

Modern practices of urban regulation of spatial development of south-east Bashkortostan

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Abstract. The article is devoted to urgent problems of preserving the unique regions of the south-eastern Bashkiria, through new approaches and tools for regulating regional spatial development. Here some results of the current state study of the territory presented, which were obtained using cluster analysis based on the theory of spatial networks. The description of the developed model and the concept of sustainable development of the south-eastern region of Bashkiria are given. The reorganization of the Southern Urals territory will allow preserving small settlements of this region, eliminating negative factors and creating a favorable environment for their development.

1. Introduction

In modern conditions of globalization and high rates of urbanization special attention should be given to the sparsely populated areas and small settlements. This should be done primarily due to the specific role that these territories play in the system of spatial, social, economic development of the whole region, to ensure spatial coherence and economic integrity of both region and country. The specialty of these territories is mostly connected with remoteness from the main centers of settlement system, poor transport and infrastructure development, and high vulnerability to some external factors. At the same time, the problem of maintaining regions with small settlements and their effective development becomes even more urgent, if we take into account that these territories are designed to ensure the integrity and sustainability of the country's economic framework, its' cores, agglomerations, megacities, urban areas and industrial centers.

The demand for development of a concept for sustainable development of seven regions of the south-east Bashkiria is dictated by the general program of development for the republic, aimed at improving the quality and standard of living of the population.

Despite the fact that the region has significant natural, recreational and productive resources, the potential of this region is not fully unleashed and most of its territories stagnate. Nowadays, there is no any clear program for the spatial development of Southern Urals. Also, main town-planning principles, methods and tools for the development of the southeastern regions of Bashkiria are not defined.

The current practice of Russian spatial development comes down to making a profit, estimating the feasibility and economic efficiency of local investments, however it does not ensure the spatial well-being of the territory. Of course, the economic factor has the decisive role [1] in choosing the path for the efficient development of the specific territory, however, lack of proper attention to a number of



system indicators, which implicitly determine spatial development, will reduce the probability of achievement of targets. [2]

In practices of urban planning, more and more data is used; huge amounts of information require processing and systematization. While planning territories of a larger scale, it is necessary to use this resource to connect different fields of data and synthesize new models of system behavior. In modern conditions spatial planning can be carried out only if taking into account the combination of social, economic, infrastructural, geographical factors and their mutual influence, formalized with mathematical methods and information technologies.

2. Analysis

The territory of Bashkortostan is physically divided by the Ural Ridge into two parts: the large northwestern part belongs to the East European Plain, on which the capital of the republic is located, and the southeastern part, stretched along the ridge, located directly in the Ural belt and partially on the West Siberian Plain. Separated by the physical barrier, the southeast consists of two republican economic subareas: Beloretsk-Uchalinsky (Beloretsky, Uchalinsky, Abzelilovsky, Burzyansky administrative districts) and Sibay-Baymasky (Baymasky, Khaibulinsky, Zilairsky districts). Within the borders of the area there are plenty of unique natural resources, many developed quarries, existing industries, farms, moreover several nature reserves, nature parks and reserves, archaeological sites, rivers suitable for rafting, peaks and ridges for hiking routes, as well as many points for the development of educational and sports tourism are located here.

The analytical phase of the work ended up with the compilation of several maps: industrial, agro-industrial, recreational, social (which represents fields of health, education, sports). These maps show the state of each industry and the main problems in each area [3]. To identify interconnections in the subarea at the level of relations between rural settlements and cities, as well as connections of enterprises and cities with other cities of the Russian Federation, the provisions of the spatial networks theory were structured and the correspondence of processes in network models to several types of common tasks in regional systems. A cluster analysis of the initial situation based on the theory of spatial networks was carried out and the final concept was tested [4].

Spatial networks are tightly connected with urban research. [5] The theory of spatial networks considers and analyzes graphs, which can be shown as networks, consisting of nodes and faces. Moreover, graphs contain weight of nodes and faces (depending on the context of the investigated issue any parameter can be taken under the weight).

