MONITORING THE SOURCES OF RADIOACTIVE POLLUTION OF ENVIRONMENTAL FACTORS IN THE BĂIŢA AREA, BIHOR

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Abstract

The appearance of life on earth and its evolution took place in the presence of the natural radiation background of cosmic and / or tellurium origin. Radiation and ionizing radiation can have harmful effects on human health and sanogenesis, environmental factors; but in certain doses and conditions man can make them useful to his social and economic activity (agriculture, medicine, transport, etc.).

In the environment there are sources of radioactivity, both natural and artificial. The exposure state and its effects have fluctuating values depending on weather conditions. The natural dose of radiation to which the biotic and abiotic environment is exposed adds an important anthropic component of various origins (extractive industry, atomic-electric power plants, nuclear physical research, etc.).

After the mining uranium mining ceased tailings dumps and mine galleries resulted, which can be a source of pollution for environmental factors (water, air, soil, biodiversity).

The paper carries out a monitoring of these sources of radioactive pollution in the South - East space of Bihor County.

Key words: radiation, radioactivity, half-life timing, radioactive waste, irradiation, absorbed dose.

INTRODUCTION

The period immediately following the end of the Second World War and the new geopolitical map of the world are characterized by the intensive and rapid development of the use of nuclear energy in various fields. The intensive diversification of the nuclear energy for peaceful purposes led to thermonuclear power plants, which represent the source of water supply, agriculture, research, etc.

Natural terrestrial sources of radiation are made up of radioactive rocks such as: uranium, thorium, radioactive isotopes of potassium, carbon, etc (Stoici, et all, 1989). In recent years, the presence of radon 222 Rn in enclosed dwellings, drinking water, air, from some geographic areas, resulted from the disintegration of 226 Ra existing in the rocks and soil (Jurcuţ, et al, 1996).

The extraction technology and the primary processing of uranium ore generated significant amounts of uranium tailings in the said spaces (see

Figure 1) which was dumped in spaces adjacent to the exhaust centers. In the S-E space of the Bihor county, corresponding to the former E.M. Bihor, there are 10 uranium tailings organized on an area of approximately 1 250 000 m^2 and totaling about 2 000 000 m^3.

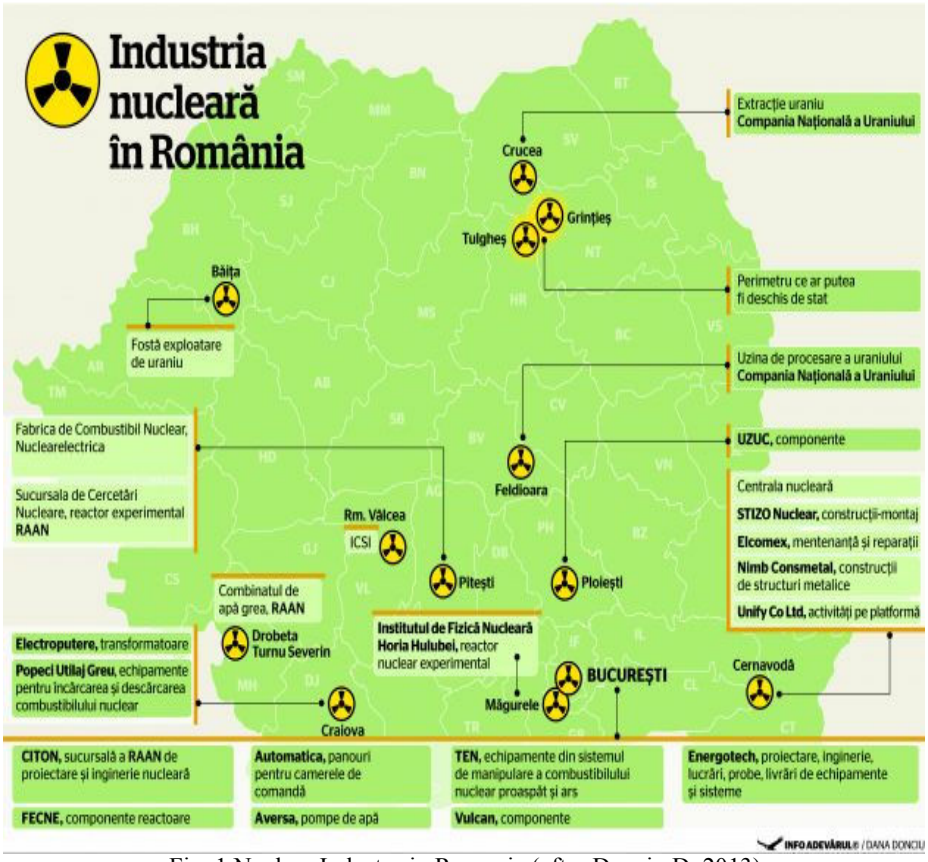

Fig. 1 Nuclear Industry in Romania (after Donciu D. 2013)

Their unsuitable management in the past has resulted in the accumulation of radioactive elements in the environment, contributing to soil contamination, destruction of its texture, ecological landscapes, groundwater and surface water pollution, and negative impacts on plant and animal biodiversity (Brejea, 2009). The easy access to the waste dumps and the fine granulation of the radioactive material, which has been used as a

waste, has allowed its use in civil engineering, residential and commercial premises (Dalea et al.,2000).

