



## Pollution of the Marec River by Waters from Artana (Novo Bërdë) Mine

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**Abstract** – In this work it was studied the pollution of the Marec river water, in Artana (Novo Bërdë), from the sterile landfill, as well as from waters coming out from horizon five and horizon six of Artana mine, and their flow combined into the Marec River, which interflows with the Morava River. To determine the pollution scale of the Marec river, water samples are taken at five locations: 1. The sample of river water, before it was combined with mine waters and, before it came in contact with landfill banks; 2. The sample of water coming out from horizon five; 3. The sample of water coming out from horizon six; 4. The mutual sample from both horizons (V+VI) and; 5. The river water sample after they were combined with mine waters. Observation of river pollution was done during years 2007 – 2008. In Table 1, there are given average values, for both years, of parameters: dissolvable substances; suspended substances; Pb; Zn; Cu; Cd; Fe; Mn, sulphate and pH values. It can be seen from the table that the river is excessively polluted and, urgent measures have to be taken to improve the situation.

**Key words:** polluted water; polluters; sterile (waste from the flotation process), determination of metals.

### Introduction

Now, it is obvious that the economical activities and, especially those industrial, in the communist systems were concentrated only at state profits, not respecting protection of the human environment at all. Kosova shared the same destiny, activities which have resulted with deep consequences, especially with the pollution of human environment like: air; water and land, from which health of human beings and of other creatures is attacked directly. Such an industrial activity took place near Artana (Novo Bërdë) mine where, from deposits of flotation there have been created two landfills, at a distance of 1.5 km from one another, with the common size of around two million tones. Landfill II, of a size of around 1.5 million tones, is situated by the Marec River (Figure 1), which contributes to further river pollution, especially with rainfalls. Taking in consideration that the Kosova Rivers flow into the former Yugoslavian rivers or Albanian ones and, from there into the Black Sea or Adriatic Sea, this issue should be an international issue, too. It is important to emphasize that from the place where the mine waters run over and, river touches the banks of landfill, there are no living creatures into the water, along the whole of its course.



**Figure 1.** Landfill II

We hope that state institutions, in cooperation with local and international experts, supported by funds of various donations, will undertake concrete actions to improve the situation; like the

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Government of Netherlands did by giving a donation of 1.5 million euro, in 2008, conducted by United Nation Development Program Organization – for removal of sterile 1, an amount of 300.000 tons (this sterile is being reprocessed in “Kizhnica” flotation, in Kizhnica).

### Material and Methods

To ascertain the level of water pollution of the Marec river by waters from Aratana (Novo Bërdë) mine and, from the sterile landfill of flotation, samples of waters were taken at five locations: 1. The sample of river water, before it came into contact with sterile banks and with influx of the mine waters; 2. The water sample from horizon five in the mine; 3. The water sample from horizon six; 4. Combined water sample from horizons V and VI and; 5. Water sample of the Marec river, 50-60 meters down the stream of the mine waters and away from the landfill.

The amount of water varies through the year, but in summer it is 16 L/s, whereas the amount of mine waters is almost constant, 4 L/s. Samples of water are taken in polyethylene bottles and are sent to “Kizhnica” laboratory in Kizhnica for analyses. The pH values of samples were decided on spot, when they were taken, by pH meter HANNA – instrument, HI – 8314. Samples are not preserved within 24 hours when processed. Samples were analyzed by the following parameters: dissolvable substances; suspended substances; lead; zinc; copper; cadmium; manganese; iron and sulphate. Elements are processed by spectrometry method of atomic absorption (Rekalic et al., 1975); Institution for Nuclear Sciences, 1981), at SOLARY absorber and by polar-graphic method<sup>4</sup>, with a standard POLAROGRAPHIC polar graph, MDE 150, while the dissolvable and suspended substances, as well as sulphate, by gravimetric method (Glotko et al., 1969; Mihanovic et al., 1982). Results (mg/l) are shown in table 1 (average values for year 2007 and 2008), as well as maximal permitted values (mg/l), according to European Union Guideline (Guideline 98/83/EC); while table 2 shows the pollution level of the Marec river (when combined with mine waters and at the exit of sterile), compared to EU licensed values (Council Directive 2000/60/EC).

**Table1.** Average values of parameters for water samples (mg/L), for years 2007- 2008

Samples	Dissolvable Substances	Suspended Substances	Pb	Zn	Cu	Cd	Mn	Fe	SO <sub>4</sub>	pH
1.	381	33	0.014	0.171	0.012	0.010	0.053	0.250	43.85	7.78
2	1859	195	0.157	32,377	0.278	0.154	15.375	28.134	1014,70	3.52
3	2672	566	0.156	79.447	0.338	0.161	66.495	51.827	1607.85	3.69
4	2217	315	0.123	62.207	0.363	0.149	47.980	31.435	1282.85	4.12
5	962	178	0.105	25.920	0.046	0.037	19.130	20.270	473.28	6.15
EU-Permitted values	-	-	0.005	0.2	2.0	0.005	0.050	0.300	250.00	6-8.2

**Table 2.** The Marec river pollution level (for how many times)

River - parameters (sample five)	EU-(mg/l) Permitted values	Gained results (mg/l)	For how many times river is polluted
Pb	0.005	0.105	21
Zn	0.200	25.92	129.6
Cd	0.005	0.037	7.4
Mn	0.050	19.13	382.6
Fe	0.300	20.27	67.6
SO <sub>4</sub>	250.0	473.28	1.9

## **Discussion and Conclusion**

According to results, from parameters of analyzed samples, it can be seen that the Marec river pollution comes from two key sources of pollution: from mine waters (of horizons five and six) as well as from sterile – remaining from lead – zinc flotation process, which is deposited by river banks. Unfortunately, we could not locate which is the highest polluter: mine waters or sterile (as there is not any drainage of sterility waters). River water, prior it comes into contact with sterile and mine waters (Sample 1) is pure at all parameters, apart of lead and cadmium, which exceed the EU permitted concentration, nearly three times, respectively two times. Regarding the course of river, after it is combined with mine waters and, after contact with sterile, water pollution is extraordinary high, table 2.

To eliminate, respectively to reduce the level of this pollution, we propose to clean the mine waters (neutralize at least), whereas around the sterile to make a drainage and, drained waters to be neutralized – until the sterile is taken to a new depository which will be made based on standards “(entire isolation of the ground where it will be deposited) and, its revitalization (Mihanovic et al., 1982).

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