The influence of the exploitation of uranium deposits on the soil and vegetation

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In this paper, an impact study of the consequences of uranium mining on the Caraş Valley was carried out and includes the radioactive effects of uranium mining activity, as well as the monitoring, remediation and post-closure program of environmental factors. The experimental part highlights the influence of the exploitation of uranium deposits on the soil and vegetation.
By bringing uranium ore to the surface, in the areas where it is handled or transported, an influence on the environment is highlighted by increasing the content of natural uranium and decay products from its family in environmental factors.
Soil and vegetation are directly contaminated by the storage of sterile ore, poor ore, ore storage or radioactive waste; either indirectly by contaminating the air or water causing soil and vegetation pollution. [1]

In order to carry out the closure and greening activities of the areas affected by the uranium mining works, underground and on the surface, the Technical Project "Closure of the Lişava Mine" was elaborated in 2000. The Technical Project was updated in 2003.
The approx. 12 km N-E of Oraviţa locality, on an area of approx. 35 km2, with an approximate N-S orientation, are the mining operations in the Banat area belonging to the Bucharest National Uranium Company - Banat Mining Branch, based in Oraviţa - Caraş Severin County.
Geographically, the deposits are located in the S-V part of Caraş Severin County, in the western part of the Anina Mountains. From a geomorphological point of view, it is a hilly area of hills and plains with altitudes ranging from 300 to 500 m.
The Lişava mining perimeter includes the Dobrei Sud, Dobrei Nord and Natra mines, located in a mountainous region on the Natra and Dobrei valleys, which join the Lişava brook, a tributary of the Caraş river, which crosses the Caraş Valley.

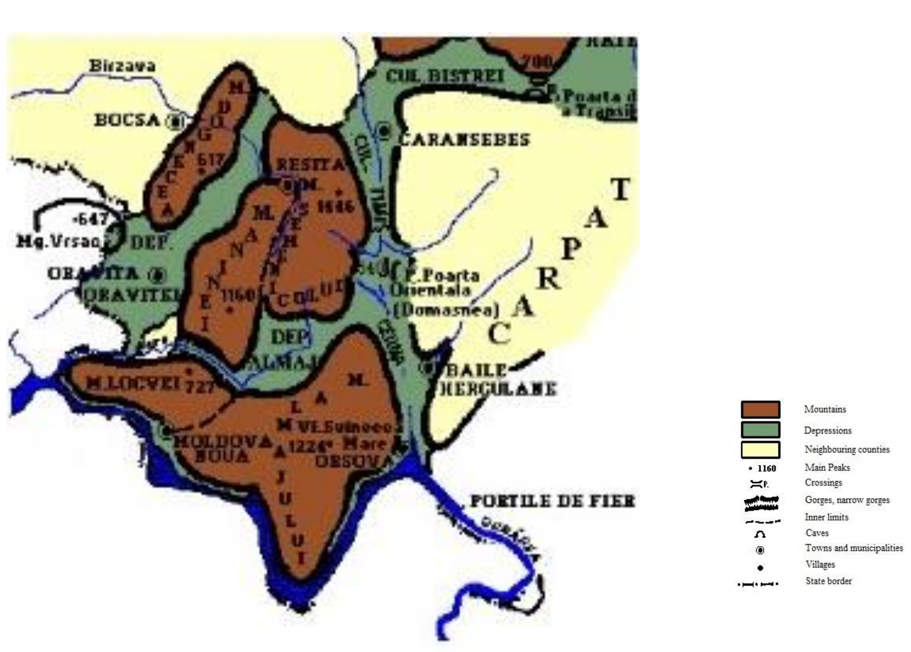

Figure 1. The map of the area of interest from which the samples were taken

In all uranium underground mining operations, regardless of the type of ore mined or the geographical area, a particular problem is groundwater, which is discharged to the surface to protect the mining works. These waters bring to the surface a certain solid mineral charge in suspension, but also an ionic one - water-soluble chemical compounds. They may not be discharged into the zonal river network before treatment has been applied to bring them to the quality of natural waters.
The influence of radioactive contamination on environmental factors can be seen in the graphs below (Fig.2-5).

