

# Specificity of the Airport Adjacent Areas Urbanization in Russia



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**Abstract** Recently, a new trend in the process of urbanization has appeared in the most developed countries: the formation of airport adjacent cities, called Aerotropolises. Initially, they were formed naturally, and in the course of development, the area of large airports influence gradually expanded, became compacted and functionally complicated. In recent years, in foreign practice, aerotropolises have started to develop purposefully according to pre-designed projects. This process occurred in Russia due to socio-economic changes. Following the Western countries, a number of Aerotropolis projects have now been developed. Their implementation is expected in the largest agglomerations of Russia. The article considers “airport adjacent areas urbanization” as a special trend of the general urbanization process with the Russian specifics. A comparative analysis of the main features and conditions of the urbanization process in Europe, Russia and the USA is presented. The real conditions of “airport adjacent areas urbanization” development in Russia at the present stage are revealed. The ways of effective planning of this process are offered.

**Keywords** Urbanization · Airport · Aerotropolis · Airport adjacent areas · Environmental density · Diversity of functions and structures

## 1 Introduction

The processes of urbanization in the modern world are an ongoing phenomenon, but with the emergence of new cities, they take on specific forms. The level of air transport development today is so high that international airports all over the world are becoming not just transport hubs, but significant city-forming objects stimulating regional development. Recently, the need to develop Aerotropolises the centers of which are large airports was understood all over the world.

The term «Aerotropolis» was introduced in 2000 by American scientist John D. Casarda. The modern airport and its work, for the scientist, are comparable to the

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“physical Internet”. Airports play dual roles because they are now air highways and global–local interfaces, which turn airports into “business magnets” and catalysts regional economies as they attract, support and develop aviation and non-aviation infrastructure in their area influences [1]. Much attention was paid to the layout of the territory [2].

Spatial development of areas around airports was described by Güller and Güller [3]. The sequence of formation of aeroportocentric urbanized territories is determined by Stengel [4]. The variety of forms of airport-centric systems and their interaction with the city was investigated by Shaafsma [5].

Interest in the topic of “near-airport urbanization” has increased among Russian urban planners and economists. The increasing role of airports as nodes of the support frame was noted by Lezhava and Kudryavtsev [6]. The economic model of the consistent development of aerotropolis was proposed by Fedorova and Chizhevskaya [7]. Veretennikova has studied in detail the specifics of formation of near-airport territories on the example of number of Russian cities [8].

Currently, the regions with developed agglomerations, forming the core of the territorial organization of the country, provided for the creation of an Aerocity or Aerotropolis in their strategic documents. In attempts to adapt the scheme of the development of “air cities” developed by the American scientist J.D. Kasarda, projects for the territories planning around the international airports of Novosibirsk, Yekaterinburg, Samara, Kazan, Rostov-on-Don were proposed.

However, it must be understood that the process of urbanization is closely linked to the country’s development history. The simple transfer of the principles of design and organization of such complex socio-territorial systems as aerotropolis from abroad is fraught with subsequent failures and the inefficient use of financial resources. It is essential to understand the specifics of the process of urbanization in Russia, to identify negative factors so that they can be eliminated, and to stimulate positive factors that ensure the movement forward.

## ***1.1 The Research Relevance***

The relevance of the study is due to the growing interest of Russian urban planners and economists in the process of the formation of large urban formations (aerocities, aerotropolises) that are formed on the basis of international airports. In Russian urban planning science, the process of forming urban areas around airports is called airport-centric urbanization. “Airport-centric urbanization of territories” is a process of interaction between an airport and a city, expressed in the urbanization of the territories surrounding the airport with a concentration of aviation and non-aviation activities. The form of airport-centric urbanization implies the functional-spatial organization of urbanized territories around international airports [8]. However, until now, the features of the development of airport-centric forms of urbanization in the Russian Federation, have not been discovered and formulated yet.