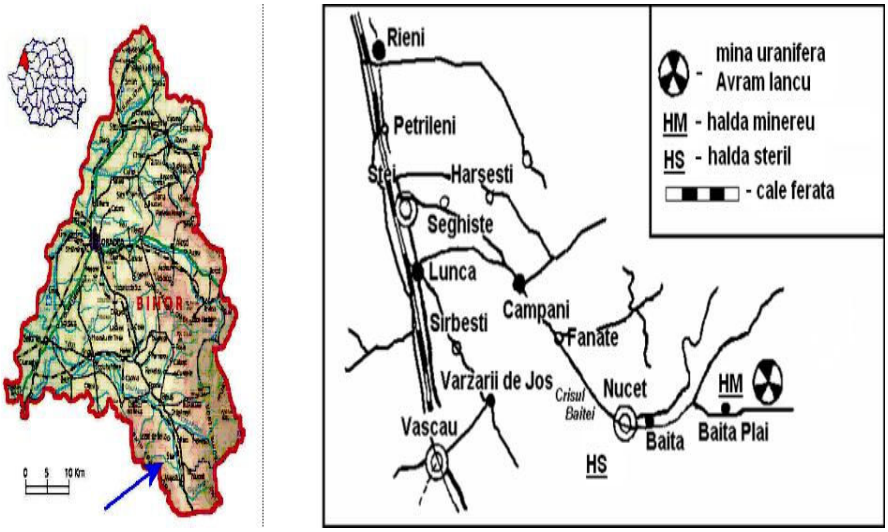

Fig. 1 Uranium area Ştei - Băiţa (after IRART Project 2010-2013)

The holes resulting from the uranium exploitation at EM Bihor are located in the perimeter administered by the local councils Băiţa, Nucet, Câmpani, Ştei, all located in the subbasin Crisul Negru on the tributary Băiţa, a tributary on the right side of the Crişul Negru, confluent downstream for the purification of Ştei, for which Crisul Negru is effluent (Popescu, 2009). The distribution of the 10 heaps is shown in Fig. 3.

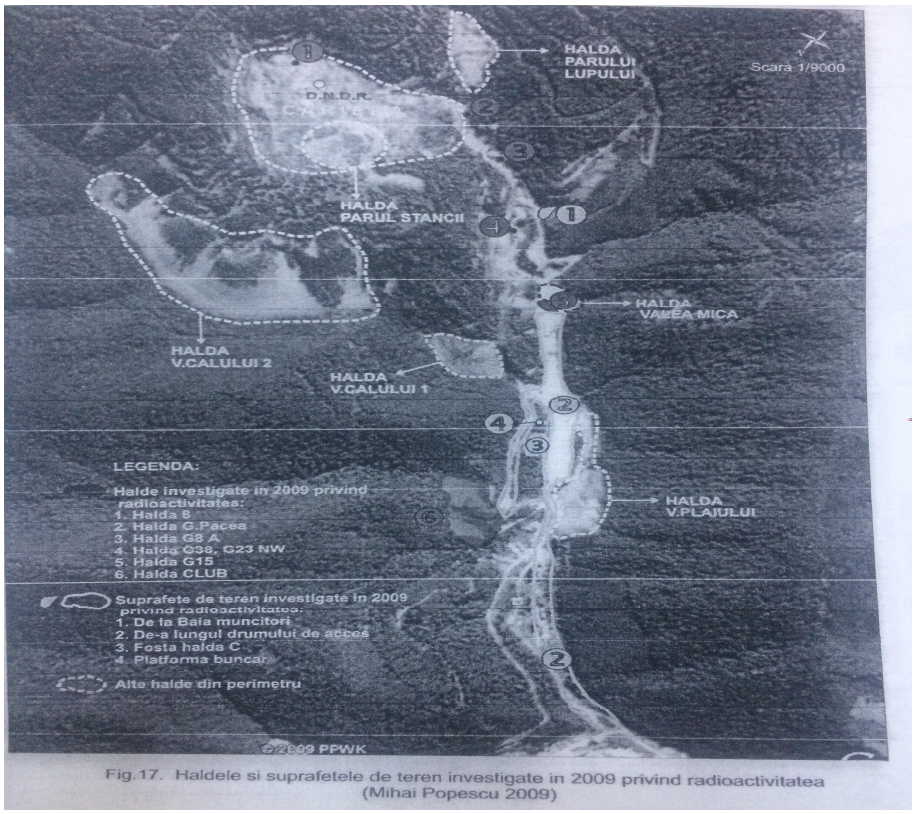

Fig.17. Haldele si suprafetele de teren investigate in 2009 privind radioactivitatea (Mihai Popescu 2009)

Fig. 3 Hoppers and field surfaces investigated in 2009 on radioactivity (after Popescu M.)

