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Water quality of river Drini i Bardhë[#]

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Abstract: The water resources are affected by factors that impose different loadings on them. The factors affecting water resources come from the urban areas, industry and agriculture. Protections of water against contamination and water resources management have a strategic role in development of Kosovo. Adequate water management practices enable sustainable water use on long terms basic. Sustainable water management offers an adequate response to permanent water quality degradation and decreasing availability of necessary quantities of water. The aim of the work was to investigate water quality of the Drini i Bardhë River, and to identify potential polluters in the catchment's area. For that purpose, eight locations were selected for the water sampling. The water quality has been evaluated using selected parameters (pH value, conductivity, DO, COD, BOD5, ammonia, nitrates and nitrites). The testing results for 2002, similar to the results of the previous years, indicate certain departures from the requested water quality in a significant number of controlled stations. Increase is share of discharge of waste water from the public drainage systems has been determined. Kosovo problems are encountered in resolving water protection issues, particularly those with treatment and disposal of waste water. In this sector, Kosovo is lagging behind not only developed countries but also behind countries in transition. To reach the set objectives, including improvement of the water quality monitoring systems, it is necessary to work out necessary principles of the new approach in planning, implementing and data collection in compliance with the Water Framework Directive.

Keywords: Drini i Bardhë, water quality, water quality indicators, pollution, monitoring, water protection.

Introduction

According to determination, water resources can considered polluted, then, causing for human activities which discharge any materials in water, or when they can change temperature, physical, biological and chemistry characteristic in that level that we can't use for any reasonable aim. In other manner, if water can not be available for any reasonable aim, then water can be polluted.

Pollution can cause from presence of any materials which are foreigner for waters. These materials can be hazard, or can be biodegradation and cause high request for oxygen.

The aim of this project was investigation water quality in Drini i Bardhë River. Drini i Bardhë spring in Radavc, Pejë. For a long time was mainly drinking water supplier for several regions when passes this River. This River goes through many urban places, and knows he is like collector of urban and industrial pollutant waters. In River basin of Drini i Bardhë run down some small Rivers, streams and water bearers from different agriculture soil drainage.

Water protection from pollution and water management has strategic importance for Kosovo. Planning and creating of optimal network and investigation program of water resources quality from economic and functional aspects, and risk of accidental breaking, are like priority duty, considering new water status.

Materials and Methods

[*]*Corresponding: E-mail: naserbajraktari@hotmail.com, Tel: +37744147473;* [#]*This study has been presented at 1st Inter. Symposium on Environ. Management, Oct., 1-3, 2003, Zagreb Fair, Croatia.*

Collection of materials has starting from spring of 2002 until autumn 2002. In this period has done closing of cycles for a year (chemical and biological cycles) even is very difficult to foreseen that when it will start and when will finish such cycle, is very difficult to say that when happening seasonal differences, which depended from climatic condition (Balvay, 1991). Place when we take sample has choose in that manner that are in a distance of 500 – 1000 m from potential of pollutant (Fig 1. Map).