The water discharged from the uranium mines brings to the surface a special category of pollutants: the suspensions are made of inert rock and uranium minerals, and the soluble part consists of natural uranium and radium, which in most cases have a concentration exceeding the limits that in Romania are:

- 60 mg/L for suspended solids;
- 0.021 mg/L for natural uranium;
- 0.088 Bq/L for Radium – 226.

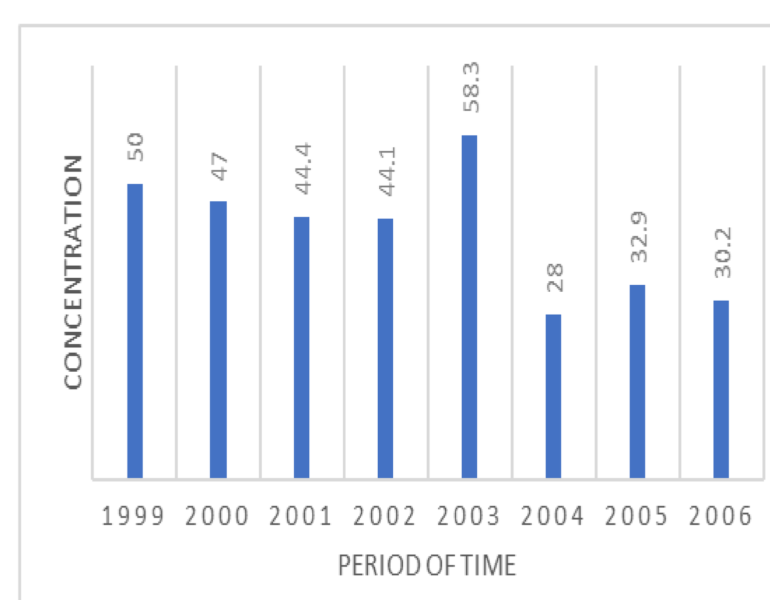

Figure 2. Concentration of radium in sediments at the entrance to the Lişava mining perimeter

