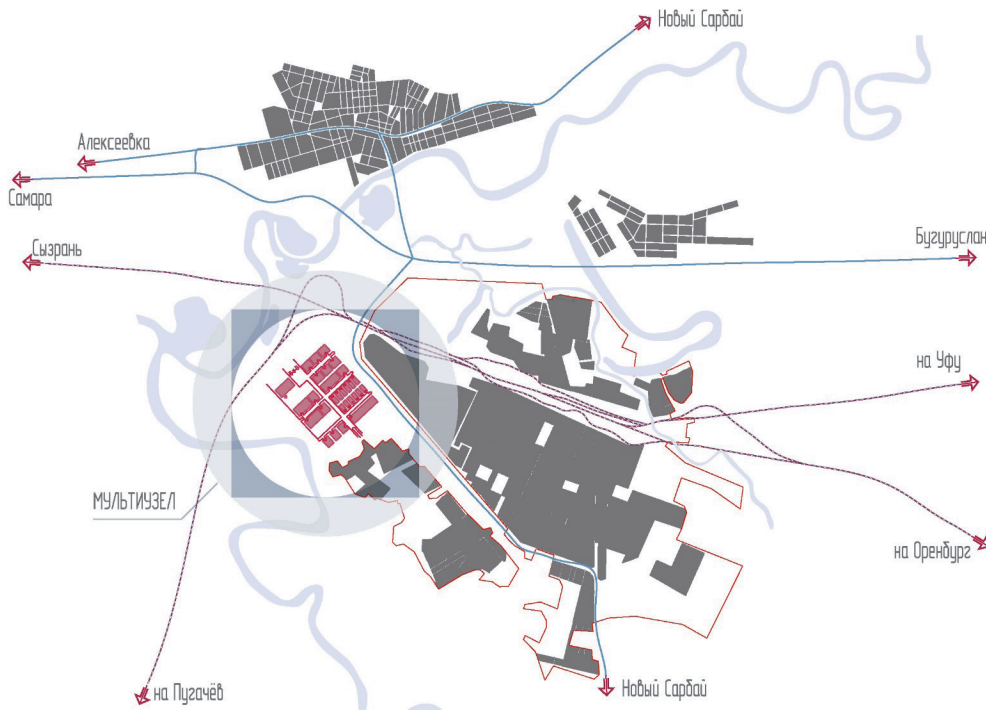


Fig. 3. Variant of multi-hub location in the city

Новый Сарбай	Novy Sarbay
Алексеевка	Alekseevka
Самара	Samara
Сызрань	Syzran
Мультиузел	Multi-hub
На Пугачёв	to Pugachyov
Бугуруслан	Buguruslan
На Уфу	to Ufa
На Оренбург	to Orenburg

between agglomeration centers and sub-centers, using high-speed public transport in places where transport hubs are created, instead of personal transport [12]. Currently, Samara is implementing long-term strategies of social and economic development, focused on the development of the transport complex, Multi-hub. Creation of a network of multi-hubs in the Volga region, the Urals, Siberia, and the Far East can fundamentally solve the problem of cargo delivery and passenger transportation according to "convenient schemes." This process happens by reducing the cost of transportation and travel time. This work will result in the development of "growth poles" of phases 1, 2, and 3, at the contact centers for the intersections of transport and infrastructure frames.

Conclusions

The road has always stimulated the intensive development of the adjacent territories. As cities grew and evolved to megalopolises, large industrial complexes were formed within their boundaries. Technoclusters were strongly developing.

The principles of phased development for the short-term, medium-, and long-term prospects of the transport and communication framework, for the Samara province and the Samara agglomeration, in particular, are as follows:

1. Favorable economic and geographical position of the Samara agglomeration enables consideration of the Samara province as a promising region of Eurasia;

2. Analysis of the existing system of settlement revealed that the dynamics of centripetal flows from rural areas to the agglomeration cores through potential sub-centers;

3. The sub-centers of the Samara agglomeration have been identified: Aerotropolis Kurumoch, Krasny Yar, Kinel, Roshchinsky, Dubovy Umet, Chapayevsk, Kuzovatovo, Privolzh'ye, Obsharovka, Shigony, Klimovka, and Khryashchevka;

4. "Growth points" were determined in the places of contact of settlements of the agglomeration marginal zone, with local rural settlement systems and contact hubs, such as: Dimitrovgrad, Elkhovka, Chernovka, Otradny, Neftegorsk, Bolshaya Glushitsa, Pestravka, Ishkovo, Novospasskoye, Kuzovatovo, Terenga, and Sengiley;

5. The following stages are suggested in the theoretical model, developed by the author, as the principles of the future urban development for the agglomeration marginal zone in conjunction with peripheral rural settlement systems:

– Development of sub-centers of agglomeration with the priority of forming settlement in the southeastern and northeastern directions, with new volumes of housing, cultural and social

construction, and new industries to create new workspaces;

– Development of a suburban and transit network of railway transport in the Samara province, to reinforce the connectivity of settlements in the agglomeration outskirts, with small towns and settlements in the radial territorial-industrial agrarian directions (I.N. Yakovlev);

– A long-term prospect for the development of connecting the Samara province to high-tech international transport corridors identified as: the Arctic – Western Asia and Europe – North America.

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