Geodemographic Polarization Processes: Municipal Level (The Case of the Kukmorsky Municipal District of the Republic of Tatarstan)

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Abstract: The global population and settlement processes have recently had a significant impact on the social and economic development of the region and its competitiveness. Therefore the areas of the concurrent use of the cartographic and mathematical methods to describe the settlement processes continue attracting attention. The gravity model of settlement, which reflects the polarization processes at the municipal level has been built and presented in this article.

Key words: Gravity model of settlement • Regional polarization processes • Kukmorsky municipal district

INTRODUCTION

The geodemographic approach to the regional evaluation contemplates the study of the municipal unit at two levels - the geographic and demographic one. The role of the territory in the social and economic development is undeniable.

For Russia, which passes the depopulation phase, with its huge, geographically remote, often sparsely populated regions the geodemographic factors play a crucial role when analysing the possible strategies for the development of the country as a whole and its regions [1-5, etc.]. The models of the potential field of settlement in a variety of different methods of its creation have become a frequent practice, as evidenced by far from being completed list of the works devoted to it.

MATERIALS AND METHODS

The concept of the potential field of settlement (in the foreign terms the demographic potential) as in equivalent to the Newton's law of gravitation has come to Geography from Physics. The Newton's formula expresses the interaction between two bodies as the product of their masses divided by the square of the distance between them. Under the Stuart's concept, in equivalent to the Newton's law of gravitation, the force of interaction between two settlements (which could be expressed as the exchange of information, passenger traffic, etc.) could be written as:

\[ I = \frac{P_i P_j}{D_{i,j}^2} \]

where \( P_i \) and \( P_j \) are the settlements population, \( D_{i,j} \) - is the distance between settlements.

This implies, that the degree of interaction \( (V_i) \) of any point in the territory (j) with all the settlements (i) is expressed as follows:

\[ V_i = \sum_{j=1}^{n} \frac{P_j}{D_{i,j}} \]

As a result, the values of regularity of the settlement allocation in its immediate environment are calculated for all the settlements. All that remains is to plot these values on the map and to show the patterns of the calculated parameters variation over the territory as contours.

When calculating the potential field of settlement not for all the territory points, but for the settlements only, the formula could be used:

\[ V_i = \sum_{j=1}^{n} \frac{P_j}{D_{i,j}} \]

For calculating the potential on the global basis Tikunov V.S. has used the following formula:

\[ V_i = \sum_{j=1}^{n} W(d_{ij}) P_i, \]
where,

\[
W(d_{ij}) = \begin{cases} 
3/2 - 1/2d^2, & d \leq 1; \\
1/d, & d > 1. 
\end{cases}
\]

The calculation of the potential field of settlement through the traditional methods using all the settlements is made on the basis of the "air" distances between settlements. The "air" distances are calculated by the rectangular coordinates of the settlements.

Some works present the methods for calculating the potential not of the settlements, but of counties, districts or other administrative units. In these cases, the population of all the calculation units is conventionally and usually referred to its administrative centre.

RESULTS AND DISCUSSION

The Kukmorsky municipal district consists of: the urban-type settlement of Kukmor, Baylyangarsky, Bereznyaksky, Bolsheukmorsky, Bolshesardeksky, Vazhashursky, Kaensarsky, Karkaussky, Koshkinsky, Lelvishsky, Lubyanky, Mamashirsky, Manzarassky, Nizheiskubashsky, Nizhnerussky, Nyrtinsky, Nyirinsky, Oluyazsky, Oshtorna-Yuminsky, Pochinok-Kuchukovsky, Psyakskoe, Sardekbashsky, Churinsky-Village, Srednekumorsky, Tuembashsky, Urkushsky, Charlinsky, Yadygersky, Yanylsky, Yatmas-Dusaevsky rural settlements.

The administrative division of the Kukmorsky municipal district is represented by an urban settlement and 29 rural settlements, which include 124 settlements, with 1 urban-type settlement, 48 rural communities, 16 villages, 59 small villages among them.