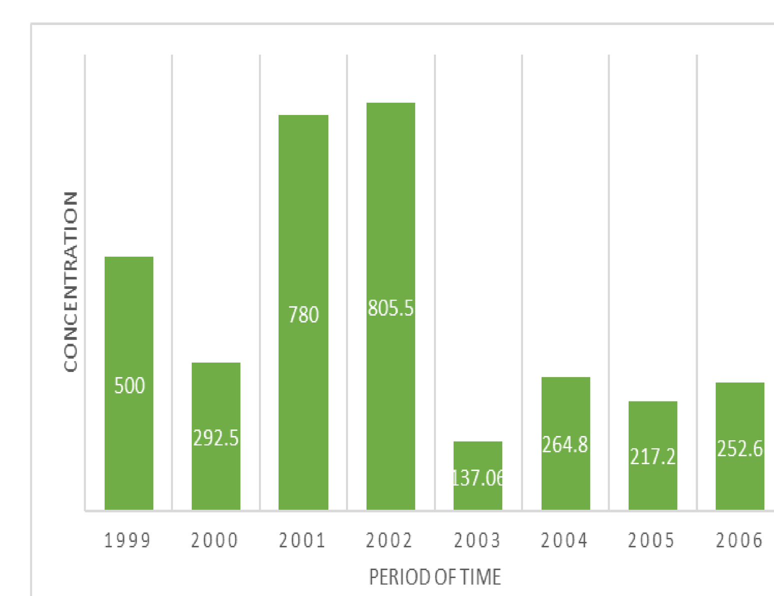

Figure 3. Concentration of radium inside the Lisava mining perimeter

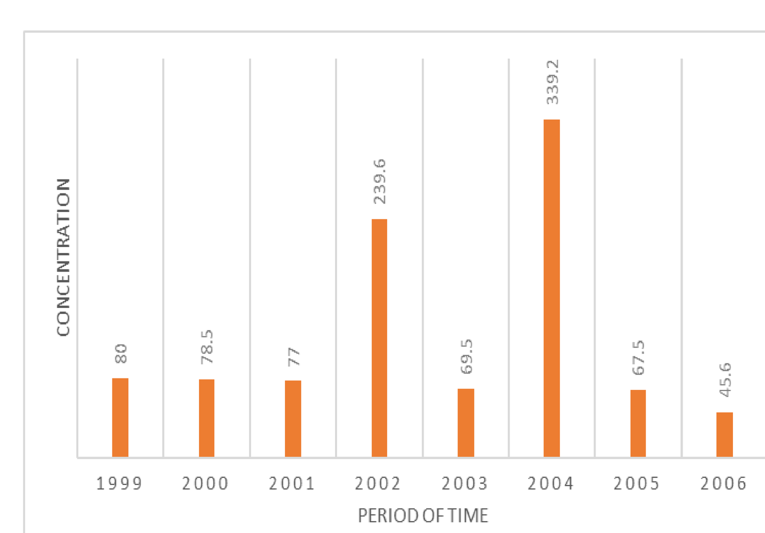

Figure 4. Concentration of radium in sediments at the exit of the Lişava mining perimeter

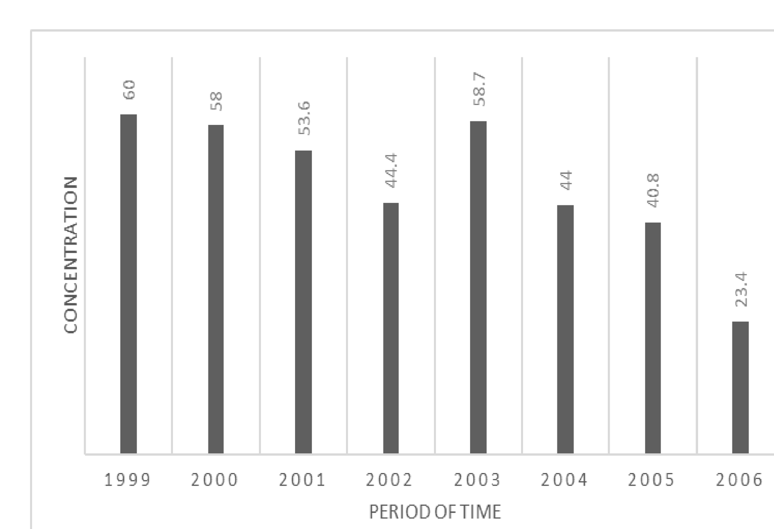

Figure 5. Concentration of radium in sediments at the entrance to the Ciudanoviţa mining perimeter

The work carried out was aimed at revegetating the areas around the pits and the contaminated material dump to fit in with the local landscape.
Through the proposed works, part of the affected areas was returned to the forestry circuit by planting seedlings of a similar category to those in the bordering development unit, and the surface of the contaminated material deposit was given a protective clay layer and planted with perennials.

CONCLUSIONS

Greening measures for the affected areas included levelling of the soil, improvement with organic fertilizers, seeding, grassing, afforestation with seedlings, laying a layer of fertile soil with a minimum thickness of 20 cm. All these measures have achieved their aim, primarily by eliminating the dry areas and replacing them with green and lively areas. Influences on the population were evidenced by the action of ionising radiation on subjects directly involved in the industry, with no impact on their descendants.
The primary objective of this action is to protect the population by eliminating land with radioactive potential, transforming it into forest areas, parks or agricultural areas depending on the level of specific activity measured in Bq/g Ra^{226} +Th^{232}.
The main element monitored to determine the polluted area is water.

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