## ***1.2 The Research Goal***

The purpose of this study is to identify the features of airport-centric urbanization in Russia. Since we are talking about a certain stage of the urbanization process, it is necessary, first of all, to study the process history and determine what factors influenced the specificity of Russian urbanization. It is necessary to establish the patterns of further development of airport adjacent areas. When analyzing the place of Russia in the global urbanization process, it is supposed to compare it with European countries, since Russia occupies a significant part of this continent, as well as the United States, because many Russian cities in a certain historical period grew as fast as some American cities and one can often encounter similar comparisons.

## **2 Materials and Methods**

The research methodology is due to the goal outlined in the article—to identify the specifics of near-airport urbanization in Russia. In this regard, the method of comparison was chosen as the main method, in the course of which it is possible to establish the similarity and difference between the objects of study that are in different social realities. As a result of the comparison, it is supposed to identify common (natural) features, and establish the main differences that reflect the specifics of Russian objects. Special attention in the study was paid to a comparative-historical analysis, which allows you to distinguish causal relationships, to build a logical chain.

At the same time, the object of study is quite complex, develops under the influence of external factors (society, its economy, degree of urbanization) and internal factors (economics and entrepreneurial activity of the object of study). In order to go the way of studying the object as a part of the general system and as a relatively independent system formation it is necessary to use the method of deduction and induction. The process of urbanization, as well as the “near-airport,” involves the development of a territory of special quality. To identify the qualitative characteristics of the aerotropolis, it was necessary to analyze its composition and structure, comparing objects at different stages of development, and on this basis formulate conclusions, that is, use the method of analysis and synthesis.

Thus, the methodology of the study was the consistent use of three methods of scientific research.

### 3 The History of the World Urbanization Process

#### 3.1 *The Urbanization Process in the Antique Period*

Urbanization is closely linked to social development, and the degree of urbanization is an indicator of its level of development.

In this regard, it is proposed to consider the analysis of the world process of urbanization since the formation of urban settlements, the formation of “urban relations” proper.

**Urbanization in Europe.** In Antiquity, the first Greek and Roman cities appeared on the coastal territories of the Black and Mediterranean Seas. It was at this time that the formation of city-states (polities), a special form of socio-economic and political organization of society, began. Greek cities became the first prototypes of cities performing administrative and commercial functions with the differentiation between public and residential urban areas. The factors for the emergence of new cities were the presence of fertile lands suitable for agriculture. To protect these lands, defensive fortifications were built. Cities formed on the banks of rivers and seas became important ports and major trade hubs.

**Urbanization in Russia.** In the Antique period, the process of urbanization of a part of the territory of modern Russia was of a similar nature. There was an active development of the Black Sea coast: the cities of Taman (Hermonassa), Sevastopol (Chersonesos), Evpatoria (Kerkinitida), Feodosia, formed in the image and likeness of ancient Greek cities.

#### 3.2 *The Process of Urbanization of Cities in the Early Middle Ages*

**Urbanization in Europe.** In the second half of the ninth century, the development of late antique cities and the formation of early urban settlements in barbarian territories continued in Western Europe. Many cities were still formed as fortresses to protect lands from barbarians. Handicraft became the main element of inner city economic relations. Peasants abandoned agriculture and went to cities. This entails a gradual increase in urban population, while the cities themselves are becoming centers of new trade routes.

**Urbanization in Russia.** In the second half of the tenth century, northern territories began to develop in Russia. The first Russian cities appeared with their own system of trade and administration: Novgorod, Pskov, Smolensk, Murom. In the same period, the borders of Ancient Rus, which did not yet have access to the Volga and the Black Sea, were outlined.

### ***3.3 The Urbanization Process of the Cities of the Classical Middle Ages***

**Urbanization in Europe.** In the classical period, Western European cities became free from feudal dependence and elements of self-government arose. Cities became the “locomotives” of economic growth. Merchants and craftsmen of different cities created their own unions. The most significant association was the famous “Union of Hanseatic Cities”, a trade and political union of merchants of many Germanic and West Slavic cities having several branches. It controlled the North European trade until the beginning of the sixteenth century. Trade became the basis for the development of European economic relations, which stimulated cities to grow and develop, increase the urban population, diversify urban functions into residential, administrative, trade and public functions.

