Method for assessing the health risk of the rural population from the hydrochemical regime of surface waters

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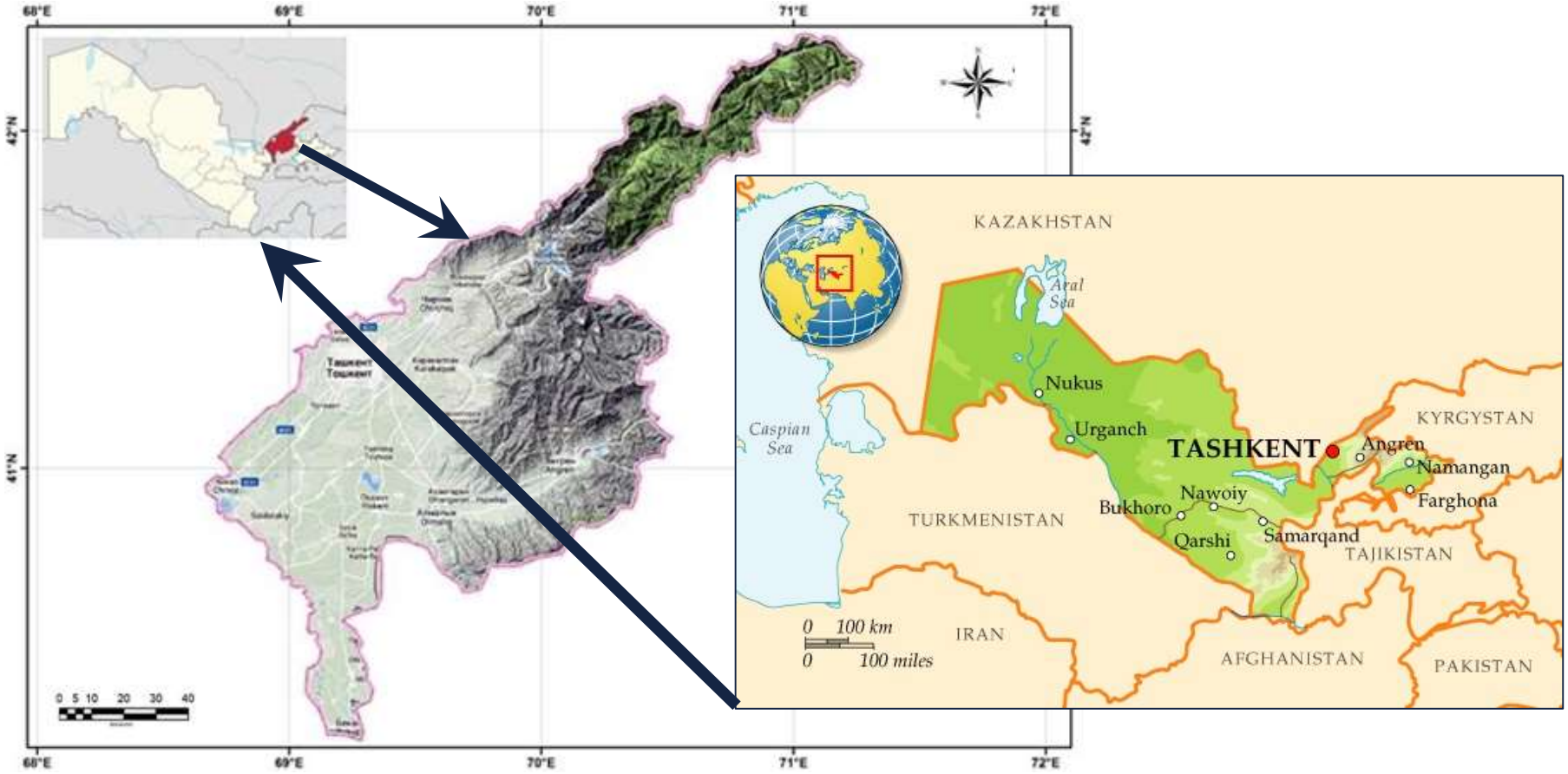
Study area

Location of the Tashkent region



In rural areas of surface water is used to irrigate food production fields and often for drinking.

