



## **Monitoring Surface and Ground Water of the Industrial Park “Trepça” in Mitrovicë**

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**Abstract:** The study presents the influence of the landfill and other wastes to the quality of the surface and ground water of the Industrial Park “Trepça” in Mitrovicë. Concretely the study was conducted in three sample-stations of ground water-in the midst of the Sitnica river wastelands and in two (sample-stations) of river Sitnica: in the outflow of the river in front of the industrial zone (park), and also in the exit of the industrial zone. Taking in consideration the actual landfill that results as disposal of waste from the Zinc Metallurgy units and chemie industry, course of the study was determination of the metals such as: Fe, Zn, Cu, Mn, Cd, and Pb to the ground water and Sitnica River, flow of which is 365 l/m. The obtained results are compared with the maximal limited value (mg/L) for different categories of water, out of which the level of the contamination and categorization of the water can be seen.

**Key words:** *monitoring, surface and groundwater, heavy metals, Industrial Park “Trepça”, Sitnica River*

### **Introduction**

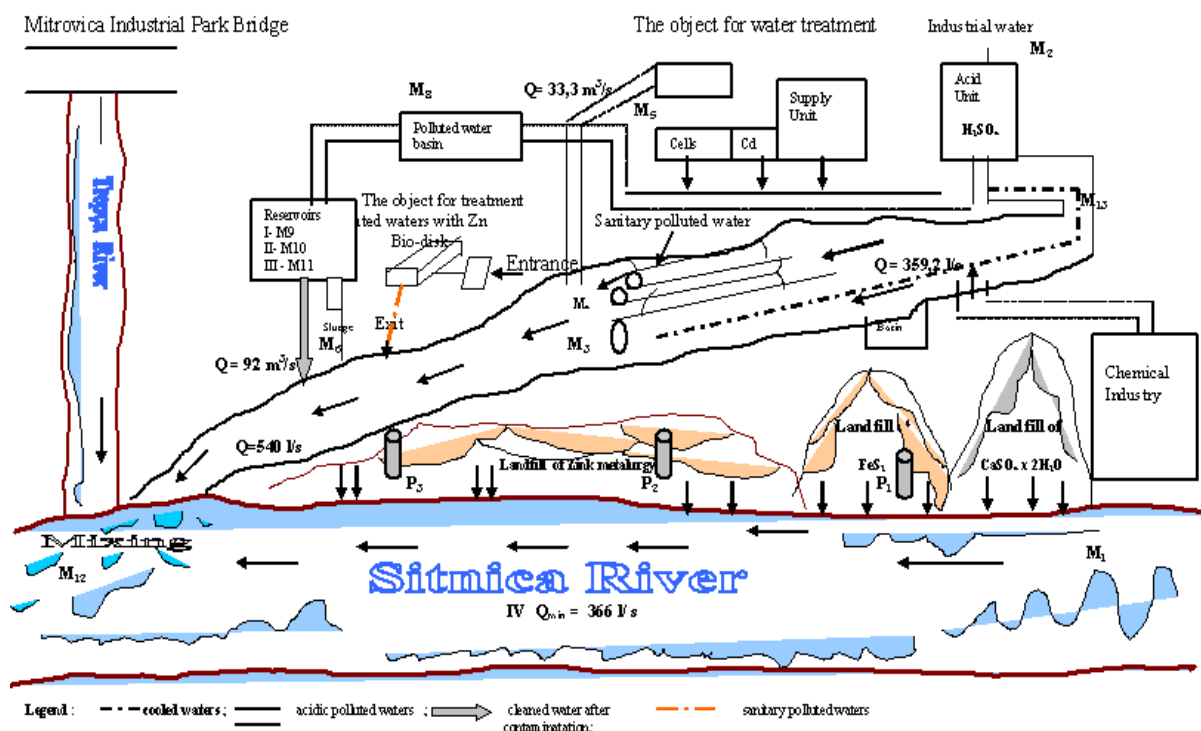
In the past, almost all industrial and economical activities that were developed in Kosova were not conducted in accordance with legal regulations on environment. Present landfills that are not properly isolated such as ash landfills of Kosova “A” and “B”, “Trepça” factory in Zveçan, Kishnica, Zinc Metallurgy, chemical industry and battery factory in South of Mitrovica nearby river Iber and Sitnica, have big impact on the environment, particularly on water quality of Sitnica and Ibër river. Such landfills are permanent source of contamination of surface and ground water, in particular with heavy metals (Pb, Zn, Cu, Cd, Fe, Mn) that heavily impact the water which is already contaminated with discharge of waste water. Such water present potential risk for aquatic organisms and is not used for any recreational need. This issue requires serious engagement of all responsible institutions, in order of improving the existing situation. Since Kosova aims the integration within European Union, they should obey the EU directives on environment.

### **Material and Methods**

On the study of the remaining landfill impact of Zinc Metallurgy, chemical industry, battery factory to the surface and ground water contamination to the outflow of the river Sitnica, that is located nearby to these landfills, the ground water samples were taken from three piezometers that were situated in year 2002, whilst in the outflow of river Sitnica (branch of river Ibër) in two sample stations: in front of the industrial parking entrance (S1) and in the exit of the park (S2) Figure 1.

Piezometer (P1) is located at 4 m depth, and 3 m far from the river. Piezometer (P2) is located at 5.93m depth, and 30 m far from the river. Piezometer (P3) is located at 4.43m depth and 4m far from the river.