Each region has its interior space and contacts with the outer space. The Kukmorsky municipal district is bordered and in close relationships with the surrounding areas - the Mamadyshsky, Sabinsky, Baltasinsky municipal districts, the Kirov Region and the Udmurt Republic. The economic and geographical location (EGL) of the Kukmorsky municipal area is favourable, which determines its social and economic, demographic potential, creates favourable conditions for the development of the industrial agriculture and industry.

On the basis of three main components of the settlements allocation: 1) the linear one, which represents the settlements allocation along the traffic arteries; 2) the congested one, which is typical for the settlements which perform specialized functions of the manufacturing and mining centres, or recreations; 3) the uniform one, which includes the centres of providing people with the variety of goods and services, the "gravity" model of the Kukmorsky municipal district population settlement field has been built (Fig. 1).

CONCLUSIONS

Currently, one of the growth poles in the Kukmorsky municipal district is the urban-type settlement of Kukmor and the village of Bolshoy Kukmor, the other growth centre - is the villages of Bolshoy Sardek and Oluyaz. For the purpose of these villages modernization, increasing its role in the geographical structure of the regional economy it is necessary to develop new competitive industries in the region demand, to upgrade the existing production capacity, which should be accompanied by attracting investments and implementing the innovative technologies which will allow tying the enterprises and institutions, localized in the environment of the geographic industrial clusters into a single unit.
Thus, the Kukmorsky municipal district is a "polycentric" one. "Polycentrism" represents a uniform distribution of the urban areas and large cities throughout the territory between which the relations system based on the equal cooperation and functional complementarity is formed. The polycentric structure of the Kukmorsky municipal district is formed by the rural settlements.

Most of the territory of the Kukmorsky district could be characterized as a rural periphery with the average population density of 26 person/km² as of January 1, 2012 (data without the urban-type settlement of Kukmor). In general, the average population density is 34,7 person/km².

The most densely populated settlements (Kukmorsky - 1283 person/km², Bolshekukmorsky - 54,11 person/km², Manzarassky - 45,46 person/km², Bolshezardeksky - 40,55 person/km², Yanylsky - 39,83 person/km², Karkauksky - 37,47 person/km², Oltuyazsky - 34,7 person/km²) are located in the nodes of traffic arteries or along the major transport and communication axes.

Grouping the settlements according to its population number allows drawing a conclusion that the most numerous group is the settlements with the population number from 100 to 500 person (Fig. 2).

The paradigm of the Kukmorsky municipal district spatial development should be designed with the maximum use of the competitive advantages. As a result of the ununiform allocation of the productive forces and settlements, the northern areas have historically a higher level of the economic and social development than the areas located to the south, east, west and south-west. This has led to the spatial differences in the social and economic development level of the district.

The main objective of the further geographical planning of the Kukmorsky municipal district is to increase the efficiency of the geographical organization of the economy and the population on the basis of implementing the competitive advantages, solving the identified geographical problems and tasks. The result of this process should be the reduction of the spatial asymmetry at the level of the regional social and economic development [7].

For the purpose of analysing the possible strategies of the demographic development it is necessary to account a variety of factors, including the geodemographic ones which besides the demographic ones include the spatial ones [8-10]. In the context of the spatial location the Kukmorsky municipal district has a favourable economic and geographical location (EGL), which, in turn creates favourable conditions for the development of industry, agriculture, social and economic partnership with neighboring entities and municipal districts. The polycentric organization of the Kukmorsky municipal district territory determined the differentiation not only economic but also social parameters. Hence, one of the necessary tasks is to develop the infrastructure objects of the district, which will allow reducing the social and economic "distance" between settlements and balancing the "centre-periphery" relationship.

The modern structure of the Kukmorsky municipal district population settlement has formed under the influence of the physical and geographic and historical factors. The most densely populated territories were the northern ones what repeats the overall republican trend in the population taste for the developed social and economic growth centres with high living standards.

The acute demographic problem of the Kukmorsky municipal area is the population decline, which is observed in almost all rural settlements of the district. It occurs because of both natural processes and due to the mechanical ones. Thus, the main task is to consolidate the indigenous population (primarily due to the development of agriculture and industry), to increase the natural population growth parameters by improving the quality and conditions of the population life.

REFERENCES