The application of theory in regional planning can be straightforward [6]. The simplest graph is built on the basis of settlements and roads between them. Depending on the issue under study, the weights of these nodes and faces are taken from the certain parameters. For example, they can be formed at the expense of the population, the availability of infrastructure facilities, economic capacities, etc. Faces are constructed from the roads and their weights are also laid for them (class and type of roads, travel time, quality of coverage, daily migrations along a certain face, real lengths taking into account the terrain). One of the most developed topics in the scientific field is the theory of clustering, which reflects the dynamics of community formation depending on changes in strategies pursued by managers. This theory reflects perfectly all anomalies and is suitable for analyzing territories and testing concepts.

The cluster analysis of the graph based on the settlement system of the southeastern region of Bashkiria includes the identification of internal and external relations between municipalities in the districts, areas of city influences and inter-district relations at the republican and country levels. All the settlements in the districts are divided into interconnected areas - regional clusters. For their further development these clusters are considered as related areas, and are taken into account for the strategy implementation in spatial planning. This part of the study reflects a number of anomalies associated with incorrect administrative division of the region, the severance of individual points, the detachment of some points from their administrative centers, and the joint functioning of groups regardless of their administrative boundaries. Transport, as well as the availability of medical and educational services

have a very strong influence on clustering, on a larger scale this role is played by places of employment and high education, and on the scale of the subarea – by the global profile of the territory.

Cluster analysis was carried out at three levels. Macrolevel: a region in the system of a state (republic) is analyzed through economic flows, spatial characteristics, transport and population. It was revealed that there are no cores of a federal scale in the region, furthermore, the connection with the republican capital is weak. The southeastern region is mainly tied to the republic by administrative tools, large cities of this subarea, production and infrastructure gravitate to other cities of the Russian Federation, consequently their economic efficiency for the republic is low.

Mesolevel: the regional system is analyzed through transport, population, industry and migration. The clusters of regional scale vary greatly in size and strength of influence, thus forming predominantly urbanized and deurbanized zones. The boundaries of some clusters do not correspond to the administrative ones. That means that it is necessary to re-examine either borders or ties to improve internal connections. The existing systems need to be strengthened along the same vectors, in the south the reticular structure should be increased and in the north the star structure should be developed.

Microlevel: the region's internal systems are analyzed through transport, population, and infrastructure. The clusters of the municipal scale in the region also vary greatly in size and strength of influence. Thus, it is possible to distinguish village council clusters (administrative and management centers), agglomeration clusters (cities and towns connected by transport networks and economic functions), prefabricated clusters (towns with different types of ties), hermit clusters (having a territorial gap from the region's main settlement system). The boundaries of many clusters do not correspond to the administrative division. Acupuncture transformation of the system is seen in this case as the most preferable. Village council clusters are supposed to maintain and strengthen their internal functionality, agglomeration clusters should receive enhanced ties to determine the development vectors of the entire territory, prefabricated clusters need to be united and common management should be established in them, and hermit clusters with sufficient sizes must be included in the structures of others, except too small ones - they should be recognized as potentially endangered [7].

The world experience was studied in the context of historical dynamics with the identification of instruments for economic, social and spatial development, and thereafter was transformed into a model of their interconnection. Altogether, they form the set of regional development instruments, structured by spheres and the main provisions of work with the region [8].

3. Results

The resulting models, methods and tools allowed working out a concept for the development of the South-Eastern region of Bashkiria. Functional, wireframe, and cluster maps were compiled for the republican, regional, and municipal levels using the provisions of the theories studied [9].

The main objectives for the development of the concept were: development of the recreational, agricultural and industrial (non-ferrous and ferrous metallurgy) sectors; the construction of the new transport framework for the purpose of building economic links between the southeastern region and republican systems; harmonization of internal relations; strengthening potential cores; creation of a new educational and scientific framework and functional diversification of the largest points, agglomerations and dense deurbanized areas.

