Principles of Urban Planning Development of Suburban Belt of Samara-Togliatti Agglomeration

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Abstract. The article deals with the solution of such issues that are associated with the development of the suburban belt of Samara-Togliatti agglomeration-conurbation (STA) and problems that are connected with infrastructural changes in the region. The article shows the results of theoretical researches in the sphere of territory and settlement spatial development. There is considered historical development of the settlement structure of the Samara guberniya. The infrastructural support of the forming the Greater Samara megapolis is considered in the dialectical contradiction of internal and external factors in cooperation with the global transport map. There are made practical proposals of a territorial settlement system formation of the Samara guberniya based on the development of related towns in the structure of the STA suburban belt with peripheral local rural settlement systems. There is considered the potential development of the STA subcenters (Samara-Arena, aerotropolis Kurumoch, Krasny Yar, Kinel, Dubovy Umeet, Chapaevsk, Bezenchuk) and potential contact points of the STA suburban belt with local settlement systems (Dimitrovgrad, Otradny, Pestravka, Novospasskoye, etc). The authors of this article were tasked to explain the principles of phased development for the near, medium and long-term perspective of the STA transport and communication framework. Currently, there are strong centripetal trends of movement from rural settlement systems to subcentres of STA. To create the opposite centrifugal movement, it is proposed to develop capital residential and industrial construction in potential contact points of the STA suburban belt with local rural resettlement systems, creating employment for high-qualified labour. On the 2nd phase, these traffic flows should be strengthened by high-speed railway transport. The authors propose variants of the placement of multimodal transport and logistics hubs (Multihub) in promising "growth poles", which are planned to be at the contact points of the peripheral suburban belt STA with local rural settlement systems. In the long term it is suggested to identify areas of town-planning reserves for the formation of Multi-hubs in order to include the Samara guberniya in the structure of the currently planned international transport corridors Europe - America and the Arctic – Southwestern Asia. There is emphasized the development of the south and the south-east direction, the perspective development of the transit railways network.

1. Introduction

The current period of urban development in Russia is connected with the search and assessment of the resource potential of territorial complexes, that meets the concept of sustainable development, proclaimed at the historical summit “Planet Earth” in 1992 in Rio de Janeiro dedicated to the development of megapolis. The main direction at this conference was a qualitative increase of the
territory and rational consumption of natural resource potential. During the urbanization development and the desire of people to live in cities, the share of the population that lives in rural areas is greatly reduced. Every year fewer people stay in rural areas around the world according to the report “Prospects for World Urbanization”, which analyzes the living conditions of people all over the world. Every year this report is made by a special UN agency [1]. Urbanization is closely connected with many political processes in different countries. Since the mid-1960s, in the historical period “Khrushchev Thaw”, Russian urban population increased in comparison with the rural one. The prerequisites for urbanization were the development of industry, trade, science and the growth of transport infrastructure in cities, the development of cultural and political functions, the mechanization of agriculture, while unemployment was also observed in remote rural areas. The process of growth and development of large cities' suburban area led to suburbanization. As a result, of suburbanization, urban agglomerations formed.

The active development of the suburbs – zones located around large megacities, has launched the centrifugal process of the urban population migration, the forms of economic activity transfer to the countryside that usually characterize the cities and the construction of industrial enterprises and warehouse area. Hourly migration of suburban residents to cities led to traffic jams, which caused harm to the environment, waste of the time and other problems. To combat this, in many developed countries, a policy of developing of public transport in suburbs. For example, there is a network of regional trains in Paris and formation of transport hubs with intercepting parking lots.

In 2018, more than half of the world's population lives in cities - it is 3.9 billion people and the number of citizens continues growing [2]. At present, there are 15 cities in Russia in each of which the population within the city borders exceeds 1 million of people. In current statistics Russia ranks 4th after China, India and Brazil [3]. According to the political and administrative macro zoning in Russia, the largest number of millionaire cities is in the Volga Federal District (Samara, Nizhny Novgorod, Kazan, Ufa, Perm). The Volga region is situated at the intersection of the latitudinal axis (Trans-Siberian Railway) and the meridional axis (the Volga River), has significant urban development resources for building modern Multihubs for the goods transportation and warehousing and the public conveyance. In 2018, the percentage of the urban population in the Volga Federal District reached 73.7% (high level of urbanization), unemployment among the rural population in 2019 is 1.7 times higher than among the urban population [4].