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**Figure 1.** Sample stations of the ground water (P1, P2, P3) and of the water from the river Sitnică (S1, S2)

Three drillings of the piezometers are of different depth and lined with 100mm diameter, in which plastic pipes of 50 mm are fixed and in the ending drilled 2 meters are rolled with plastic nets in order to prevent the closure of the tube. On the top of plastic pipe (piezometer) is attached the metal tube, that is locally sealed above (Clesceri *et al.*, 1989).



**Figure 2.** Piezometer.

From the collected water samples at least three volumes of water were purged from each piezometer using a small diameter submersible pump. At the same time are collected water samples from the river Sitnica. The samples are marked with S1 and S2.

The pH was monitored in a flow- through chamber according to standard procedure. Samples of groundwater are collected after measurements of pH. The collected samples were filtered and tinned with nitric acid at pH<2. The tinned samples were transported to laboratory for the examination of heavy metals. The examination of heavy metals were done in laboratory of "INKOS" Institute and

laboratory of “Artana” and “Kizhnica” Mining, using the Atomic Absorption Spectrophotometer method AA-6300-SHIMADZU and ASS-SOLAR (Korça ,2003). The samples were monitored at regular intervals (monthly) over the year 2006 and 2007, recording the variations of the season as well. The average annual values for the year 2006 and 2007 are presented in the table 1 and table 2 (including the maximal limited values according to the European Union Directive 98/83/EC).

## Results

**Table 1.** Average values of heavy metals for the year 2006.

Samples	Concentration (mg/L)						
	pH	Fe	Cu	Cd	Zn	Pb	Mn
<b>P1</b>	5.92	0.52	0.18	1.44	155.13	0.06	21.51
<b>P2</b>	5.75	1.33	6.11	3.14	162.17	0.18	32.00
<b>P3</b>	5.85	0.32	0.11	1.92	271.11	0.22	4.53
<b>S1</b>	6.65	0.47	0.027	0.01	0.30	0.01	0.02
<b>S2</b>	6.56	0.53	0.034	0.01	0.82	0.11	0.35
<b>Limited values</b>	6-8.2	0.3-1.0	0.01-1.0	0.005-0.01	0.2-1.0	0.005-0.01	0.05

**Table 2.** Average values of heavy metals for the year 2007.

Samples	Concentration (mg/L)						
	pH	Fe	Cu	Cd	Zn	Pb	Mn
<b>P1</b>	6.45	0.27	0.01	0.43	198.61	0.067	26.05
<b>P2</b>	----	----	----	----	----	----	----
<b>P3</b>	6.13	0.25	0.01	2.22	476.07	0.36	5.61
<b>S1</b>	7.28	0.25	0.017	0.010	0.270	0.016	0.051
<b>S2</b>	7.32	0.28	0.025	0.010	0.480	0.022	0.231
<b>Limited values</b>	6-8.2	0.3-1.0	0.01-1.0	0.005-0.01	0.2-1.0	0.005-0.01	0.05

## Discussion and Conclusion

Results obtained shows that pollution of surface an ground waters with metals such as Fe, Cu, Cd, Zn, PB and Mn multiply exceed the acceptable values, according to the European Union Standard. Pollution of ground waters with aforementioned metals differs from element to element as well as from the locations where samples are taken.

The highest ground water pollution with Fe, for 2006 occurred at sample location P<sub>2</sub> (which stands 2m far from landfill of the Zinc Metallurgy and 3m far from river). The same phenomenon occurred with Cu, Cd and Mn, whereas the highest concentration of Zn and Pb occurred in the water of piezometer P<sub>3</sub> (which is located 20m far from the landfill and 4m from the river). Pollution went on also during 2007, although at a lower level than in 2006, with exception of zinc which is in higher level than in 2006. Values of pH, in 2006, are a bit lower than in 2007 and show a dependence of pH concentration (mg/L). According to the parameters, such ground water can't be used for any purpose.

Concerning water from the Sitnica river, pollution was exceeded in both years (as prior to the contact of the river water with the ground waters of landfills S<sub>1</sub>, also at the exit of landfills S<sub>2</sub>) with an exception when pollution is doubled at location S<sub>2</sub>, apart of manganese, which is increased four times, while cadmium remained constant. River water at location S<sub>1</sub> can be ranked at third (3) category , and as such it can be used only in irrigation; while the flow of the river up to the location S<sub>2</sub> can not be used in any purpose unless is cleaned. Up to 1965 these waters belonged to the second (2) categories.

To remedy or mitigate this concern, we propose the following actions, which necessarily require large funds: a) Setting up a new landfill far from the river, isolated with a water impenetrable

material, in which then it would be collected the entire material from existing landfills, and afterwards it would be re-cultivated, or b) re-cultivation of the existing landfills (Igrutinovic & Jovicic, 1965; Stojanovic & Kosanovic, 1984). As to our opinion, solution under (b) would only soften the pollution but not also eliminate it.

## **Reference**

- Clesceri LS, Grenberg, AE, Trusel RR, (1989) *Standard Methods for Examination Water and Waster water*, 17<sup>th</sup>, American Public Health Association, American Water Works Association, Water Pollution Control Federation.
- Igrutinovic D, Jovicic M, (1965) *Hydrogeology Research Work for the purpose of water supply of zinc electrolyzes K. Mitrovica*, Water Economy Institute "Jaroslav Crni", Belgrade.
- Korça B, (2003) *Chemical Examination of Water*– VUS – Austria-Prishtina, Project.
- Stojanovic O, Kosanovic N, (1984) *Hazardous and Harmful Materials*–Chemical–Technological Digest- RAD, Belgrade.