At the republican level, which, in turn, is interconnected with the systems of the Volga and Ural federal districts of Russia, a framework was summarized and links were identified in which the southeast was included in the republican system. To do this, the linear central connection Ufa-Sterlitamak-Salavat-Ishimbay-Kumertau-Meleuz was strengthened, the faces Uchaly-Beloretsk-Ufa and Sibai-Baimak-Starosubkhangulov-Sterlitamak were diagonally tied to it, the weaker but significant link connected Beloretsk-Baimak-Akar republic and excluded some of the flows through Magnitogorsk.

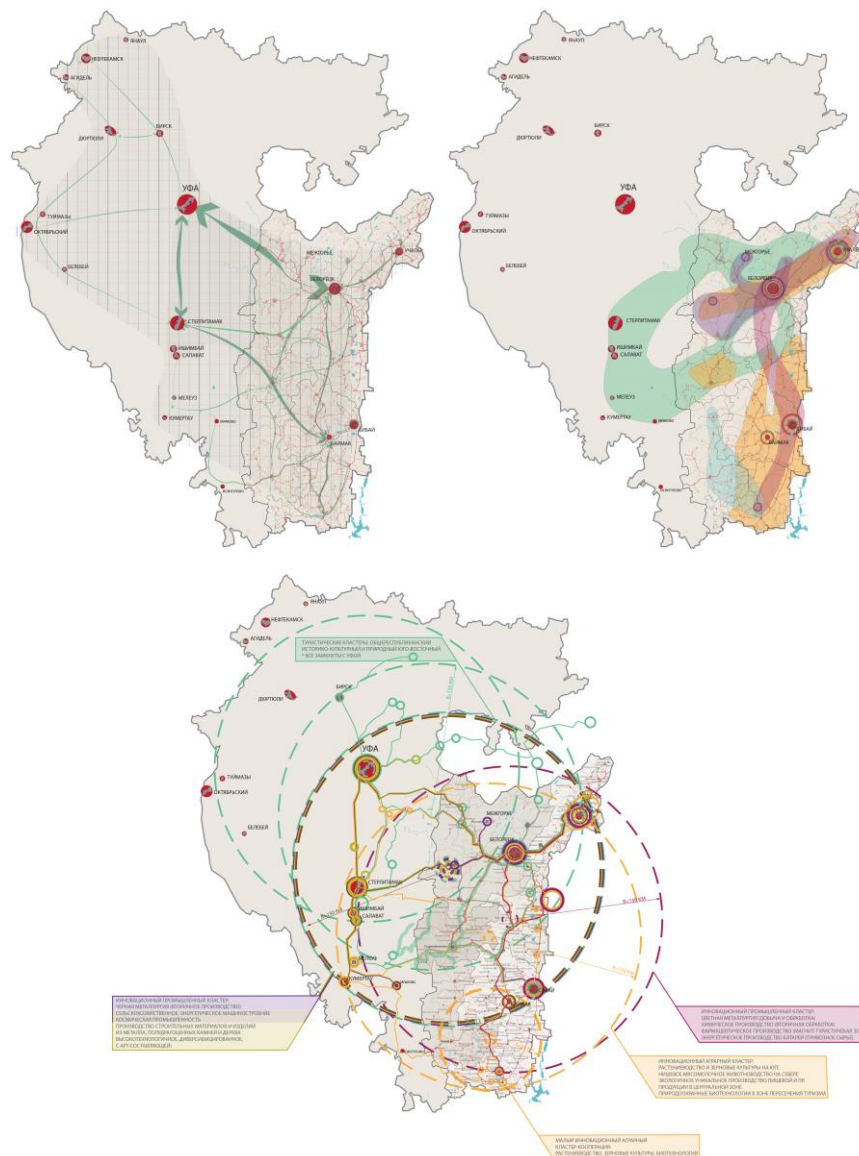


Figure 1. Concept of development of the south-eastern region of Bashkortostan at the republican level