**Urbanization in Russia.** During the X–XII centuries northern cities were actively developing in Russia. Veliky Novgorod became the first Russian city to join the famous “Hanseatic Union”. However, by the thirteenth century, the process of urbanization in the country was suspended by the Tatar-Mongol invasion and the establishment of a three-hundred-year yoke in the eastern part of Russia. The southern part of the country came under the control of the Grand Duchy of Lithuania. The northern lands, where cities formed as separate principalities, were plagued by internecine wars.

### ***3.4 The Process of Urbanization of Cities in the New Age***

**Urbanization in Europe.** During the New History period of the early sixteenth to the second half of the eighteenth century, Western Europe there was an era of demographic growth, including the growth of the urban population. On the one hand, it was caused by the quality and availability of medical care; on the other hand—by the development of new types of industrial activity and the intensification of trade. During this period, a common European market emerged, new spheres and methods of exchange, means and ways of communication appeared (steam engine, steam locomotive). Production and trade were concentrated in specific centers. The population of cities in Italy, Netherlands, France, England, Portugal, Belgium, reached 80 thousand people and by the end of the period reached 400 thousand people (Paris). In 1700 the share of urban population in Italy and Spain exceeded 20%, in Belgium it was 30%, and in the Netherlands it was close to 40% [9]. Thus, in Europe in the 16–18 centuries, there was a process of densification of the urban environment and the concentration of the economy of the countries in large cities. Cities became centers of education, commerce and urban culture.

**Urbanization in North America.** In 1607 the first English colony, Virginia, arrived in North America and founded the first city, Jamestown. By 1700, the population

of the thirteen British colonies along the Atlantic coast east of Appalachia was 2.5 million. The process of urbanization in the United States was very rapid. One of the reasons was the development of the territory by adapted and enterprising townspeople looking for ways to develop independently. By the end of the seventeenth century, cities with the population ranging from 4000 to 16,000 had been formed in the United States (Philadelphia alone was the largest city with about 40,000 inhabitants). The proportion of the urban population in the eighteenth century was 5%, and by the beginning of the twentieth century it had increased to 39.6% [10].

Urbanization in the Russian Empire. While the territory of Western Europe became “compact” and differentiating itself both socially and functionally, the Russian state was expanding its borders, including new territories of eastern lands. To capture and maintain control of the new lands, the key factor was to focus on the quantitative factor of cities rather than the qualitative one. Russia’s first strongholds gradually turned into new cities, the number of which grew vigorously. New cities were populated by peasants who migrated from the European part of the country and who had cultural values and lifestyles that were not typical of city dwellers. By the beginning of the nineteenth century, the urban population of the Russian Empire accounted for only 5% of the population [11].

The development of rail transport played a decisive role in urban development in the second half of the nineteenth century. Cities that were not connected to the railroads faced stagnation. This happened with a number of Russian cities with a deep history (Suzdal, Rostov Veliky).

### ***3.5 The Urbanization Process of Cities in the IXX–XX Centuries***

**Urbanization in Europe.** The urban population became predominant in a number of Western European countries, such as Belgium, Great Britain, by the beginning of the twentieth century. The Industrial Revolution radically changed ideas about the norms and standards of the lifestyle and quality of life of citizens, their culture, income, and the state of the urban environment. By the end of the twentieth century, on the territory of Western Europe, there was a transition from point towns to a system of urbanized settlements connected by a network of highways, agglomerations and conurbations.

**Urbanization in North America.** In the United States, the process of urbanization was especially noticeable, caused by powerful industrial development. The positive consequences of the industrial revolution had a particularly strong effect on the development of urban settlements. By the end of the twentieth century, this led to the formation of “metropolitan areas”, an urbanized area around one or several large core cities with a high population density and close economic ties [12].

Thus, the highly developed urbanistic systems of Europe and the United States were the result of systematic evolutionary development, where the urban population with the corresponding cultural values and lifestyle predominated, and diversification of urban functions took place.