The chemical composition of water has a direct impact on the health of the population.

A nosogeographic analysis of the incidence of the population from the hydrochemical regime of surface waters flowing through the territory of administrative districts was carried out using geographic information systems (GIS) technologies.

Nosogeographic GIS analysis revealed territories with different incidence rates.

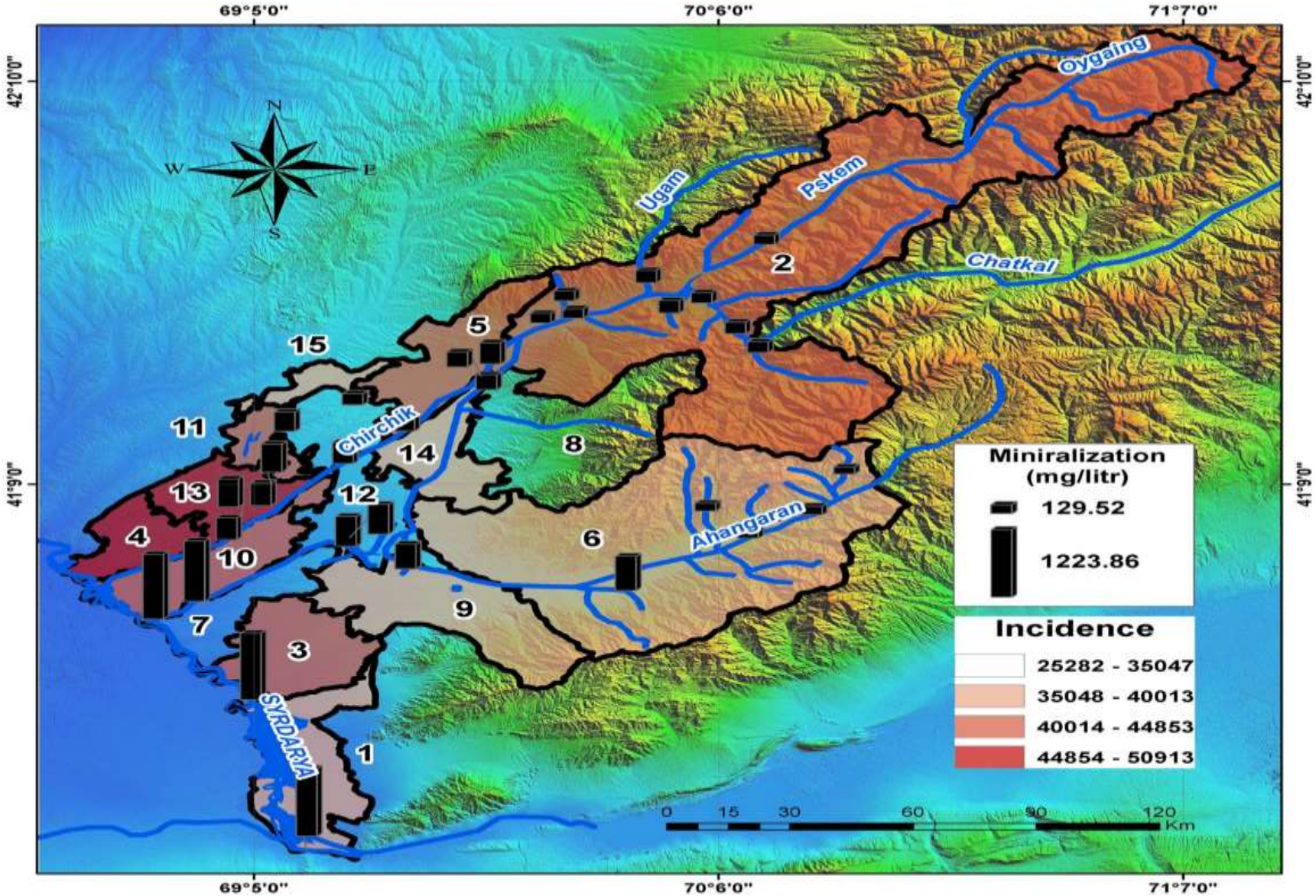
Human health is determined by the state of the immune system. The determining factor in the state of the body's immune system is the lack or excess of chemical elements.