RESULTS AND DISCUSSION

The Băiţa Mining Explosion from Bihor county took place over several decades, between 1950-1990, in the Bihor Mountains, on the surface of three counties: Bihor, Alba and Arad. The administrative center was organized in Ştei with infrastructure: -road DN 76 Deva - Oradea, with diversion DN 75 Meadow - Turda; respectively DN75 / DN74 Meadow - Abrud - Alba Iulia; - Vaşcău railway - Bucharest North. The active part was organized in the space called Băiţa - Plai belonging to Băiţa commune, as the central point of the Avram Iancu gallery, where the Good Luck and Molybdenum galleries are located. The observations and the own measurements correlated with other sources are shown in Table 1.

Table 1

Table comprising the Ra 226 soil analysis chart (after Bogdan Gh. 2017)

Crt Nb	Samples	2017 Ra 226(Bq/kg)								
		IAN	FEB	MAR	APR	MAI	IUN	IUL	AUG	SEP
1.	Băița Plai Barieră	118	54	218	105	161	269	340	313	692
2.	Haldă V. Calului 2	1070	900	889	362	558	461	272	470	833
3.	Haldă V. Calului 2	470	369	362	202	175	199	202	222	512
4.	Halda Complex Nou -drum acces haldă	541	225	227	247	211	737	475	743	369
5.	Haldă V. Mică	536	306	593	297	503	1261	960	981	975
6.	Haldă Complex Vechi	590	529	100	205	845	634	658	640	794
7.	Haldă gal. 45	1343	392	544	307	507	1341	1158	1049	1060
8.	Halda Paraul Lupului	495	235	409	127	1246	879	944	974	2536
9.	Platf. Gal. 23 - gura galeriei	456	125	287	180	299	792	752	779	2212
10.	- incintă galerie	939	402	763	710	166	392	371	957	489
11.	Halda Paraul Stâncii	613	757	628	176	398	948	782	361	452
12.	Halda Club - drum acces	857	167	236	261	1003	790	519	563	494
13.	Halda C	648	113	122	634	393	476	461	446	285
14.	Platformă energetic	476	160	873	365	425	409	490	465	533
15.	Halda 13	361	466	695	494	164	1015	364	461	1333
16.	Halda 14	1740	380	711	341	358	689	638	542	310
17.	Haldă gal. 49	245	424	851	317	879	1273	1060	569	1418
18.	Haldă gal. 23 NW	889	1029	758	591	834	962	587	764	737
19.	Haldă Complex Nou	684	233	764	448	699	1709	1693	1181	1443
20.	Haldă gal. 15	453	151	417	540	566	1027	442	977	1033
21.	Haldă gal.38	248	182	781	1057	1405	2017	1252	1488	385
22.	Platformă baia minieră	1318	855	402	493	821	1498	949	983	876
23.	Platformă gal. 23 bis	421	55	734	637	466	2066	304	1042	448
24.	Haldă gal. 8 - platformă haldă	780	630	755	220	146	624	350	350	751
25.	Haldă gal .Pacea	350	309	1192	101	314	476	259	371	392
26.	Haldă gal 19-22-52-plat. hal. gal.19	275	133	224	65	63	498	65	107	160
27.	- plat. hal. gal . 52	757	644	460	393	29	55	411	56	322
28.	Haldă gal.7-15 - platf. haldă gal. 7	651	644	1186	251	799	112	508	111	697
29.	- platf. haldă gal.15	104	339	231	582	422	1052	463	562	700
30.	Stația auto Băița Village	27	64	89	34	37	21	18	23	22

Samples were performed at a depth of 0-10 cm.

Note that reference values for the Ra 226 content are within the range

- 10 - 60 Bq / kg for sediment samples
- 10 - 40 Bq / kg for soil samples
- 20 - 150 Bq / kg for vegetation samples

According to STAS 1342/91, C.M.A. for the natural uranium content in drinking water is 0.021mg / l.

According to STAS 1342/91, C.M.A. for activity 226 in drinking water is 0.088 Bq / l

We mention that the normative for the quality of waters discharged into surface waters, NTPA 001/2002, modified by GD no. 352/2005, does not mention admissible limits for uranium and radium.