Urbanization in Russia. The events that took place in the early twentieth century in Russia slowed down the current process of urbanization: the civil war, then the restructuring of the economy, the creation of a form of economic development still unknown to the world, the economy of socialism. In the 1920s and 1930s, a peasant country set a course for industrialization and the development of new territories. The newly formed cities were filled with populations, mainly peasants. The formation of urban civilization lagged catastrophically with the growth of cities [13]. Urbanization in Russia became a by-product of industrialization. The cities with different levels of development received equally distributed resources, and the main vector of the country's development was aimed at militarizing and developing industry, rather than urban areas.

A significant damage was caused by World War II: most of the historic cities were severely damaged. The evacuation of enterprises from the European part of the country has increased the movement towards the east.

The new wave of urbanization in the 50–70s of the post-war period differed little from the first in terms of qualitative characteristics. Mass construction and its high rates led to austerity of funds, which in turn led to the unification of design solutions, types of houses, methods of spatial organization of cities. This is how a miserable urban typical environment appeared in the country, where one city differed little from another. A limited number of people (enterprising citizens) have formed who were able to organize their business and fill the urban environment with various types of activities, able to diversify the economy, social structure, and create conditions for the formation of an urban lifestyle.

Thus, as a result of the historical and political events that took place in Russia, the natural course of the urbanization process was disrupted and acquired specific features. For a long time, the main factor in the emergence and development of Russian cities was their artificial formation on the basis of the construction of industrial enterprises. Almost a third of Russian cities appeared artificially, near factories, during the construction of railways, ports, etc. An artificial city is usually monofunctional, aimed at solving one problem, the production. There is no organic diversity created by long evolutionary development and economies of scale work to a greater extent for production [14]. The assimilation and development of industry in sparsely populated areas led to the emergence of many single-industry towns, the centers of which were not a historically established urban structure, but industrial enterprises, in parallel with which public and residential areas were formed.

The same principle is still used in the design of new forms of modern urbanization, airport urbanized formations within the radius of influence of large international airports.

## **4 Functional-Spatial Formation of Airport Adjacent Urbanized Formations**

### ***4.1 Peculiarities of the Formation of Airport Adjacent Areas***

Airport cities (aerocities, aerotropolises) in foreign practice develop in highly urbanized, economically developed countries with a wide range of international relations and the presence of international-class airports with a multimillion passenger traffic (over 50 million people) and cargo turnover (over 2 million tons of cargo), which are major transport hubs, combining water, rail and road transport.

The ideology of socialism in Russia until the 1960s considered urbanization to be a process unique to capitalism. Artificial restriction of the growth of major cities was taken as control of the urbanization process.

By the end of the second millennium, only about 20 developed agglomerations had emerged in Russia's vast territories. Five of them needed to create aerotropolises that could stimulate the process of development of these agglomerations. Many Russian scientists and planners have searched for the most successful forms of airport adjacent areas development, which has led to the emergence of aero-city projects for major urban agglomerations and conurbations. As already mentioned, projects of aero-city were received by Novosibirsk, Sverdlovsk, Samara-Togliatti, Kazan, Rostov agglomerations, the basis for them were developed by American scientist J.D. Kasarda, who spoke about the cluster placement of functional areas with the center-airport.

According to J. Kasarda, different sectors of the economy and infrastructure are attracted in different ways on the territory near airports. Some infrastructure sectors, such as transport and logistics functions and warehouses, trade and hospitality services are most associated with passenger air travel and cargo delivery. Other sectors of the economy (e.g. production) may not be so functionally connected to air transport, but have a significant relationship with suppliers or consumers who also require air transport services [15].

However, it is worthwhile mentioning the high degree of specificity of the development of urbanized territories in Europe, the U.S. and Russia, which indicates that the mere application of foreign experience in its territory will inevitably lead to inefficient use of the resource potential of airports.

### ***4.2 Functional and Planning Organization of Russian and Foreign "Air Cities"***

The design stage is always preceded by a pre-project analysis of foreign experience, where quantitative rather than qualitative indicators are taken for comparison. Such



analysis was carried out by the design institute of Rostov-on-Don, where the architects attempted to apply successful foreign experience in the development of “air cities” for the formation of the airport adjacent areas of Rostov-on-Don. Quantitative factor related to the characteristics of the airport itself (passenger traffic, cargo turnover, distance to the city, etc.), not to the size and population of the urban agglomeration was considered. In this case, the airports of Frankfurt am Main (Germany) and Memphis (Tennessee, USA) were taken for comparison as the closest to Rostov agglomeration in terms of the population size of urban agglomerations where they are located [16].

