



## THE IMPACT OF POLLUTION SOURCES ON THE PHYSICO-CHEMICAL PROPERTIES OF WATERS IN RIVER SITNICA

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### ABSTRACT

After Drin, Sitnica is the longest river in the territory of Kosovo. Since the source, the southeastern part of Kosovo until its unification with the River Ibër in the western part of Kosovo, the waters of the Sitnica, in the road with a length of 90 km, pass peacefully in the bed of the river in an field area. This river is characterized by annual flow of water of 16.6 m<sup>3</sup>/s, while in the summer months the water flow which discharge on the river Ibër falls up to 2.35 m<sup>3</sup>/s. Since the Vragoli village, in Fushë Kosovë, until his discharge in the river Ibër, the waters of this river polluted by various anthropogenic sources, such as households, various preparations and agricultural chemicals and industrial discharges. For the compilation of this work, we started by the needs of identification of different pollutants of water quality of the river Sitnica, based on physical-chemical parameters and for this reason we have selected six monitoring points. During our research we have achieved to ascertain that the rivers, as Graçanka, Drenica Prishtevka together with Ferronikel, Kosovo Corporation Energy, industrial waste of Industrial Park in Mitrovica and Trepça Mines are most potential pollutants of waters of the river Sitnica.

**Keywords:** river sitnica, pollutant, physico-chemical parameters, monitoring points.

### INTRODUCTION

Because of the long journey which made the river Sitnica, from the source to the bottom discharge, the waters of this river are continuously attacked by numerous pollutants that make this river the most polluted in Kosovo.

It is known that the environment, in the world, has never been endangered by numerous pollution than today, then it is necessary to contribute to the preservation and protection of our natural resources.

For this reason, in our research we tried to identify and assess the real situation of the waters of the river Sitnica, with emphasis based on physico-chemical parameters or indicative parameters, who are the best indicators of water quality.

An aqueous medium that presents high levels of BOD<sub>5</sub> is not suitable for life organisms that require oxygen. (Alqi Çullaj, 2010)

Aquatic organisms affected by pH and most of their metabolic activities depend on the pH value (W. Wang *et al.*, 2002).

Oxygen, especially in summer season, due to the higher temperatures, the needs for the O<sub>2</sub> consumption rise more and at the same time the O<sub>2</sub> solubility in water decreases. (Lazo P. *et al.*, 2004)

In order to have a true picture of water quality of the river Sitnica, we have seen reasonable to create network monitoring, which includes six monitoring points, as: Sitnica in village Vragoli of Fushë Kosova, Graçankë in village Vragoli, Drenica in village Vragoli, Prishtevkë in village Bresje, Sitnicë in village Plemetinë and Sitnica in Mitrovica after PIM.

### MATERIAL AND METHODS

To have an overview as representative of the quality and level of pollution of the waters of the river Sitnica, samples have taken in two periods, during the months of April and August of 2015.

We have done so for the fact that in April feeds the rivers, which flow into the river and runoff of agricultural land as a result of weather changes (melting snow and rainfall), is more pronounced than in August.

That is fundamentally known, that the higher the level of water, the concentration of pollutants and their impact on water quality is lower and the opposite happens in August, when the amount of water is smaller, while the presence of pollutants it is higher.

Besides the monitoring points, during process of the sampling we have defined the coordinates of site-sampling (see Table-1). Collection, preservation and conservation of samples, it's done in accordance with the methods and recommended standards (APHA) in correlation and compliance with paragraph 5.4 of norms EN ISO/CEI 17025.

For the assessment of water quality of the river Sitnica, we are based on the reference values and the EU Directive, Directive 75/440/EEC.

Besides some physico-chemical parameters, which have been able to directly determine in the site-sampling, other parameters included in the table of results, we have defined in the environmental analysis laboratory of Hydrometeorological Institute of Kosova.

The determinations were realized by following methods:

Photometric method (phenat method 417.C); spectrophotometric method (Nessler method 417.B); turbidimetric methods (426.C); potentiometric methods, etc. (APHA, 1983), (APHA, 2005).

**Table-1.** Monitoring points and their coordinates.

River	Samples taken	Geographical width	Longitude	Sea level (m)
1. Sitnicë	Sitnicë in Vragoli	42°36'33.29"	21° 3'41.79"	535
2. Graqankë	Graqankë in Vragoli	42°36'40.37"	21° 4'2.35"	538
3. Drenicë	Drenicë in Vragoli	42°36'52.46"	21° 3'37.40"	537
4. Prishtevka	Prishtevka in Bresje	42°37'26.03"	21° 4'17.23"	535
5. Sitnicë	Sitnicë in Plemetin	42°42'27.26"	21° 2'14.33"	529
6. Sitnicë	Sitnicë in Mitrovicë	42°53'21.72"	20°52'36.65"	504

## RESULTS AND DISCUSSIONS

During our research, with the aim of the reflecting as realistic of the water quality of the river Sitnica, we are focused, mainly in the determining of these physical-chemical parameters: temperature, turbidity, electrical conductivity, pH, saturation with oxygen, dissolved oxygen, BOD<sub>5</sub>, nitrates, nitrites, ammonium ion, phosphate ion, sulphate ion and total phosphorus.

