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***Assessment of city territory providing with objects
of social, anthropogenous and tourist infrastructure by
GIS (on the example of the city of Kharkiv)***

Abstract: This paper evaluated the city of Kharkiv ensure real social, human and tourism infrastructure in 27 categories. Using geoinformation approach that involves the use of leading GIS tools identified such laws and phenomena, the study of which is impossible using only general scientific methods.

Keywords: town, objects of anthropogenous infrastructure, geoinformation approach of GIS tools.

Introduction. The city is the natural and manmade system. The main backbone factors are people (they and all activities carried out within the urban area) and the environment (land relief, geological conditions, climate, water and etc.).

Environmental and social comfort population living formed under the influence of both natural and socio-economic conditions and their impact most clearly manifested at the local level.

Area population and economic complex regarded as forming conditions of comfort. Population is the main consumer of comfort, without which the concept loses all meaning economic complex – the largest factor affecting the comfort level change, both in a positive and a negative side.

One of the main benefits of geoinformation approach is the ability to use spatial operators geodata bases for new information. These tools are the basis for spatial modeling and geoprocessing.

Key Results. To assess the city of Kharkiv provide different types of infrastructure objects were selected by 27 categories of objects. Typical objects of social infrastructure are hospitals, schools, kindergartens, transport – metro, major highways, tourism – parks, cinemas, stadiums, sacred objects and monuments. All objects belong to the general category and anthropogenic infrastructure with conventional "positive" or "negative" impact on comfort and landscaping.

Once we got a summary table of indicators of real human infrastructure stations of Kharkiv city linked to the polling stations as points of reference, could go to create a model of territorial distribution of the phenomenon. In our case, this phenomenon is comfort, charm or territory metropolis in terms of real human infrastructure. This was used ArcGIS platform and its separate modules Spatial Analyst and Geostatistical Analyst [13]. In the first model was created that reflects the density distribution indicators of real anthropogenous infrastructure (Fig. 1).

It shows areas of greatest concentration of high performance and the overall trend of decline of the phenomenon. We can see that the best situation to ensure human infrastructure objects observed in the city center. This pattern was to be expected, since the tool "Density" works on the principle of summation indices for each of the points. In the center of Kharkiv polling stations received the largest value of the sum. In addition, these areas of the city is pretty much the most polling stations. This imposition gave high values defined area predominance of the sum.

Quite irregular can be called the second area, which are less intense. It is located in the southern of Saltovka. This phenomenon may indicate that the area is largely dominated by infrastructure facilities from human impact. You can also confidently say that in this area there are a large number of objects of different type of

anthropogenous infrastructure, which helped to increase the total figure for several stations.

The second model is a model of distribution of the phenomenon. The corresponding ArcGIS platform tool helps determine which point to the influence of each cell belongs source site. In our case the points are polling stations, and the study area is the city of Kharkiv. Distribution model allows to see the phenomenon of primitive zoning or regionalization of the city in terms of real anthropogenous security infrastructure (Fig. 2).

Using the distribution model of the phenomenon is not appropriate because this tool provides a large error in the calculation of initial parameter values in the study area. In our case, we see that in some areas there Kharkiv too sharp differentiation index without a clear transition between the stations.

One way to visualize the distribution of any phenomenon is contours. In our case, using the contours of the city territory can be classified in terms of ensuring real anthropogenous infrastructure (Fig. 3).

Contours at Fig. 3 are laid on the model of the density distribution of the phenomenon. Similarly, they can be run on other methods of classification or zoning. There is a natural trend of increase in the approach to the center of Kharkiv.

First, you need to perform interpolation method natural surroundings (Fig. 4). This method has one significant drawback. He builds a model using extents being built along the perimeter of the figure, which is formed of ribs connecting the extreme points of the territory. Because of this distribution model the phenomenon studied outside the plane is impossible.

By the method of the natural surroundings there are common. The best situation is observed in the city center, but there are also areas in areas Saltovka, HTZ and Oleksiivka.

Another model was built by inverse distance weighted. It allows you to calculate values for cells that are located between the points of the original data set. IDW advantage of the method lies primarily in that it counts most mathematically accurate values for cells that are distant from the points of reference. In our case, the point of station distributed densely enough, as IDW gives one of the most accurate simulation results compared with other interpolation methods (Fig. 5).

Analyzing created model can conclude that significant differences on the distribution of the model, built by the natural surroundings. We can also select a small

area in the south-west, formed primarily due to the absence of any negative impact from objects in the area.

Next was the method of Spline. Because in this case the tool is trying to build a surface with minimal curvature, there are significant errors in the calculation (Fig. 6). As you can see that the minimum value of the sum predominate in the peripheral areas of the south and east of Kharkiv, but in reality it is not. Also there is the greatest figure in the north-western periphery, which is itself inaccurate. Because of this distribution to model the phenomenon in the city use the method of spline inappropriate.

Among interpolation methods the most often used and functional is kringing. There are many varieties kringing, but we decided to use ordinary kringing with normal distribution parameters.

Although the surface that are built by ordinary kringing and out discontinuous and fragmented, this method can most accurately simulate the distribution of any phenomenon. In our case, we see a clear distinction in the city areas prevalence rate (Fig. 7). It is the center of Kharkiv, Alekseevka, Saltovka and HTZ area. In previous models appeared in the southwest area of the city, but on this model it is not. And this is true because it is impractical to allocate because a significant predominance of objects with positive impact in this area are observed.

