ASSESSMENT OF GROUNDWATER RESOURCES QUALITY IN THE WEST REGION OF ROMANIA

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Introduction

Groundwater resources are vital for drinking water supply and the state of groundwater resources needs to be monitored regularly to provide the basis for their assessment and to estimate their quantity and quality, for effective groundwater management.

The aim of this study was to give an overview of the current groundwater quality and its suitability for drinking purpose in several urban and rural areas from the West Region of Romania, taking into account the recommendations of Directive (EU) 2020/2184.

Complex analytical investigations on the quality of water from underground resources was proposed in order to identify and quantify persistent pollutants with toxic potential, respectively toxic metals, specifically tracking the presence of arsenic in groundwater resources in the West Region of Romania.

Materials and methods

To determine the degree of pollution of groundwater resources intended for human consumption in the West Region of Romania, 35 representative drills were selected and analyzed (Figure 1):

Figure 1. The sampling locations investigated in the West Region of Romania

➢ Timis County (14 locations: 6 communes, 8 villages),
➢ Arad County (8 locations: 7 cities, 1 commune),
➢ Bihor County (13 locations: 2 peri-urban areas, 7 communes, 4 villages).

The sampling campaign took place during May 2023, the groundwater sources analyzed had varying depths, between 10 and 300 m.

The main physical-chemical water quality indicators analysed were: pH, electrical conductivity, total dissolved solids, the total hardness, dissolved ions (F^-, Cl^-, Br^-, SO_4^{2-}), ammonium, nitrate and nitrogen content, total organic carbon, dissolved oxygen, calcium, CO_3^{2-}, HCO_3^-, total phosphorus and phosphate content.

The metals (Mn, Fe, Cu, Zn, Cr, Cd, Pb, Ni) were analysed by flame atomic absorption spectrometry (FL-AAS) and As by Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES).

Results and Conclusions

In order to comprehensively evaluate the degree of pollution of groundwaters, a wide range of physical-chemical indicators was analyzed.

⟹ The groundwater sources from the West Region of Romania that require water treatment, are generally characterized by high concentrations of **Fe** and **Mn** (Figure 2), also **As** being present in fairly high concentrations (even about 400 µg/L in two isolated Timis County locations) and in certain situations exceedances may occur for NO_3^-, NO_2^- and NH_4^+ (e.g the rural area around Ineu city, Arad County).

⟹ The level of **Fe** exceeded the 0.2 mg/L safe limit imposed for drinking water for 85% of the Timis County analyzed samples.

⟹ The content of **Zn, Cu, Cr, Cd, Ni, Pb** was within the maximum permissible limits for all the 35 representative analyzed drills.

Figure 2. Manganese content in the analyzed drills, in the areas of the investigated counties

Summarizing, the quality of the groundwater from the West Region of Romania is of good quality and applying specific treatment procedures, these sources can be used for drinking purpose.

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