On the functional diagram, the recreation zones were looped: in the small - inside the region, and the big - with access to the central regions of the republic and the Chelyabinsk region. Agricultural grain zones did not change their shape in order to improve cooperation, product quality and form the nucleus of a possible secondary production. In Beloretsky district, meat and dairy production zones, and in Burzyansky, a zone of niche agriculture were expanded. The ferrous metallurgy zone shifted the scientific and production sphere to the west, to the mining sites, but the center remained in Beloretsk. The non-ferrous metallurgy development zone was stretched by the Akyar-Sibay-Beloretsk-Uchaly ribbon with an inclination towards the new framework passing inside the republic. Points for raising the class of education have been formed everywhere, and in the Zilair district with a complete lack of resources, a zone for the development of educational institutions on transit routes was planned. In the cluster scheme according to OECD standards, small agrarian and large agrarian clusters were distinguished, industrial (non-ferrous and ferrous metallurgy, construction materials, woodworking) and recreational clusters, whose enterprises are within a radius of 150 km from the geometric center. In this center it was recommended to have a cluster management center with administrative and research functions. At the republican level, the centers of several clusters approximately coincided

with the intersection of roads at large points of Kaga-Verkhny Avzyan, and also ended up in Amangildino and Temyasovo, however, the cluster configuration at this scale is not entirely correct, and was edited at lower levels of the concept accordingly.

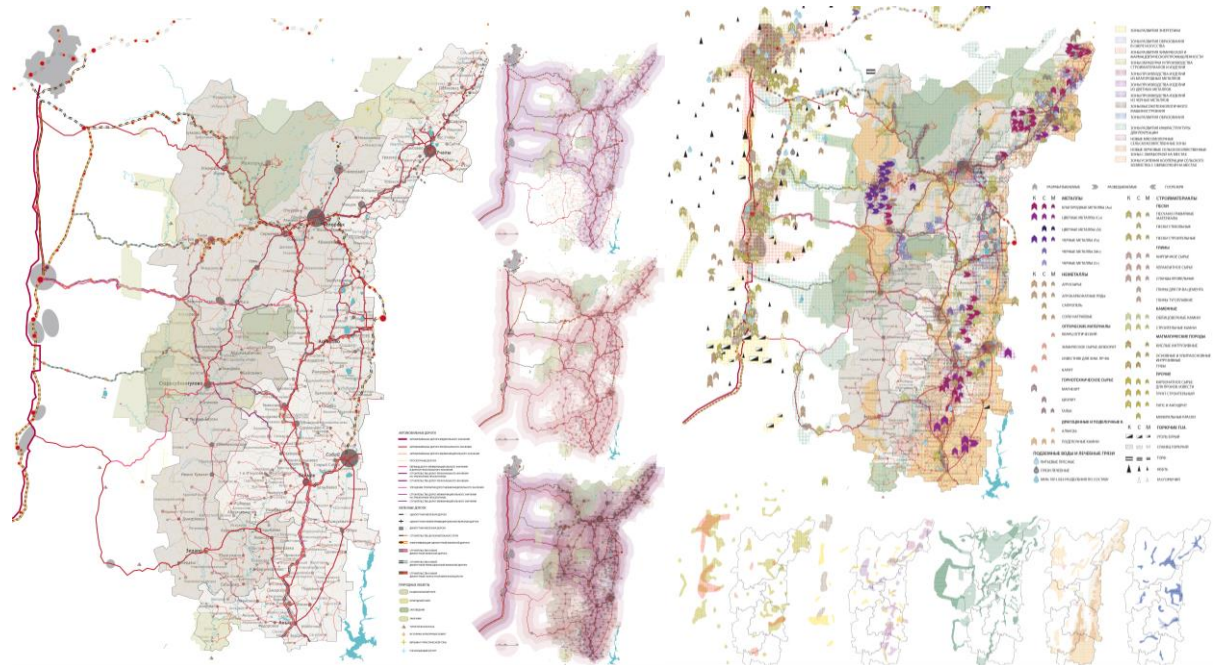


Figure 2. Framework model of development of the south-eastern region of Bashkortostan at the regional level