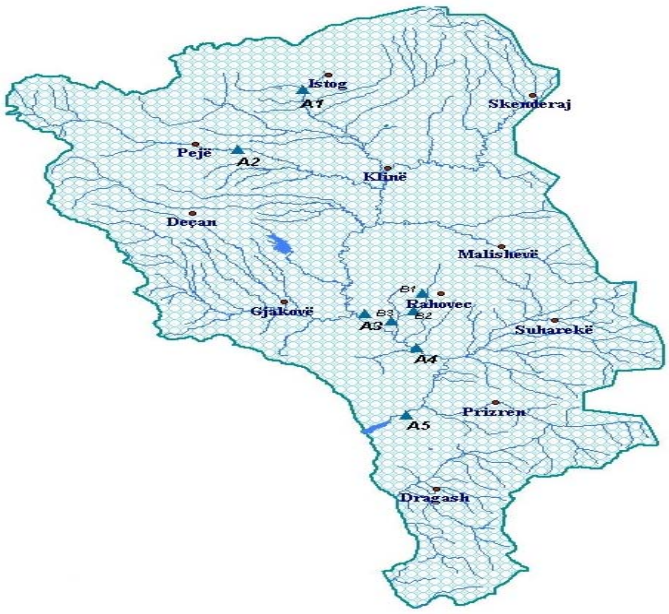

Figure 1. Map of district Drini i Bardhë River

Sample places were: A1 source in Radavc, A2 after discharging of municipality and industrial waters in Peja with suburbs, A3 after discharging of Klina and Ereniku river in Gjakova and other secondary bearers, A4 after discharging of water of Rahovec, in frame of which are involved these point, B1 for discharging of water pollution of Rahovec and suburb, B2 discharging of industrial and agriculture waters and B3 discharging of industrial, agriculture and urban waters in this region, A5 after discharging of river Lumbardhi i Prizrenit and other industrial and agriculture bearers.

Samples for water analyses has be taken and conserved in manner which has been foreseen with Regulation for water standard [Dalmacija B, 2000]. Mainly parameter of water polluteted are: chemical oxygen demand (COD), biological oxygen demand (BOD), dissolved oxygen (DO) some chemical parameters (ammonia, nitrate, nitrite, phenols, heavy metals etc.).

In field from water samples has been measured pH amount and wasted oxygen amount After that with standard methods [American Public Health Association, 1992],

It has been done measurement of these parameters for water quality: conductivity, COD, BOD_5, heavy metals (Pb, Cd, Cu, Zn and Ni.), Phenols, ammonia, nitrate and nitrite.

Discussion and Results

In European countries, results of river quality estimation are reported based on classification system where water quality is considered satisfactory from first category until third category. Applied classification system, numbers of measured and compared parameters, manner of calculation are based on physical, chemical, biological characteristics of water are different for different places.

In this project we present water quality of Drini i Bardhë river in 8 different places. The places for water example are: Radavc (A1), Pejë (A2), Rogovë (A3), Lukinaj A4, Vërmnicë A5

and in branch of river Drini i Bardhë, river of Rahovec; Bërnjak (B1), Fortesë (B2) and Xërxë (B3), has been monitored water quality every year with the water quality indicators. Estimation has been done based on selected water quality indicators determined in the Table for Classification from Economic Commission of United Nation for Europe, UNECE [Directive 2000&60&EC]. Physical and chemical parameters for water quality of river Drini i Bardhë and his branch, Rahovec River has been monitored for one year. But, because of simplicity, we will introduce only results of estimated parameters for a period (April 2002).

Results are presented in the Table 1 and in graphic manner in figure 2-4. From table1, the results of measured parameters are showing a difference of determinates parameters for water quality of river Drini i Bardhë.

Table 1. Results of parameters for water quality of river Drini i Bardhë

Parameters	Unit	A1	A2	A3	A4	A5	B1	B2	B3
pH	-	8.02	8.22	7.82	7.89	7.71	7.51	7.32	8.16
Conductivity	μS/cm	408	412	424	516	644	645	644	636
DO	mg/L	10.8	8.02	7.15	6.2	6.2	5.15	5.05	5.37
Turbidity	mg/L	2.45	3.23	12.6	13.4	13.9	5.43	6.06	6.93
TDS	mg/L	207	218	221	233	238	326	308	326
COD	mg/L	3.82	4.25	4.85	11.46	11.66	11.47	15.5	20.15
BOD_5	mg/L	2.85	3.85	3.96	10.5	10.82	7.78	10.82	15.9
Nitrate	mg/L	5.5	45.5	51.5	52.3	53	58	60	45.5
Nitrite	mg/L	0.005	0.16	0.03	0.04	0.16	0.18	0.1	0.15
Ammonia	mg/L	0.06	2.8	2.6	2.018	2.28	4.57	5.2	5.36
Phenols	mg/L	-	0.061	0.045	0.04	0.038	0.31	0.28	0.26
Pb	mg/L	0.0013	0.0015	0.0126	0.0148	0.0015	0.003	0.022	0.022
Ni	mg/L	0.0065	0.08	0.064	0.0812	0.088	0.098	0.108	0.1188
Zn	mg/L	0.0045	0.07	0.0324	0.0768	0.082	0.07	0.117	0.0596
Cu	mg/L	0.001	0.0009	0.0007	0.0006	0.0009	0.001	0.001	0.0009
Cd	mg/L	0.0008	0.004	0.0032	0.0048	0.0051	0.005	0.004	0.0032