The rural population uses surface or groundwater in their territories for drinking needs.

The hydrochemical composition of ground and surface waters of specific territories of the river catchment is usually the same.

The problem of comparing the nosogeographic map and the hydrographic location of hydrochemical data for the hydrological observation points in the environment of the geographic information system is solved.

A nosogeographic map of the incidence of the rural population by administrative region and histograms of the total mineralization of surface waters by hydrological sections



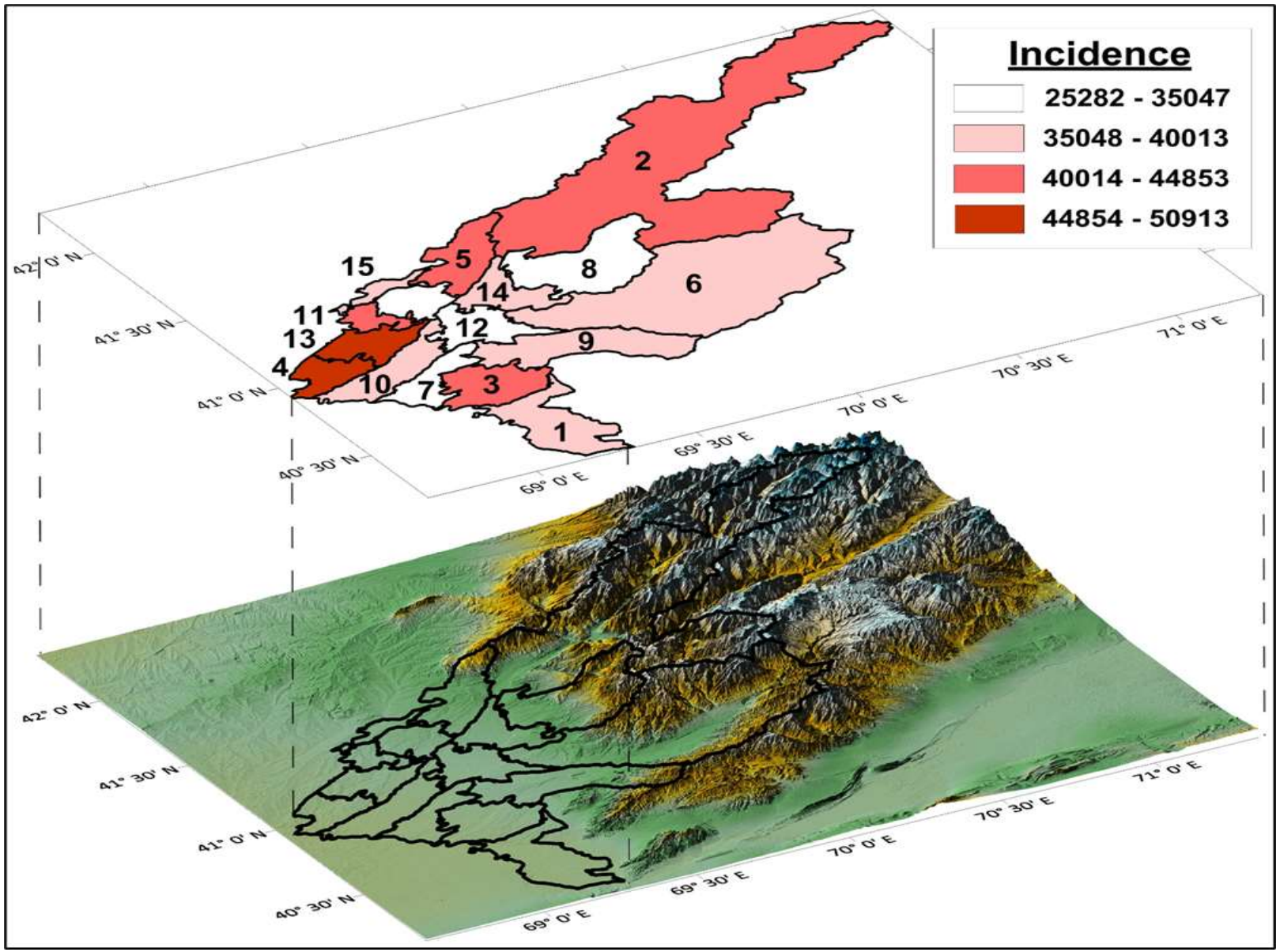
The analysis showed that the risk of morbidity in the rural population is higher in the upper and lower reaches of the catchment area of the main river in comparison with the middle reaches.

