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ASSESSMENT OF GROUNDWATER RESOURCES QUALITY IN THE WESTERN 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 in the Western Region of Romania, taking into account the recommendations of Directive (EU) 2020/2184.

A complex analytical investigation on the quality of water from underground resources 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 Western Region of Romania was proposed.

Materials and methods

Groundwater quality monitoring was carried out in 35 sampling points selected from the three different counties: Timis, Arad and Bihor, located in Western part of Romania.

The sampling campaign took place during May 2023, the groundwater sources analyzed had varying depths, between 10 and 300 m, most of them being located in the rural area.

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

The main physical-chemical water quality indicators analysed were: pH, electrical conductivity, total dissolved solids, the total hardness, dissolved ions (F⁻, Cl⁻, Br⁻, SO₄²⁻), ammonium, nitrate and nitrogen content, total organic carbon, dissolved oxygen, calcium, CO₃²⁻, HCO₃⁻, 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 groundwater, a wide range of physical-chemical indicators was analysed and the results of the present study are generally similar to what was reported in other studies, especially regarding the iron and manganese content (Figure 2).



Fig.1. The sampling locations investigated in the Western Region of Romania counties

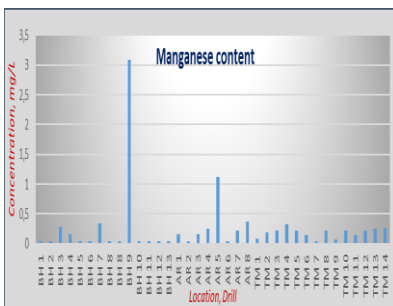


Fig. 2. Manganese content in the analysed drills, in the areas of the investigated

The physical-chemical characterization data showed that, at least in some cases, for the selected and analyzed resources, the maximum limits allowed for drinking water are exceeded for the content of iron, manganese, ammonium and arsenic ions.

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

The groundwater sources from the West Region of Romania that require water treatment, are generally characterized by high concentrations of iron and manganese, also arsenic being present in fairly high concentrations (even about 400 $\mu\text{g/L}$ in two isolated Timis County locations) and in certain situations exceedances may occur for nitrate, nitrite and ammonium (e.g the rural area around Ineu city, Arad County). For example, the level of Fe exceeded the 0.2 mg/L safe limit imposed for drinking water for 85% of the Timis County analyzed samples.

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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