Dissolved oxygen is consummated in reaction and during that time are produced new microbial cells from organic substance which are present in water. After a time, old cells die and organic materials which are joint with them will be consummated in the following reaction. This synthesis and dissolution of cells will go on, until number of live cells will be minimized and in the water remain only organic materials, which are relative resistant, which are like humus. Concentration interval for this important indicator of water quality in our samples, are about 6.20 - 10.8 mg/L (Drini i Bardhë) and Rahovec River discharged in Drini i Bardhë River has value 5.05 - 5.37 mg/L (Table 1 fig 2).

Biochemical oxygen demand (BOD_5) is a value of presence of organic materials in water which can support increasing of microbe organisms. BOD_5 is well known test to control water pollution. It is clearly that BOD_5 measure only one piece of this general process. BOD_5 can be measured with dissolved oxygen amount, during aerobic oxidation of microbes of one water sample, during due period and due temperature. Usually, time is five day and temperature is 20^oC and the results is recognized as five day biochemical consumption for oxygen and usually noted as BOD_5. Concentration of organic substances, presented with BOD_5 in our samples was 2.85 - 10.82 mg/L for Drini i Bardhë and 7.78 – 15.9 mgO_2/L for Rahovec river. From the gained results we can see that river Drini i Bardhë and his branches are charged with considerably organic materials (Table 1, Figure 2)

Amount of materials that subservient oxidation in one water sample and which can be oxidised from chemical strong oxidation is known as chemical oxygen demand (COD). Usually, as oxidant is used dichromate potassium and acid sulfuric valorized solvent. Correlation between COD and BOD_5 is not easy and depend very much from nature of organic materials in

sample. Some organic components are biologically degraded, but, they do not dissolve from dichromate acid, for example acid acetous, whereas, opposite of that is reality for organic component like cellulose. COD has advantage because, the prove can be done faster than BOD_5, in question are some hours compare with some days. From the results of our measurements we can see that contamination of COD it goes from 3.82-11.66 mgO_2/L in Drini i Bardhe River, while 11.47-20.15 for river of Rahovec (figure 2). Rahovec River where still we have higher result of organic substances as consequence of runoff of polluted waters from Rahovec industry (wheat factory, vine plant, plastic measures and maniacal sewage waters).