2. The greater samara

In 1586, by Tsar Fyodor I Ivanovich decree, 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 largest river in Europe - the Volga river. When the city was built, the rivers changed their flow and came to the city, forming a river spit, convenient conditions for berths, as the main transport inside the country was horse-drawn and water transport, also it provided cargo transshipment.

2.1. Brief review of the prior development settlement development

In 1688 Samara got the status of the city and started fulfilling the functions of a military border base and center of trade with the East. Later, in the 1730s, there was located the Orenburg exploration center of the expedition of the southern Urals and eastern lands of the Russian state. The city developed rapidly: there were working mills and numerous of industries with granaries were developing. In the city there were 375 trading shops, about 200 yards and the population of the city exceeded 7 thousand people. In 1780, in Samara were opened various state institutions: Treasury Department, courts, city government and other organizations, including manufactories such as furniture and weaving factories. To regulate the city development, in 1782, the Governor General confirmed a development master plan according to the regular "Catherine's" plan.

From the 1880s to the 1950s, there was an accelerated urbanization of Samara. The city was founded as a fortress and the administrative center of Russian colonization to the East and then became one of the largest industrial and cultural centers in Europe. There started forming the
enterprises of future industry clusters - petrochemical, aerospace, engineering, automotive, construction industry cluster and building materials, and others. In the 1960s, due to the construction of the systemically important organizations AutoVAZ and the Kurumoch airport, such towns as Togliatti and Syzran, which are the part of the Samara guberniya agglomeration, started developing in conjunction, but largely independently.

Currently, after the transition from the post-industrial stage to the information technology society, scientific elaborations become the main driving force of the economy – the base of the knowledge industry. The megapolis the Greater Samara is considered in the structure of the STA. Its core are the largest transport, industrial, cultural and scientific centers of Samara, Togliatti and Syzran. STA’s population is from 2.3 to 2.7 mln. (depending on the determination of its borders) – this is the third largest population in Russia, polycentric in the form of spatial organization. The STA also includes such towns as Syzran, Novokuybyshhevsk, Chapaevsk, Zhigulevsk, Kinel, Otradny, Pokhvistnevo and other towns. Samara is the sixth largest population Russian city dynamically developing and expanding extensively in all directions, apart from the territories of the National Park Samarskaya Luka (200 thousand ha). However, the centripetal agglomeration process leads to population migrations from the suburban belt of rural areas [5,6].

2.2. Suburban belt of the Samara-Tolyatti agglomeration-conurbation
STA has all the prerequisites for any kind of construction. At the same time, motorization of the population is one of the well developed in the country due to the work of an automobile plant in Togliatti, where, along with the largest industrial enterprises, there are a university, the technopark “Zhigulevskaya Dolina”, “Special Economic Zone”, “Territories priority development” and others. The prerequisites of complex urban development reduce itself to the identification and analysis of internal and external factors that determine development processes. Internal factors - social, demographic, scientific and educational. External factors - the migration of labor resources from other regions of Russia and neighboring countries, the favorable geopolitical location of STA at the intersection of latitudinal and meridional flows of citizens with labor purposes.

The suburban STA belt is a territory within 1.5-2 hours of access with two-way movement of residents of the region to new places of employment and service centers. Despite the significant territory that involved in the settlement polarization, the suburban agglomeration belt is still under-populated. In general, the agglomeration has an underdeveloped transport framework, which needs to be improved [7]. Since the 1960s, in the projects of district planning schemes and the territorial planning scheme of the Samara guberniya started to be used design proposals for the directed interdependent development of Samara, Syzran and Tolyatti. Scientific research of STA has been conducted, involving foreign scientists and urban planners. In the 1990s, there were considered several scientific strategies of the STA spatial development: the formation of a forest- park safety belt, short-distance and long-distance satellite towns called the “five fingers” - the radial beam development of the agglomeration around the National Park Samarskaya Luka, linear conurbation [8]. The research was mainly of theoretical value, the real development of the STA included several spatial development strategies, the priority development was based on the latitudinal transport and communication framework created by the 1990s over tracing of the Kuibyshev railway (an important part of the Trans-Siberian Railway). For a long time, the south and south- east directions remained the least provided with transport infrastructure in the Samara guberniya.