Figure 3. Functional model of development of the south-eastern region of Bashkortostan at the regional level

At the regional level, the framework was formed by roads and railways. For roads, status transfers of roads, improvement of coatings and construction of new sections were indicated. The assessment of corridors of 20 and 40 km shows almost complete coverage of all settlements with the new framework. The functional map was crushed more strongly, many small development zones were formed: energy, education, creative education, chemical and pharmaceutical industries, processing and manufacturing of building materials, production of products from precious, non-ferrous and ferrous metals, high-tech mechanical engineering, infrastructure for recreation, meat and dairy and grain agriculture, agricultural cooperation. Within the boundaries of these zones, clusters were developed: industrial production of noble, non-ferrous and ferrous metals, mechanical engineering, chemical production, agriculture and the production of building materials, in particular from ornamental and building stones, sand, clay, igneous rocks and others mineral. The roles were distributed within each cluster: obtaining a resource, secondary processing, education and science nuclei, logistics, and administration.

At the municipal level, the principal regional scheme received harmonization of ties at the skeleton level. Small sections of inter-municipal roads were built, depending on the needs of clusters and zones. Points at the intersection were highlighted, and functions were added for them. The railway network was linked to energy based on new micro-hydroelectric power stations. The functional scheme for most layers was converted into an object-connected form, in more detail, recreational routes and the agricultural sector were developed by zones. The cluster model was combined to appoint the roles of settlements, lay social infrastructure and consolidate diversification.