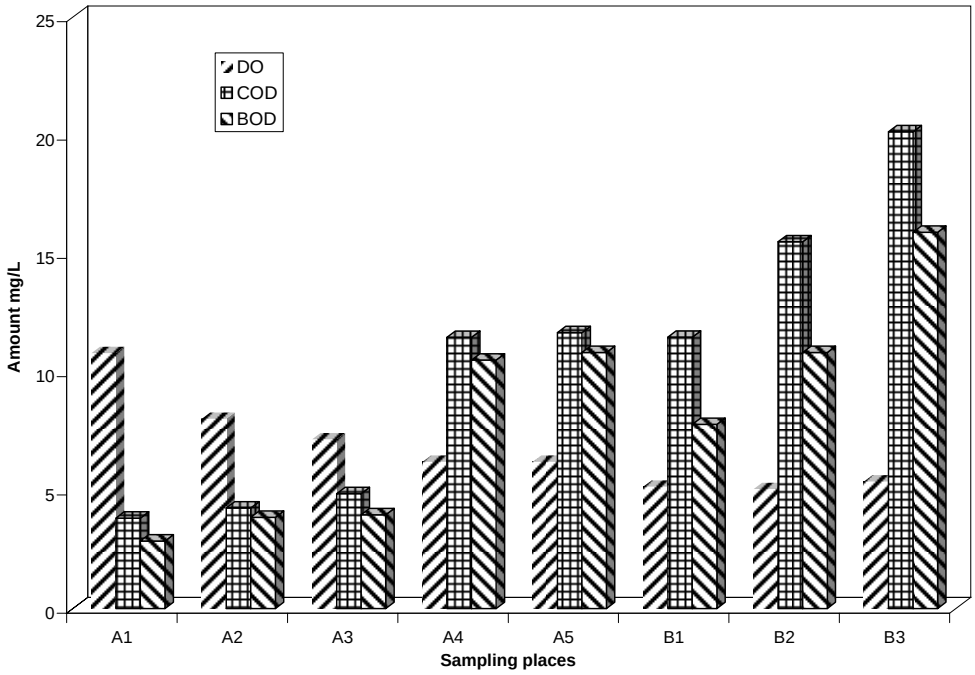

Figure 2. Amount of OD, COD and BOD

Waters in natural condition (unpolluted) have relative low contamination of nitrogen and phosphorus. In these cases view of water is clear, with small or without vegetation and the bottom of river water is clear. From nutrients loaded in natural waters in some relevant conditions, especially where in waters there are unloads with anthropogenic origin reach with nitrogen and phosphorus it can be observed a sensitive intensification of photosynthesis processes and big increase of alga quantity with waters and view of waters changes, it becomes green juice and turbulent. Concentration of nutrient salt of nitrogen in water as ammoniac, nitric and nitrates are causing process of eutrophication. Ammonia is the product of disintegration of organic materials; it can be also toxic for fishes and other water organisms. Nitrates as last products in process of nitrification, in higher concentrations are toxic for organisms of new ages. Ammonia concentration in our measurements is from 0.06-2.80 mg/L in waters of Drini i Bardhë and 4.57- 5.36 mg/L for Rahovec River. Concentration of nitrites is from 0.005-0.16 mg/L for Drini i Bardhe River and 0.10-0.18 mg/L for Rahovec River. Nitrates have these concentrations after measurements from 5.50-53.0 mg/L, for Drini i Bardhe River while for Rahovec River from 45.5 - 58 mg/L (figure 3).

In waters of Drini i Bardhë and his branches, observed in Rahovec River has an increased concentration of phenol which is from 0.038 - 0.061 mg/L for Drini i Bardhe River and 0.26-0.31 for Rahovec River. Concentration of phenol is higher in Rahovec River than in Drini i Bardhë because of water slimming and this concentration is decreased apparently (figure 3).

With unload of polluted water in these rivers it comes a considerable quantity of heavy metals (as lead, nickel, zinc, copper and cadmium), that takes part as micro-polluters. These concentrations exceed maximal quantities allowed to these polluters in natural water in some cases (Table 1, Figure 4).