In Tables 2 and 3 are shown the results of physico-chemical parameters, of the water samples taken in six monitoring points.

From the obtained results shows that the highest value of turbidity during April is to sample 6 (155 NTU), while in August, the highest value of the turbidity is to sample 2 (186 NTU).

Based on the obtained results from table 3, results that have exceeded the reference value of electrical conductivity in samples 2 and 3.

Exceeded the reference value to BOD<sub>5</sub> have encountered in all monitoring points, until in the river Prishtevka the excess reaches in peak (105.1 mg/dm<sup>3</sup>).

Exceeded the reference values to the waters of Sitnica, have encountered the nitrites (NO<sub>2</sub><sup>-</sup>) and ammonia ion (NH<sub>4</sub><sup>+</sup>), while with phosphate (PO<sub>4</sub><sup>3-</sup>), during August, they submitted exceeded in all monitoring points.

Total phosphorus, except of samples 1, 2 and 6 during April and sample 6 in August, in all other monitoring points they submitted exceeded with reference value.

Dissolved oxygen, which in addition to sample 2, in all other sampling points, in August appears lower than the reference values.

Nitrates, at all monitoring points are lower than standard values, while the sulphates except of sample 2, in all other monitoring points are presented with lower value than standard values.

**Table-2.** The determination of physical-chemical parameters in April.

Physical-chemical parameters	Unit	MLV	S 1	S 2	S 3	S 4	S 5	S 6
Water temperature	°C	25	8.2	7.2	8.3	8,8	9.4	11.0
Turbidity	NTU		53	38	39	33	46	155
Electrical conductivity	µS/cm	1000	372	675	532	669	452	442
pH	1-14	6.5-8	7.92	7.9	7.89	8.03	7.64	7.61
Saturation with oxygen	%	>70	86.3	82.8	85.0	88.3	96.3	87.1
Dissolved oxygen	mg/dm <sup>3</sup>	> 5	8.86	8.94	9.01	9.14	8.85	7.41
BOD <sub>5</sub>	mg/dm <sup>3</sup>	<7	44.1	14.5	48.5	27.4	30.6	13.9
Nitrates	mg/dm <sup>3</sup>	30	4.1	3.8	6.8	6.2	6.8	9.3
Nitrites	mg/dm <sup>3</sup>	0.2	0.309	0.189	0.236	0.668	0.274	0.350
Ammonium ion	mg/dm <sup>3</sup>	0.2	0.419	0.212	0.350	4.466	0.349	0.274
Phosphate ion	mg/dm <sup>3</sup>	1.0	0.162	0.093	0.153	0.466	0.279	0.163
Total phosphorus	mg/dm <sup>3</sup>	1.0	0.101	0.882	1.180	1.598	1.048	0.620
Sulphate ion	mg/dm <sup>3</sup>	150	33.9	159.6	35,67	47.32	30.45	45.03

**Table-3.** The determination of physical-chemical parameters in August.

Physical-chemical parameters	Unit	MLV	S 1	S 2	S 3	S 4	S 5	S 6
Water temperature	<sup>0</sup> C	25	22.9	26.8	23.4	22.7	24.1	20.2
Turbidity	NTU		16.7	186	13.6	30	103.9	18.9
Electrical conductivity	μS/cm	1000	970	1552	1015	862	913	691
pH	1-14	6.5-8	7.93	8.31	8.12	8.08	8.05	8.12
Saturation with oxygen	%	>70	28.7	128.3	49.8	23.4	27.2	41.1
Dissolved oxygen	mg/dm <sup>3</sup>	>5	1.95	9.25	3.77	1.64	2.23	3.15
BOD <sub>5</sub>	mg/dm <sup>3</sup>	<7	18.8	27.6	37.4	105.1	48.0	26.2
Nitrates	mg/dm <sup>3</sup>	30	ULD	5.1	11.7	ULD	ULD	3.6
Nitrites	mg/dm <sup>3</sup>	0.2	0.417	1.959	2.160	0.180	0.200	0.740
Ammonium ion	mg/dm <sup>3</sup>	0.2	3.075	2.173	0.332	1.891	6.117	5.190
Phosphate ion	mg/dm <sup>3</sup>	1.0	4.14	2.006	2.896	4.104	5.242	1.80
Total phosphorus	mg/dm <sup>3</sup>	1.0	1.657	1.335	1.513	4.026	2.768	0.981
Sulphate ion	mg/dm <sup>3</sup>	150	90.6	342.3	111.7	85.2	109.2	50.76

## CONCLUSIONS

From the elaboration of the results, it appears that the pollution of river Sitnica, occurs as a result of urban discharges of wastewater, especially from Prishtevka, various industrial discharges, as Graçanka, which itself takes the sewage to the Kishnica mine, then industrial waters of Ferronikel, KEK, PIM, "Trepça" mine and surface water from agricultural lands.

The degree of pollution of the river Sitnica ranges from a monitoring point to another, because it depends on polluting sources.

Tabular results shows that the concentration of pollutants in April is lower due to the high water level, while in August, when the amount of water is less, the concentration of pollutants is higher.

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