Activities carried out in former uranium mining have had adverse effects on environmental factors; soil pollution has occurred through deposition of radioactive dusts from unprocessed waste dumps and platforms and drainage water spills; the pollution of water and sediment in water is due to the discharge into the emissary of untreated mine waters; air pollution by Ra and dust emissions as well as radioactive pollutants (Chiosilă, 1998).

CONCLUSIONS

The first half of the 20th century marks the intensive and rapid development of the use of nuclear energy in the social and economic spheres. The end of the Second World War and the new geopolitical map of the world is characterized by the establishment of many uranium mining holdings to provide nuclear fuel for multiple activities and uses to which this new type of energy is required. In Romania major holdings are organized in the perimeter of Baita, Ciudanovita, Crucea. Băiţa is a core of these activities, proof that in the adjacent perimeter it develops activities meant for the production of the material for auxiliary activities, extraction and primary processing.

Due to the intensive exploitation of the uranium deposits, a very large volume of tailings resulted in the space we refer to: former galleries, prospecting points, in the Bihor - Băiţa county, Banat - Ciudanoviţa, Moldova – Crucea. The existence of uranium tailings dumps influences the environmental factors (water, air, soil, biodiversity) and the quality of social life. Băiţa area generates influences in Bihor county demographic area S - E, as well as on agricultural land in the area.

Proximity to the waterbeds of the waste dumps and mine galleries, the Baita River, generated and can generate radioactive pollution on this watercourse, belonging to the Crisul Negru river basin, located on the upper course.

The weather conditions and the fluctuating water flows of the Baita River and other tributaries of the Crişul Negru caused different manifestations on the human factor and the environmental factors. Environmental agencies and health departments Bihor, Cluj, have recently discovered the presence of radon and other byproducts in homes or in publicly accessible areas, which requires continued monitoring and surveillance of the effect of radiation on human health.

REFERENCES

1. Bandici Gh. E., Borza I., Ardelean I, 2007, Ecoagricultura, Editura Universităţii din Oradea;
2. Brejea R., Domuța C., 2009, Refacerea şi protecția terenurilor din carierele de bauxită din munții Pădurea Craiului, Editura Universităţii din Oradea;
3. Brejea R., 2009, Tehnologii de protecție sau refacerea solurilor, Editura Universităţii din Oradea;
4. Chiosilă I., 1998, Radiaţiile şi viaţa, Editura Aidrom, Bucureşti, volumul I;
5. Comby, B., 2001, Energia nucleară şi mediul, Editura TNR, Bucureşti;
6. Coste I., 2001, Ecologie generală şi agricolă, Editura Orizonturi Universitare, Timişoara;
7. Dalea A., Bara V., 2000, Some aspects of radioactive polution of Băiţa River Hidroecosistem, Analele Universităţii Bacău;
8. Dalea A., 2004 , Influenţa radiaţiilor asupra fiziologiei porumbului, Editura Universităţii din Oradea;
9. Domuța C., 2005, Agrotehnica terenurilor în pantă din nord – vestul României, Universităţii din Oradea;
10. Domuţa C., Brejea R., 2010, Monitoringul mediului, Editura Universităţii din Oradea;
11. Drăgănescu I., 1983, Radiostimularea, o aplicaţie a tehnicilor nucleare în agricultură, Editura Ştiinţifică, Bucureşti;
12. Jurcuţ T., Cosma C., Radonul şi Mediul Înconjurător, Editura Dacia, Oradea, 1996;
13. Marcu G. , Marcu T. 1996 , Elemente radioactive. Poluarea mediului şi riscurile iradierii, Editura Tehnică, Bucureşti;
14. Neag Gh., 2001, Depoluarea solurilor şi apelor subterane, Editura Casa Cărţii de Ştiinţă, Cluj-Napoca;
15. Popescu M., 2009, Evaluarea detaliată de securitate radiologică actualizată conform parametrilor radiologici şi a altor parametri neradiologici pentru obiectivul minier Băiţa-Plai, judeţul Bihor, Bucureşti;
16. Sălăgean Ş. şi colaboratorii, 1984, Consideraţii radioecologice într-o zonă de exploatare uraniferă, a II-a Conferinţă de Ecologie, 11 – 14 septembrie 1984, Sibiu;
17. Stoici, S. Tătaru, S., 1989. Uraniul şi Thoriul, Editura Tehnică, Bucureşti.

18. [H.G.nr.750/14-05-2004 HOTARARE privind modificarea Regulamentului de organizare ţi funcţionare a Comisiei Naţionale pentru Controlul Activităţilor Nucleare, aprobat prin Hotărârea Guvernului nr. 1.627/2003].
19. Legea nr. 265/2006 pentru aprobarea Ordonanţei de Urgenţă a Guvernului nr. 195/2005 privind protecţia mediului, modificată şi completată de O.U.G. nr. 195/2005 privind protecţia mediului – modificări (O.U.G. nr. 75/2018).