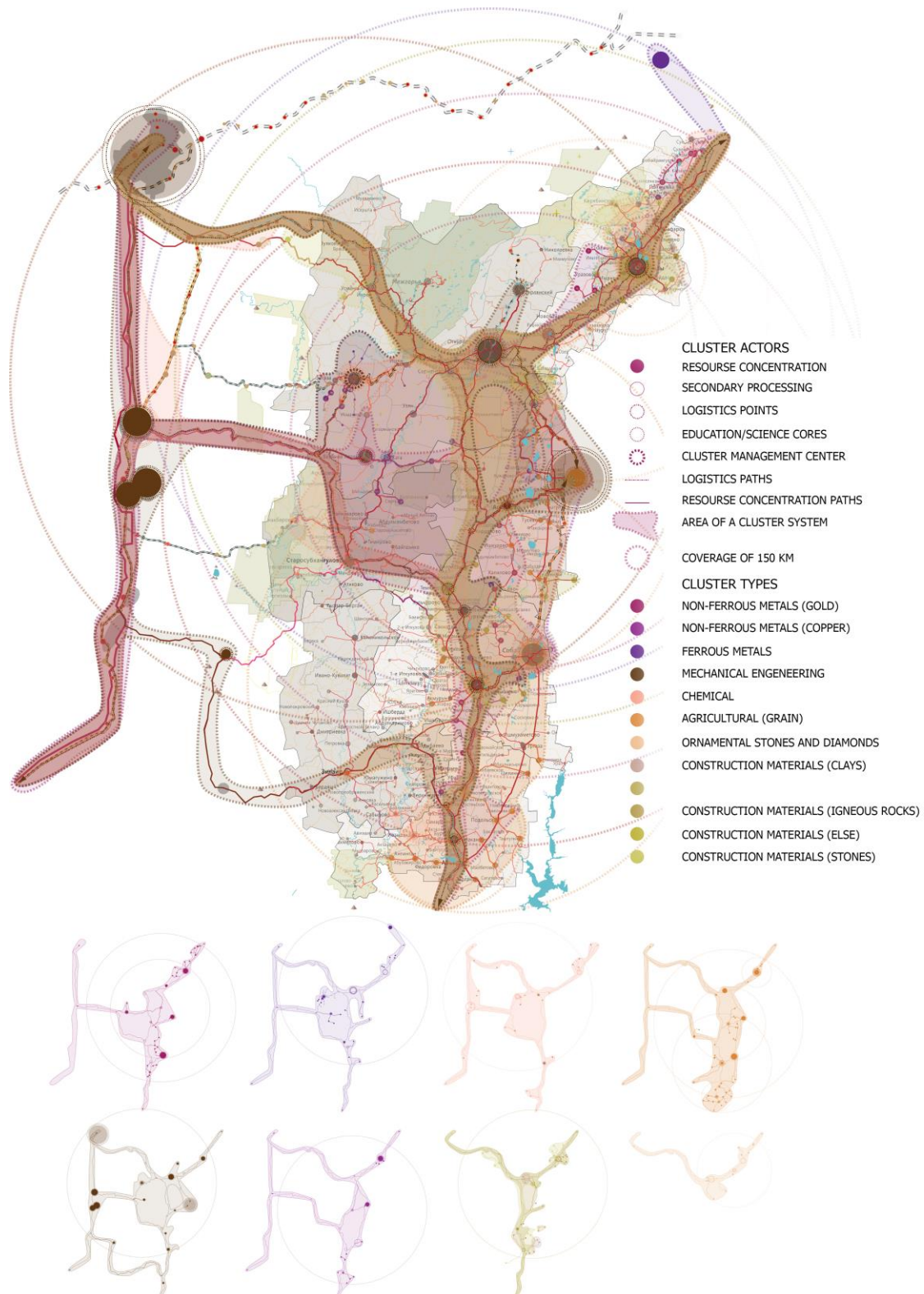
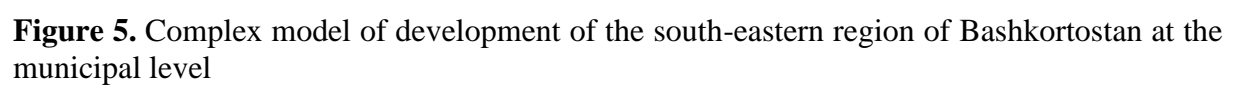


Figure 4. Cluster model of development of the south-eastern region of Bashkortostan at the regional level



4. Conclusion

The final concept is presented in a new graph with embedded network parameters in the form of multifunctional nodes and a skeleton of different levels. A new clustering of the final concept of the spatial development project show the following results. Two independent nuclei are formed on a regional scale: the urban binuclear region between Uchaly and Beloretsk, the deurbanized polycentric region with a shift of intermediate centrality from Sibay to Baymak, and the region around Starosubkhangulovo begins to gravitate towards Sterlitamak - Salavat - Ishimbay conglomerate. In general, new ties form a shift in the center of regional gravity to the central axis of the Republic of Ufa – Sterlitamak – Salavat – Ishimbay – Kumertau – Meleuz. On the regional scale, more second order centers appear which create a more harmonious system by increasing the value of the reticulation parameter (high values are welcomed only at this level, one level lower, high reticulation is set only for the deurbanized zone of the Khaibullinsky district). At the level of village councils and municipalities, anomalies and imbalances in distance and administrative management are eliminated, but the outflow of the population from a number of points for the implementation of global goals is also deliberately forecasted, and for this some points become zero nodes.

The concept of spatial development was worked out for a group of problem areas in the southeastern region of Bashkiria. Of course, it requires not only physical embodiment and investment, but also a review of the many legislative, administrative, social and economic aspects [10], that can create a spatial basis of a favorable environment for self-development of the region [11].

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