In a market economy, the airport is not only a route point. Today it is not only an urban object, but also an object of entrepreneurship, developing according to the economics laws. The success of the airport determines its budget and the share of aviation and non-aviation revenues in its structure, which, in turn, depends on a number of other factors. Earlier the author gave a list of factors which influence the development of the airport as a business object (aero-city) and which should be considered in a comparative analysis. The author identifies the following factors:

- The area of the passenger terminal.
- Distance to the nearest city.
- The area of the airport territory.
- Number of runways.
- Number of directions of air departures.
- The area of storage facilities.
- The number of retail and service facilities.
- The number of hotels at the airport.
- Number of parking lots [17].

### ***4.3 Comparative Analysis of Rostov-am-Don, Frankfurt-am-Main and Memphis Airports***

By the example of the colleagues from Rostov, the author conducted a comparative analysis of the territories of the three airports, taking into account not only the population of the agglomeration, but also key factors of the airports themselves: passenger traffic, cargo turnover, number of air departures, and distance to the city.

#### **Comparative analysis of Rostov-am-Don and Frankfurt-am-Main airports**

The comparative characteristics of agglomeration population and urban density in Rostov-am-Don and Frankfurt-am-Main are similar indeed. But the quantitative parameters of the airports themselves are strikingly different. The passenger traffic of the latter is more than 90% higher than that of the Rostov airport, the cargo turnover is 100 times greater and the route map of the airport is much wider and more diverse than that of the Platov airport. Frankfurt-am-Main Airport itself is located 11 km

**Table 1** Comparative analysis of Rostov-on-Don, Frankfurt-am-Main and Memphis airports

Comparative characteristics	Platov airport, Rostov-am-Don, Russia	Frankfurt-am-Main airport, Germany [18]
Population of the urban agglomeration	2,260,787 people	1,950,000 people
Population density	3264 people/km <sup>2</sup>	2966 people/km <sup>2</sup>
Airport passenger traffic	3,236,000 people	70,556,027 people
Airport cargo turnover	20,000 tons	2,076,734 tons
Number of air flights destinations	50 destinations	265 destinations
Distance between the airport and the city	29 km from the city	11 km from the city

from the city center, born in 794. Hence, the formed aerotropolis included part of the urban area, which is reflected in the diversity of functional areas (Table 1).

### Comparative analysis of Rostov-on-Don and Memphis airports

Comparative characteristics of agglomeration population size and population density of Rostov-on-Don and Memphis showed that both of these indicators in the American city are even slightly lower than in the Russian city. This is especially noticeable when comparing the population density of Memphis, which suggests a rather loose, low-density urban environment, not inherent in urbanized areas. We should pay attention to the fact that while the passenger traffic of the airports is quite similar, the cargo turnover of Memphis airport is many times greater than that of Platov airport. This is due to the fact that the airport has focused its economic activity on distribution and logistics operations. Memphis airport is located 16 km from its center. It specializes in cargo transportation, because it is in an ideal place for transport and trade: the Mississippi River runs west of it, it is crossed by two interstate highways of the USA, seven highways and many freight railroads. It is a major transportation hub, combining river, road, and rail transportation (Table 2).

It is also worth noting that Memphis is a relatively young city, founded in 1889. Due to the fact that American cities were formed at an accelerated pace and on free territory, their environment, like that of most Russian cities, is rather loose and low-density. But maintaining a consistent course of economic development and urbanization made it differentiated and diverse.

**Table 2** Comparative analysis of Rostov-am-Don and Memphis airports

Comparative characteristics	Platov airport, Rostov-am-Don, Russia	Memphis airport, Tennessee st., USA [18]
Population of the urban agglomeration	2,260,787 people	1,341,746 people
Population density	3264 people/km <sup>2</sup>	770 people/km <sup>2</sup>
Airport passenger traffic	3236 000 people	3,330,000 people
Airport cargo turnover	20,000 tons	4,330,000 tons
Number of air flights destinations	50 destinations	157 freight destinations 55 passenger destinations
Distance between the airport and the city	29 km from the city	16 km from the city

## 5 Conclusions

As a result of the comparative historical analysis, the author established the main differences in the results of the process of European, American and Russian urbanization.