The upper catchment areas of the Tashkent region are located in the mountainous region and are used for recreation. In the upper part of the drainage basin there is cleaner air and cleaner water (spring water).

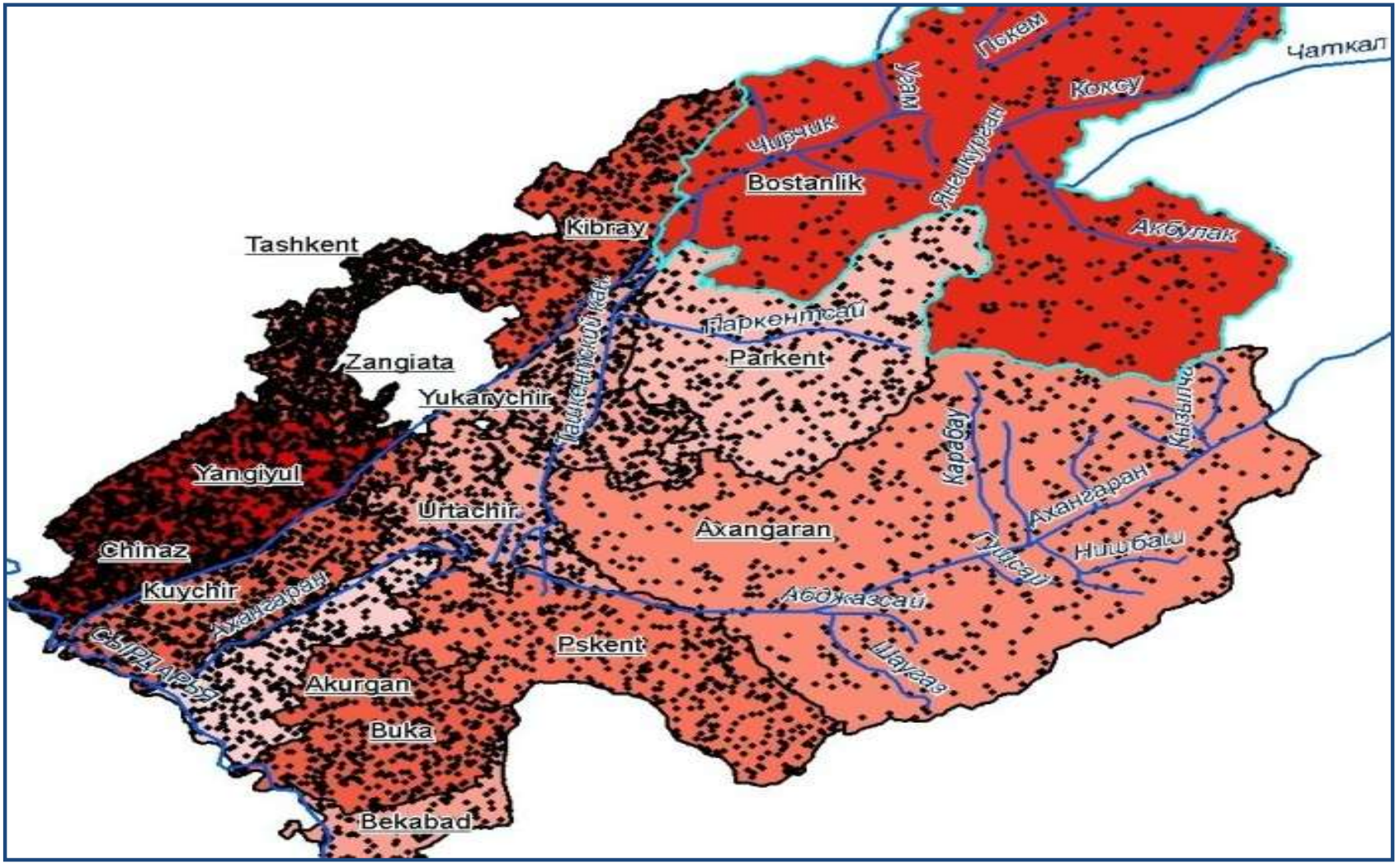
The rural population, permanently living in recreational areas, lacks chemical elements in drinking water.

