Assessment of parameters of groundwater quality in Lviv

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Abstract – The thesis is devoted to the research of indicators of groundwater quality in the Lviv region and the city of Lviv in particular. The peculiarities of formation and distribution of groundwater in Ukraine are described. The monitoring data on the potential of natural sources in administrative areas are given. The features of natural waters in the Lviv region and the main factors influencing the distribution of groundwater in the region are shown. In summary, the results of the obtained studies, their analysis and comparison are presented.

Keywords – underground water, sampling, research methods, water analysis.

Introduction

The source of drinking water supply in the Lviv region is mainly groundwater (more than 95% of the water supply of settlements is carried out from underground sources and about 5% - from the surface). The area is approved in the category A + B + C1 = 1237.39 thousand m^3/day and in the category C2 = 47.3 thousand m^3 / day of underground fresh water.

For use, groundwater accounts for 35%. The predicted resources of fresh groundwater in the oblast are 36,644.1 thousand m^3/day (all stocks with mineralization of water up to 1 g/dm^3).

Favorable conditions for the formation of groundwater have developed in the Lviv region, this is a moderately continental climate, a significant amount of precipitation, and, accordingly, a developed river network, as well as the geological structure of the region, which is characterized as complex.

Since the territory is in the zone of excessive humidification with shallow groundwater deposits, this contributes to the formation of groundwater resources, due to the infiltration of atmospheric precipitation.[1, 2]

Description of the problem

The quality of water in the city of Lviv is influenced by many indicators, among them the significant influence of the human factor, which in its power may vary in different parts of the city.

For the zoning of the city of Lviv for the anthropogenic load, the following indicators were used: loading of the territory by automobile, rail and air transport, density of development, presence at industrial sites and occupancy of areas by green plantations.

According to these parameters, 11 districts are distinguished in Lviv according to the level of anthropogenic loading. Indicated zoning is shown in Fig. 1. [3]

To study the quality of underground water in Lviv, samples of waters from the selected three locations with natural sources were selected:

1. Stryjsky Park, Lviv;
2. Park of culture and rest to them. B. Khmelnitsky (Park of Culture), Lviv city;
3. Park "Pohulyanka", Lviv.