European cities developed in an evolutionary and almost natural way. Their environment gradually became more complex and differentiated, their cultural potential gradually increased. Currently, in the countries of the European Union, the cities have a high population density, but the main thing is a wide variety of types and methods of production and other types of human activity. An extensive network of road and rail transport makes it possible to fulfill an important need of a modern city dweller, the territorial mobility. In the limited territories of the European continent, airports were initially built close to cities. With the development and densification of the road transport network, the urban territory interacts with the airport territories. In this regard, European urbanization is long and consistent in the development of urbanized culture; territories near the airport have a high density and variety of functions.

American cities are younger than European ones. The process of their development was more rapid, so the structure of American cities is “loose”. The area of the country is larger than the area of Europe, and therefore, in some states, the population density is slightly lower. The United States urbanization is industrial capitalist urbanization, the population of the country is represented by adapted, enterprising townspeople, due to which, despite the low density, urban areas are distinguished by a high degree of functional diversity. The vast expanses of the American continent, combined with industrial-capitalist urbanization, stimulated the development of all

types of transport, which turned US airports into major transport hubs, which also diversified their economic activities, expanded their borders and entered into active interaction with other cities and countries.

Thus, the basis of American aeronautical urbanization was the need to connect a large territory of the country with economic ties during the period of rapid growth of the industrial economy. US airports are initially consciously formed as transport hubs, which become an incentive for the development of near-airport cities.

Russian urbanization, like the process of the country's development as a whole, is discrete, several times interrupted by various socio-economic and political events. Large cities are concentrated mainly in the European part of Russia and are located at a considerable distance from each other. The regulatory framework of socialist urban planning did not allow the location of airports near large cities and financial constraints led to the limited development of the transport network. In such a situation, the city is unable to participate in the development of airport adjacent territories: the main city functions are far removed, and the lack of stable high-speed transport links does not contribute to mutual development and rapprochement between the city and the airport.

The overwhelming majority of Russian airports do not have the capacity that international-class European and American airports have. The absence of a polycentric settlement system on the territory of Russia, in which important functions are concentrated only in the capital city, are not redistributed to regions, leading to the fact that international airports in large urban agglomerations do not add up to significant air hubs of the country, without which the stability of the development of an international airport is generally doubtful.

The stereotype thinking of the Soviet period regarding the formation of new cities on the basis of an industrial complex with functional zoning of the territory in the form of three zones (industrial, residential, public and business) cannot be applied to such a new urban formation as Aerotropolis for a number of reasons:

- the airport is not a city-forming base that attracts the population to the nearby territory, due to which an urban formation is not always formed on its basis;
- the airport attracts certain types of activities, the results of which need to be quickly transported to the destination;
- in a market economy, the airport has an internal economic source of development, which should be taken into account when planning airport adjacent territories [19].

Thus, as a result of the analysis, the specifics of Russian urbanization were established. These are the discreteness of the development of market relations, low density of population and urban settlements with large territories of the country and low density of transport links.

Talking about the development of near-airport territories as aerocities and aerotropolis—urban formations around airports—then the search of spatial solutions should be carried out taking into account the laws of urbanization. For urbanism, two key moments of urban formation are concentration and diversity, which are the two basic characteristics of the city [14].

The analysis shows that in the conditions of Russia it is initially necessary to rely on the American experience: the country's most powerful international airports should become hub centers. Only then to turn to the European experience means to begin to form a diverse and functionally saturated environment of their near-airport territory.

Thus, the diversification of enterprises and offices of companies ready to be located on the territory, the diversity of the formed urban environment, the high concentration of various types of transport systems and the use of the principles of economics of scale for the organization of trade, logistics and management processes, as well as the formation of a finely dispersed and variable urban environment should become characteristic features of near-aerial urbanized formations.

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