The rural population living in the lower part of the catchment of the river uses water with an excessive concentration of pollutants.

Nosogeographic map of Tashkent region and digital elevation model.



Overlaying the **primary morbidity** polygons (background color)
of the morbidity values of diseases of the **gastrointestinal tract** (density of dots)



The regression equation was obtained and its evaluation was carried out in accordance with the methodological rules of “Statistical software”:

$$Y = 7657-4.7*X_1 + 13*X_2 + 107*X_3 + 13.7*X_4 + 177*X_5 + 480*X_6-2.67*X_7-92.2*X_8$$

In the equation: Y is the number of diseases registered in the region,
concentration X_1 is total water mineralization,
X_2 is calcium, X_3 is chlorine, X_4 is hydro carbonates, X_5 is potassium,
X_6 is magnesium, X_7 is sodium, X_8 is SO_4.

A standardized form of the regression equation was obtained, which has the form:

$$Y_C = -0.21*X_1 + 0.11*X_2 + 0.33*X_3 + 0.11*X_4 + 0.24*X_5 + 1.36*X_6-0.011*X_7-2.19*X_8$$

Determination coefficient $R^2 = 0.38$. Communication is moderate.

The results can be used to predict the risk of diseases from the concentration of substances in the water of watercourses in the Tashkent region with the expectation condition of 0.67%.

Conclusion

The rural population living permanently in the **upper and lower parts** of the river basin when used as drinking water, surface water is more at risk of ill health and the effects of viral infection.

Quantitative estimates are obtained of the effect of concentrations of the main chemical elements in surface waters on the health of the rural population of Tashkent region.

The coefficient of multiple linear regression (R^2 = 0.38) indicates a high relationship between the concentration of chemical elements in surface waters on the health of the rural population.

The results of the work can be used to predict the risk of disease growth depending on the concentration of chemical elements in the surface waters of the Tashkent region with **the expectation condition of 0.67%.**

The coefficients of a standardized form of the regression equation with the corresponding coefficients of determination were obtained.

GIS maps of the territorial distribution of the morbidity of the rural population were obtained. Multivariate equations for regression of the risk of an increase in morbidity from changes in the hydrochemical regime of surface waters have been obtained.

The results can be used to predict the risk of diseases from the concentration of substances in the water of watercourses in the Tashkent region with the expectation condition of 0.67%.

The implementation of the project makes it possible to assess the risk of an increase in the morbidity of the rural population from changes in the hydrochemical regime of surface waters as a result of changes in the regime of water use and water consumption, the dynamics of agrotechnical measures in the production of food in irrigated areas.

Calculate the risk of an increase in morbidity from changes in the parameters of the hydrological cycle of natural watercourses as a result of climate change.

This method can be used for other territories

Thank you for your attention