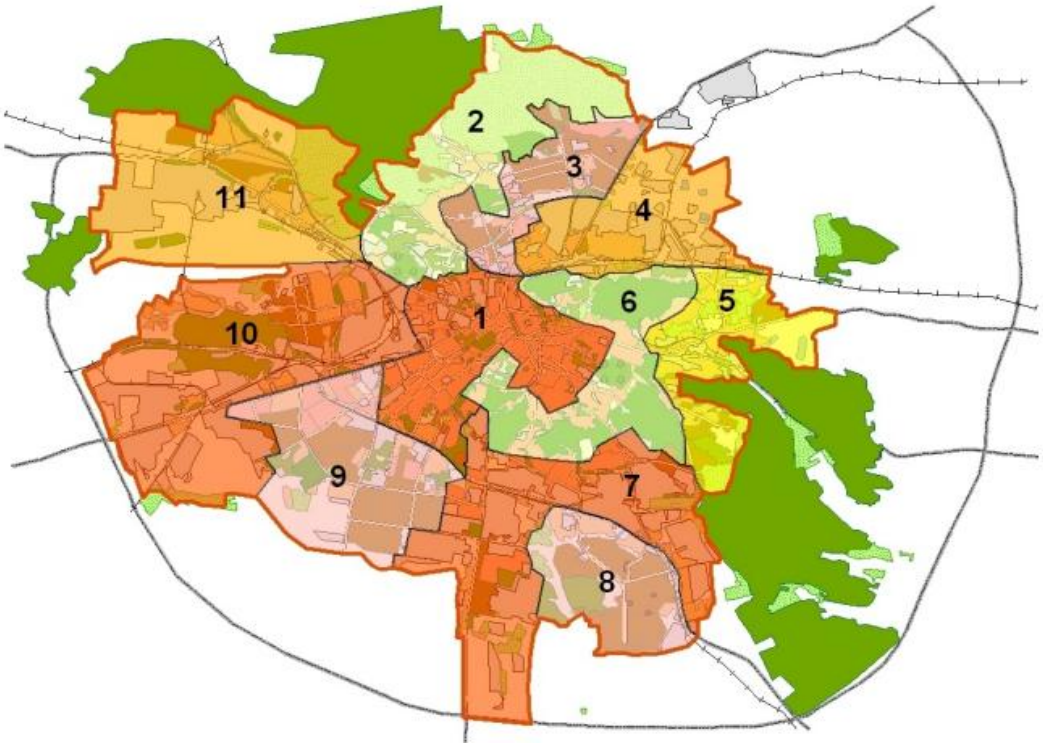

Fig. 1 Areas of Lviv on the degree of anthropogenic load

Additionally, the research of the quality of drinking water was selected from the well on the street. Andrey Sheptytsky, Lviv, and, for comparison, the results of the analysis of water quality parameters from the center of Lviv city, where technogenic influence on groundwater is most observed, is taken.

The results of chemical studies are given in Table. 1

Table 1

Obtained results of testing water samples

Name of metrics	Actual values				Norm according to SSRaN2.2.4-171-10 [4]
	Street Andrew Sheptytsk.	Park of culture	Stryisky Park	Park "Pohu-lyanka"	
Indicator of the concentration of hydrogen ions, pH	7,4	7,8	7,15	7,2	6,5 – 8,5
Total hardness, mmol / dm^3	6,6	8,6	10,4	8,6	Not more 10,0
Total alkalinity	-	6,6	7,6	6,9	Not determined
Calcium, mg/d^3	94,2	128,26	116,23	132,26	Not determined
Chlorides ,mg/m^3	33,7	35,56	39	21,34	Not more 350
Sulfates, mg / dm^3	40,1	206,4	249,6	158,4	Not more 500
Total iron, mg / dm^3	0,06	0,3	Absent	Absent	Not more 1,0
Phosphates, mg /dm^3	3,2	1,8	0,28	0,4	Not determined
Ammonium, m /dm^3	Absent	Absent	Absent	Absent	Not more 2,6
Nitrates,mg/dm^3 (nitrate tester)	25	26-28	29-31	28-30	Not more 50,0

From the obtained results it is clear that all the parameters in the selected samples are within the limits of the norm in accordance with SSRaN 2.2.4-171-10 for wells and sources of copper. However, there is a slight increase in water hardness in Stryjsky Park - 10.4 mmol/dm^3 at a norm of 10.0 mmol/dm^3. The presence of calcium is most often observed in the source located in the park "Pohulyanka", but if the results of water quality are compared in the central part of Lviv, then the concentration of calcium in these waters is 215-230 mg/dm^3. The main reason for exceeding the above indicators is the feature of the geological structure of the region.

The presence of chlorides in our selected sources is small, the maximum concentration is concentrated in the underground waters of the Stryisky Park, but in the central part of the city the presence of chlorides varies within the range of 230-270 mg/dm^3, which though it is within the limits of norm, but significantly exceeds the indicators of groundwater in parks sources. The reason for this is human activity, because the chloride content is due to the discharge of industrial and domestic sewage into the water. Regarding the presence of sulfates in water, the smallest value of the presence of this component belongs to a sample of water taken from the well on the street. Andrei Sheptytsky, the highest levels of sulfate presence are observed in Stryisky Park - 249.6 mg/dm^3 and in the center of Lviv - 260 mg/dm^3. However, on the street. Andrey Sheptytsky has the highest concentration of phosphates - 3.2 mg/dm^3. Among other indicators there was no significant difference; in two of four samples, the presence of iron, the concentration of which is within the normal range, was detected. In the study of water for the presence of ammonium, the results showed its absence.

Conclusion

Sampling of water, and conducting research with these samples of water, was carried out in accordance with the guidelines. The results obtained have made it possible to compare the water quality in the selected sampling points. And also evaluate the possibility of using these sources for the drinking water supply of the population.

In selected samples of water there was no significant excess of the above mentioned indicators, but the chemical composition of water, which was selected from the central part of the city of Lvov, significantly differed. In all samples of water, we identified an increased rigidity, among the chemical elements most dominated by the concentration of calcium. To the elements that were partially or completely absent in water are iron and ammonium.

According to the results of the research of selected samples from underground sources, it can be argued that the selected water satisfies all requirements related to drinking water and therefore it can be recommended for consumption by the population.

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