The urban planning framework of the Samara guberniya resettlement was formed in the latitudinal direction from the Penza and Ulyanovsk regions to Syzran - Bezenchuk - Chapaevsk - Novokuybyshhevsk - Samara - Kinel - Otradny - Pokhvistnevo to Orenburg. The meridional directions - Kirov - Kazan - Tolyatti - Samara - Pugachev - Atyrau. The construction of the Kirov Bridge across the Samara river in the south direction allowed to develop the freight transport in a south- eastern direction. The Samara Ministry of Transport is working on a spatial development strategy of the Samara guberniya. It is planned to build a high-speed rail link on the route Novokuybyshhevsk - Samara – Kurumoch Airport - Tolyatti. The STA suburban belt is formed along the ring road and
forms the main transport frame, territorial industrial and agricultural areas (TIAA) [9,10,11]. The development of high-speed transport, the need of fast and comfortable movement from remote parts of the city to the central one will significantly develop the planning structure of the city. An important part in the formation of an interdependent transport system of the megapolis will be played by the development of a network of high-speed railways and innovative projects such as Hyper Loop [12].

![Diagram of STA suburban belt](image.png)

**Figure 1.** STA suburban belt in the structure of spatial development of Samara.

2.3. STA subcenters
The STA distinguishes subcenters - towns and settlements lying on the regional transport framework, which are located closely to the local rural settlement systems (Aerotropolis Kurumoch, Krasny Yar, Kinel, Roshchinsky, Dubovy Umeet, Chapaevsk, Kuzovatovo, Privolzhie, Obsharovka, Shigony, Klimovka, Khryashchevka). There start the main directions of azimuths transport routes (railway and automobile) to local settlement systems. The nearest large settlements of these local systems must be developed as “growth poles” and contact points of the perspective connection of local systems to STA.

2.4. STA Contact points
Improving the freight and passenger transport infrastructure, taking into account long-term plans for the spatial development of the Samara guberniya (high-speed train Bezenchuk - Samara - Kurumoch - Tolyatti - Ulyanovsk and further to north), the inclusion of STA in the global transport corridors of possible directions Europe - Western China and the Arctic - Northern Iran). For these purposes, it is necessary to form contact points at the STA suburban belt along the most important directions and possible directions of railway and road transport in the southern and southeastern directions (Dimitrovgrad, Elkhovka, Chernovka, Otradny, Neftegorsk, Bolshaya Glushitsa, Pestravka, Ishkovo, Novospasskoe, Kuzovatovo, Terenga, Sengiley). The near-term prospect of the resettlement development will attract people to the growth poles and create a good living conditions there with the
help of the cultural and social services, conditions for education, sports and healthcare, as well as creating opportunities for quick movement between STA centers and subcentres by transfer from personal to high-speed public transport in the places of transport and transfer transport hub creation [13,14,15].

Currently, Samara is pursuing long-term strategies of socio-economic development, in which much attention is paid to the development of complex called Multihub. Creating a network of multihubs in the Volga region, in the Urals, Siberia, and the Far East can solve the problem of cargo delivery and passenger transportation according to “convenient schemes”, reducing transportation cost and travel time. The result of this work will be the development in the contact points of the intersections of the transport and infrastructure frameworks of the “growth poles” of the first, second and third phases.

3. Theoretical model and principles of the STA suburban belt formation
A theoretical model of the phased transport framework development with the modeling of effective territorial zones for multifunctional facilities are able to provide their customers with a service package that meets the modern requirements of the logistics market, initially focused on ensuring the most effective interaction and coherence of all participants in the transportation process in the logistics supply chains. The fundamental elements of the logistics infrastructure of international transport corridors are multimodal transport and logistics centers and terminal complexes located in large transport hubs and seaports. They are not only centers of cargo flows and good transportation concentration and distribution, but also become centers of concentration of entrepreneurship [16].

The principle of the multihub is to form a large transport hub based on a linear corridor and an interdependent system of automobile objects, high-speed rail, air and water transport, which allows increasing the investment attraction and competitiveness of this system.

