Correlation Analysis of the Morbidity and Pollution Using GIS

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ABSTRACT

Introduction. In addition to harmafull influence to nature environmental pollution leads to various diseases of the population living in the contaminated area, including cancer. In the Republic of North Ossetia-Alania, environmental pollution occurs mainly due to enterprises of non-ferrous metallurgy and vehicles (Alborov et al., 2019).

The capital of the republic the city of Vladikavkaz is exposed to the greatest pollution there the main stationary sources of pollution and the largest number of vehicles is located. In rural areas of the republic, the condition of atmospheric air is stably satisfactory due to the absence of large industrial enterprises and a large number of vehicles (Burdzieva et al., 2019).

The incidence of neoplasms in the city of Vladikavkaz according to the zonation of urban clinics. Anthropogenic environmental pollution has a pronounced effect on the formation of population health. The steady increase in the flow of toxic substances into the environment primarily affects the health of the population.

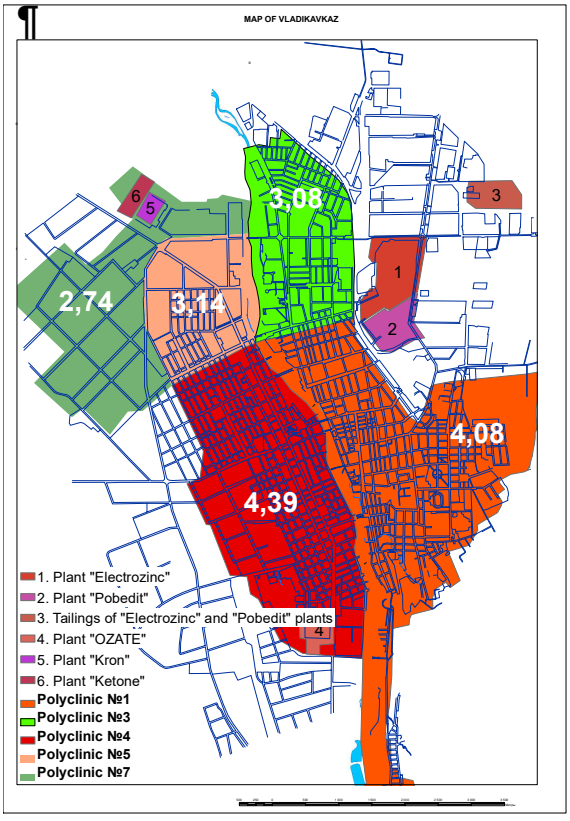

Figure 1. The incidence of neoplasms in the city according to zonation of urban clinics

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Assessing the significance of environmental pollution according to the biological responses of the human body, according to health indicators, is more objective than comparing the concentrations of individual pollutants with hygiene standards, since it integrally takes into account the influence of all, including unidentified pollutants, their integrated and combined effect on the human body (Burdzieva et al., 2016; Zaks et al., 2016).

The resulting material, designed in the form of a database, was superimposed on a digital map-scheme of city development. In other words, in GIS technologies, the place of residence of the patients (streets, buildings, their numbers) were applied to the map of the existing buildings, thus forming a real distribution of the incidence of malignant tumors over the city area. The incidence values for different years were obtained, as well as the average value for several years, which was applied to the map (see Fig. 1).

Methods. To conduct regression and correlation analyzes the incidence of the population on a uniform grid of 500 by 500 meters was calculated. The task of constructing such a grid in the form of a shape-file often arises in ArcGIS. Such a grid, for example, can be used as a coordinate grid. The easiest way to solve this problem is realized by using the Create Fishnet utility from the Feature Class toolbox. Using a spatial join, a comparison is made between the rows of the Join Features table and the Target Features based on their spatial location.

Results. The result of the calculation is a map in the form of a raster layer. To calculate the average value of the content of heavy metals in each cell for which the incidence rate was calculated using the tool "Spatial join", it is necessary that the layers are in the shape file format. To do this, a layer consisting of points was created, to which data on the concentration of heavy metals at this point were assigned as attribute information. Then, using the tool "Spatial join", the average value of all points included in the polygon was calculated, for which the incidence value was calculated.

Conclusions.

1. Correlation and regression relationships between the oncological morbidity of the population and the content of heavy metals in soils have been established.
2. For the analysis, the territory of Vladikavkaz city was divided into 118 identical sites, for each of which the oncological incidence of the population was calculated.
3. Using modern GIS technologies, the heavy metals content in the soils of the city of Vladikavkaz was interpolated according to the available results of laboratory tests of soil testing and the corresponding maps were constructed.
4. Based on the processing of the results of the studies, a linear dependence of the oncological morbidity of the population on the content of heavy metals in soils is established.
5. The reliability coefficient of the approximation $R^2 = 0.14$ indicates that the contribution of the content of heavy metals in soils to the total incidence of oncology can be up to 14% of the total contribution of all factors that form the final value of the incidence.

References

Alborov I., Burdzieva O., Tedeeva F., Arkhireeva I., Bekuzarova S., Maisuradze M., Dzobelova L., Dzhusoeva N. Advances in Engineering Research, 182, 1-8. (2019). DOI: 10.2991/ciggg-18.2019.1

Burdzieva O., Zaalishvili V., Aiskhanov S., Kanukov A., Margoshvili M., Yakhikhazhiev S. Advances in Engineering Research, 182, 50-56. (2019). DOI: 10.2991/ciggg-18.2019.10

Burdzieva O., Zaalishvili V., Beriev O., Kanukov A., Maisuradze M. International Journal of GEOMATE 10-1, 1693-1697 (2016). DOI: 10.21660/2016.19.5327

Zaks T., Kanukov A., Maliev I., Melkov D., Tuaev G., Tuchashvili D. Geology and Geophysics of Russian South, 4, 68-74 (2016). DOI: 10.23671/VNC.2016.4.20900