

DETERMINATION OF HEAVY METAL CONCENTRATIONS IN SAMPLES POTENTIALLY CONTAMINATING FROM THE MOLDOVA NOUA AREA – 21 November 2022

The research team continued with the third sample collection campaign from the Moldova Nouă area, which took place on November 21, 2022. The same samples were collected by the WUT team, and, for the determination of metals, the samples (surface water, groundwater, sediment, and soil) collected from the Moldova Nouă area were sent to the Institute of Mining and Metallurgy in Bor, Serbia.

Table 1 and Table 2 show the results obtained and their interpretation for surface water samples and groundwater samples, respectively. The interpretations for sediments and soil are made in Table 3 and Table 4. The interpretation of the results is in accordance with Order of the Ministry of Environment and Water Management 161/2006, for the approval of the normative on the Classification of Surface Water Quality to establish the ecological status of the water bodies and with according to Law No. 458/2002 regarding the quality of drinking water in Romania republished in 2011.

The results for surface water samples (Table 1) are of good quality and are classified as Class I. For cadmium results, all samples had values slightly higher, being included in class III. Samples W22 and W23 had higher values for Cd, Fe, Mn, Pb, and Se, values included in classes II, III, respectively V. The water quality in the Nera River was poor during the winter season. Cu values were slightly higher for the Bosneag River in town and upstream, and iron values were extremely higher for the Nera River from Socol and upstream, followed by the Radimna River from town.

Table 1 Interpretation of chemical results for every metal/nonmetal identified in surface water samples (Moldova Noua) according to Order of Ministry of Environment and Water Management 161/2006, for the approval of the Normative on the Classification of Surface Water Quality to establish the ecological status of the water bodies.

Metals	Classes*					Samples µg/l					
	I	II	III	IV	V	W18	W19	W20	W21	W22	W23
As, µg/l	10	20	50	100	>100	2.1	2.1	2.1	2.1	2.1	2.6
Cd, µg/l	0,5	1	2	5	>5	1.6	1.4	1.3	1.2	1.4	1.3
Cr, µg/l	25	50	100	250	>250	1.7	1.7	1.7	1.7	6	7.9
Cu, µg/l	20	30	50	100	>100	28.7	27.9	13.7	13.9	16	16.7
Fe, tot., µg/l	300	500	1000	2000	>2000	180.1	249.2	357.8	154.6	4836.7	6526
Mn, µg/l	50	100	300	1000	>1000	34.8	41.5	43.9	15.4	148.5	204.7
Ni, µg/l	10	25	50	100	>100	3.6	3.6	3.6	3.6	4.6	6.1
Pb, µg/l	5	10	25	50	>50	4	3.1	3.3	3.3	7	5.8
Zn, µg/l	100	200	500	1000	>1000	24.6	34.6	9.9	18.8	44.8	26.3
Se, µg/l	1	2	5	10	>10	4.5	4.5	4.5	4.5	4.5	4.5

*Maximum acceptable concentrations

The results for groundwater samples (WU11-WU14) are in the normal range for all metal concentrations. The exception is for the WU14 sample, which had a Fe concentration higher than the MAC. The presence of green in the rectangles expressed the good quality of the groundwater collected from wells in the Moldova Noua area (Table 2), while red colours represented the bad quality of samples collected from groundwater in the Moldova Noua area.

Table 2 Interpretation of chemical results for every metal/nonmetal identified in groundwater samples (Moldova Noua) according to Law No. 458/2002 regarding the quality of drinking water in Romania republished in 2011. The rectangles with a red colour are the samples that exceed the MAC, and the rectangles with a green colour are the samples that are under the MAC.

Metals	MAC µg/L	WU11 µg/l	WU12 µg/l	WU13 µg/l	WU14 µg/l
As, µg/l	10	2.1	2.1	6	2.1
Cd, µg/l	5	1.3	1.2	1.3	1.3
Cr, µg/l	50	1.7	1.7	1.7	1.7
Cu, µg/l	100	14.8	13.3	15.6	14.5
Fe, tot., µg/l	200	75.7	11.6	44.5	245.6
Mn, µg/l	50	4.8	4.4	4.9	5.6
Ni, µg/l	20	3.6	3.6	3.6	3.6
Pb, µg/l	10	3.2	2.6	3.2	2.6
Se, µg/l	10	4.5	4.5	4.5	4.5
Zn, µg/l	5000	13.7	16.7	8.5	14.6

*Maximum acceptable concentrations

The values for the sediment samples (S83–S85) are in the normal range for sample S83. Sample S82 had values exceeded for As, Cu, and Zn. And sample S83 had values in the normal range, except for Hg, which exceeded the MAC according to Law No. 458/2002 regarding the quality of drinking water in Romania, republished in 2011 (Table 3).

Table 3 Interpretation of chemical results for every metal/nonmetal identified in sediment samples (Moldova Noua) according to Law No. 458/2002 regarding the quality of drinking water in Romania republished in 2011. The rectangles with a red colour are the samples that exceed the MAC, and the rectangles with a green colour are the samples that are under the MAC.

Metals	MAC* mg/kg	S82 mg/kg	S83 mg/kg	S84 mg/kg
As, mg/kg	17	26.4	5.3	10.5
Cd, mg/kg	3,5	2.4	0.71	0.71
Cr, mg/kg	90	10.6	17.1	28.6
Cu, mg/kg	200	578.5	17.0	48.7
Hg, mg/kg	0,5	0.1	0.1	1.7
Pb, mg/kg	90	82.5	14.5	23.5
Zn, mg/kg	300	495.5	80.1	220.0

*Maximum acceptable concentrations

For soil samples (Table 4), almost all the values are over the normal range, only chromium and mercury have normal values for entire samples (S85-S88). Sample S88, collected at 600 m from the tailing pond, had almost all metal concentrations in the normal range, whereas the other samples had almost the entire spectrum of metal concentrations over the normal range.

Table 4 Interpretation of chemical results for every metal/nonmetal identified in soil samples (Moldova Noua) according to Law No. 458/2002 regarding the quality of drinking water in Romania republished in 2011. The rectangles with a red colour are the samples that exceed the MAC, and the rectangles with a green colour are the samples that are under the MAC.

Metals	MAC* mg/kg	S85 mg/kg	S86 mg/kg	S87 mg/kg	S88 mg/kg
As, mg/kg	5	122.1	117.2	57	23.5
Cd, mg/kg	1	2.3	6.2	6.5	0.71
Cr tot., mg/kg	30	11.6	10	7.8	18.5
Cu, mg/kg	20	2260.5	2663.5	1585.0	59.1
Hg, mg/kg	0,1	0.1	0.1	0.1	0.1
Mo, mg/kg	2	42.1	13.8	15.2	1.1

Ni, mg/kg	20	34.9	19.2	11.9	18.7
Pb, mg/kg	20	71.3	77.3	22.8	51.7
Se, mg/kg	1	12.2	11.4	5	2.4
Zn, mg/kg	100	362.1	1253.2	1422.7	64.1

*Maximum acceptable concentrations



Cooperation beyond borders.

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