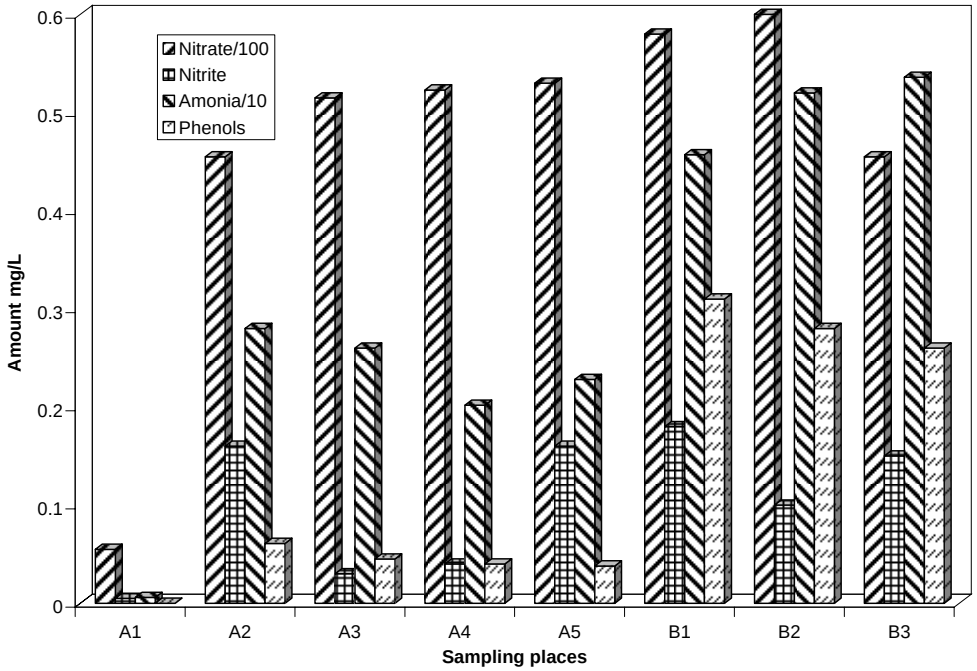

Figure 3. Amount of nitrate, nitrite, ammonia and phenols

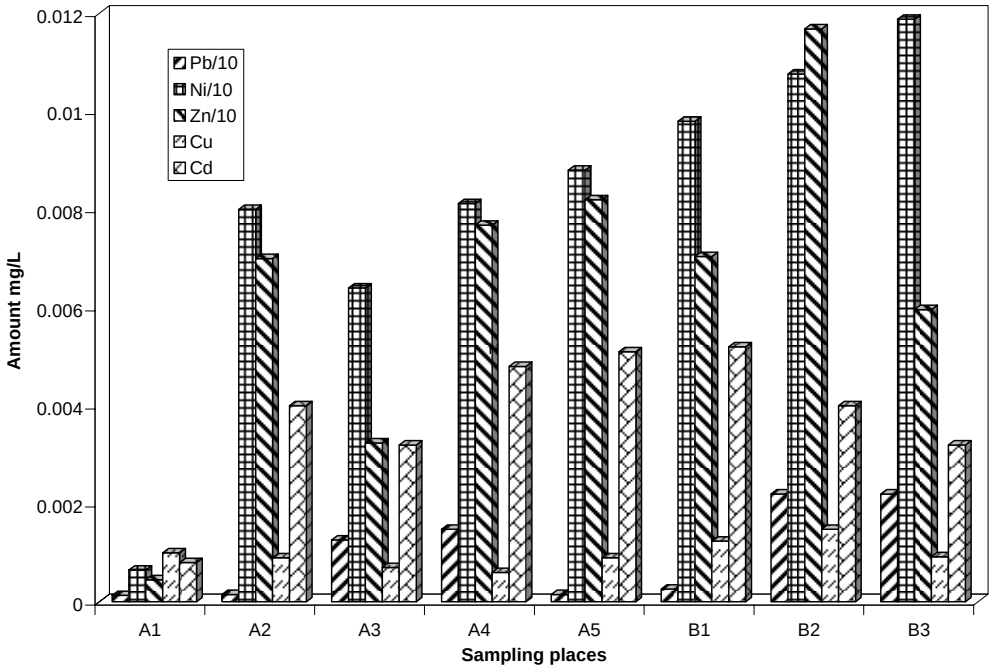

Figure 4. Amount of heavy metals

From table 1 it seems that value of pH it doesn't make any apparent problem of water quality from river and this value it comes mainly in cadre of normal values for natural

ecosystems (from 7.82-8.16), while concentration and turbulent shows that these waters are loaded with different pollutants.

Based on the chemical statistics for the water quality Drini i Bardhë River, in comparison with Directives of European Union above classification of natural waters, waters of these rivers doesn't fulfill conditions even for waters of II category (in exception of river sources), even in some points these rivers are of III and IV category for superficial waters and this mean that the water in this current cannot be used for recreation and shower, for water sports, for cultivation of fishes etc.

From the results of the analyzed samples within the starting period April 2002 until October 2002 can be said that level of quality of this water is getting worst. It is great concern for the water quality of the rivers Drini i Bardhë River of Rahovec because some of the indicators like are COD, BOD_5, dissolved oxygen, phenol, nitrate, nitrate shows are having an increased tendency of all sample-points and in particular for the branch of river Drini i Bardh and River of Rahovec.

Conclusions and Recommendations

Discharging of industry polluted water and untreated municipality sewage water in river Drini i Bardhë has a huge consequence for the waters' fauna and for the supplement of the inhabitants with drinking water. A long and uncontrolled discharge of municipal sewage water, agriculture and industrial waste in Drini i Bardhë River, inflicted the change of waters' quality. Therefore, it is special importance to a treat the polluted water (sewage) prior to discharge in the bank of river Drini i Bardhë. With the polluted water in the bank of Drini i Bardhëë River also the organic and inorganic substances are being discharge. Regardless of the evident gaps, still it is possible to reduce or to stop this negative trend , first of all to discontinue the pollution of the river Drini i Bardhë, and to enhance and keep safe its natural goods.

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