Thus, using the built model can conclude that the best situation is observed in Kharkiv city center, but is also a habitat of several positive trend.

Next was the method of Voronoi map (Fig. 8). Maps are constructed from a series of Voronoi polygons formed a circle of support points.

Voronoi Polygons are created so that each point within the landfill was considered closer to the reference point than to any other reference point. Once this operation has been performed for all polygons and their neighbors, using the color bar appeared mentioned local medium to help visualize regions of high and low values.

Under this method, we see that the whole territory of the city of Kharkiv divided into five categories of values for the corresponding colors.

The advantage of visualization zoning in this form is that each cell of the study area influenced by individual free-form polygon, so we can pretty confidently say that this option zoning interpolation method is accurate.

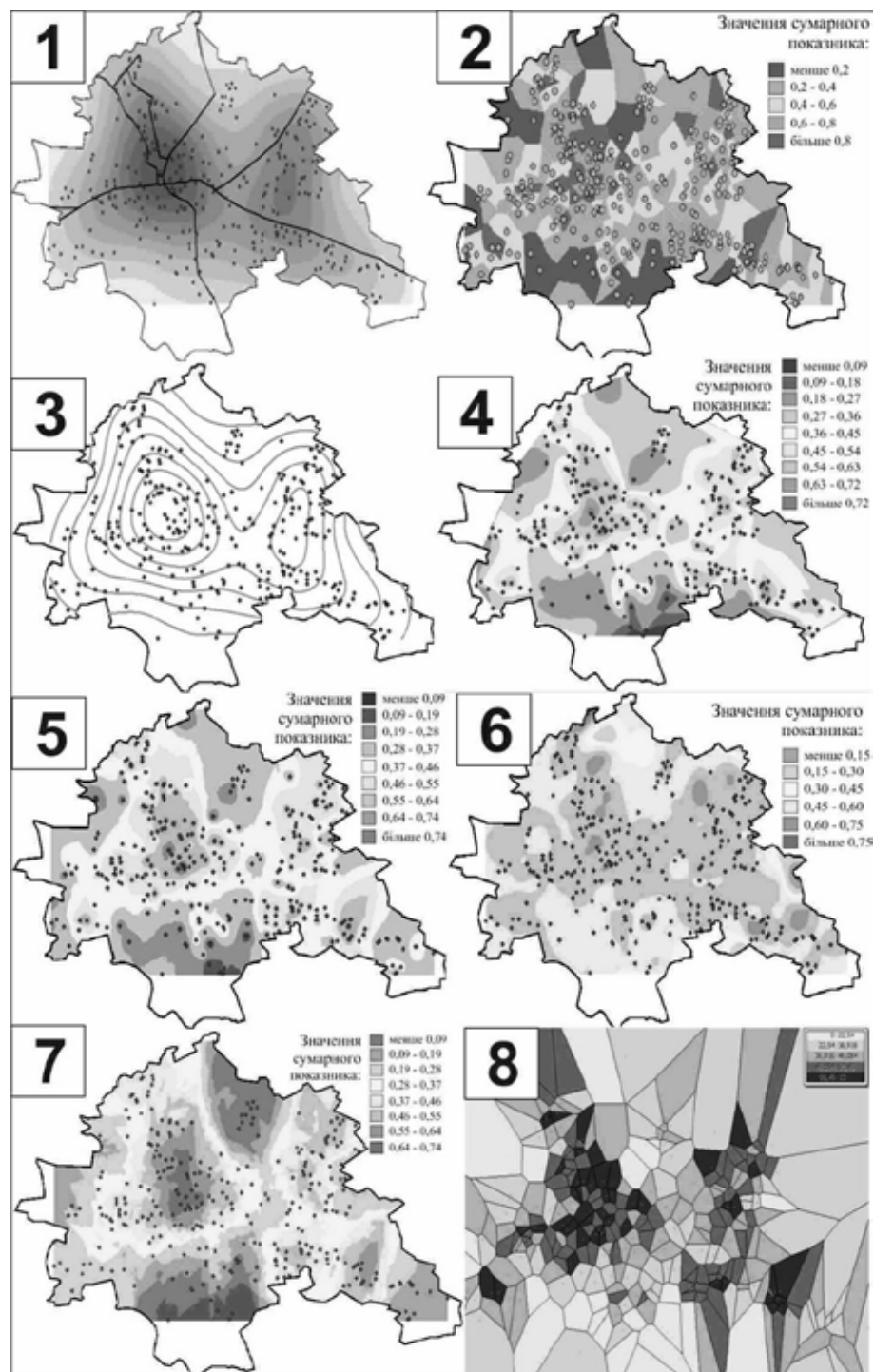


Fig. 1-8. Examples of the use of GIS tools for spatial analysis

Conclusions. So we can conclude that schools and fire stations have the greatest care coverage in the city of Kharkiv. 80% of the population can expect that the fire brigade arrive on time in case of fire. The lowest availability with markets. 93% of the population have to walk to the markets of more than 500 meters, which corresponds to 5 minute walk for an adult, that most travel market by public transport

(central market or Barabashovo). Failure can be called the fact that about 2% of the population living near the treatment facilities and 13% close to the dispensaries of various types.

Geoinformation approach offers many opportunities for the spatial analysis of human, social and tourist infrastructure. GIS tools can detect such patterns and phenomena, the study of which is impossible using only general scientific methods.

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