![Diagram](image.png)

**Figure 2.** A theoretical model for the phased development of the STA suburban belt with three basic principles.
In case of the STA and the Samara guberniya spatial development connect the regional and global transport corridors three fundamental principles can be identified. The STA sub-centers development with the south-east and north-east directions; development of a suburban and transit railway network in the STA, increasing the economic opportunities of the Samara guberniya; connection to global transport and communication corridors (Figure 2). Transport infrastructure not only fixes the planning structure of the city, megalopolis, but also largely determines its following development. Elements of the transport infrastructure are rigidly fixed in space and the higher this rigidity, the higher the class of communication.

3.1. Near-term prospect – the development of STA subcenters
Short-term opportunities include the active development of residential development, new public spaces of the Samara-Arena region, etc., the STA sub-centers – the Samara-Arena district, Aerotropolis Kurumoch, Kinel, Chapaevsk, Shigony and others.

3.2. Medium-term prospect - the development of a railway network in STA
Medium-term project include the formation on the “fingers” the objects of the network structure of a bio-eco-agrocluster. It will supply food and purge organic waste from Samara guberniya; construction of a high-speed railway Samara-Kurumoch-Tolyatti with a prospect for Ulyanovsk and Kazan; the formation of the science city-technopolis of the “Gagarin Center” near Samara-Arena; construction of an interdependent transport system of a high-speed railway network of automobile and water transport, implementation of innovative projects [17].

3.3. Long-term - connecting to global transport corridors. New Silk Road
In the long term, there are possible to realize other “utopian” strategies, one of the most likely to happen - connecting the STA to the international corridor of the New Silk Road (NSR), with the formation of a multihub in Samara for cargo transshipment with subsequent departure around the world. Russia has a favorable geographical position. In the future, Russia can act as an international bridge connecting all continents. The East-West transport corridor passing through Samara guberniya (Europe - Western China) is the shortest route uniting European and Asian countries, and the North-South corridor (Sabetta - Iran) is the shortest route unifying the Arctic with Forward Asia [17].

NSR is the concept of a new intercontinental transport system promoted by China, in cooperation with Russia and other countries, for moving goods and passengers by land from China to European countries across Russia. A high-tech transport system concentrates public transport (rail, road, sea, and pipeline) and telecommunications on general directions. The transport route includes the transcontinental railway - the Trans-Siberian Railway, and the second Eurasian continental bridge going to China and North America. Trains on the world's longest freight railway route from China to Germany will go 15 days, which is 2 times faster than by the sea route through the Suez Canal. The concept of the new intercontinental transport system "one belt - one way" includes many infrastructure projects that should eventually encircle the earth.

4. Conclusions
1. The favorable economic and geographical position of the STA allows us to consider the Samara guberniya as a promising region of Eurasia;
2. The analysis of the resettlement system showed the dynamics of centripetal flows from rural areas to STA cores through potential subcenters;
3. There were determined the types of STA subcentres – Aerotropolis Kurumoch, Krasny Yar, Kinel, Roshchinsky, Dubovy Umet, Chapaevsk, Kuzovatovo, Privolzhie, Obsharovka, Shigony, Klimovka, Khryaschevka;
4. There were determined “Growth points” at the settlements contact points of the STA suburban belt with local rural settlement systems, with contact points – Dimitrovgrad, Elkhovka, Chernovka, Klinovka, Khryaschevka;
Otradny, Neftegorsk, Bolshaya Glushitsa, Pestravka, Ishkovo, Novospasskoye, Kuzovatovo, Terenga, Sengiley;

5. As the principles of future urban development of the STA suburban belt in conjunction with peripheral rural settlement systems, the authors put forward the following stages as a theoretical model:

- the development of STA subcenters with the priority of forming resettlement in the South-East and South directions with residential and cultural construction, new industries increase employment;
- development of the suburban transit railway transportation in Samara guberniya for the connection of settlements in the suburban zone of towns and settlements in the radial directions of the TIAA (I. N. Yakovlev);
- there is defined the long-term prospect of connection of Samara guberniya to high-tech international transport corridors – Arctic – Western Asia and Europe – North America

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