Determination of COD, BOD5 and bacteriological parameters of water in the river basin of Ereniku

Ecosystem

Keywords: river, Erenik, parameters, bacteria, basin.

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Abstract

Water quality throughout the Ereniku river basin is under the influence of various factors, mainly dominate pollutants from wastewater discharges from municipal and infiltration from agriculture, then industrial discharges where their activities create river basin water of Ereniku. In this paper I intend to provide data as to the condition of the water in the Erenik basin and give ecological assessment (physical, chemical and biological) of water quality of the river Ereniku. Assessment is done in four seasons and in 13 points. For this numerous analysis have been carried out, among them is determination of COD (chemical oxygen demand), BOD5 (biological oxygen demand), as well as bacteriological parameters, as the most important parameters in determining the level of water pollution. Also from bacterial terms, total coliform bacteria were analyzed, fecal originating coliform bacteria and live mesofilic bacteria. Water samples were taken in polyethylene bottles of 500 ml, which are initially well cleaned and immediately analyzed in the chemical and bacteriological laboratory. Based on results it is clearly seen the pollution of this river and which needs a great care as well as treatment plant of wastewater from which comes major pollution.

1. Introduction

Until in the pre-industrial period, water pollution problem was not worrying because the pollution was caused by small, mainly liquid discharges. In less populated areas without sewerage systems, today these problems are easily overcome by own natural cleaning capability of rivers. Industrial development and modern civilization led to the formation of large residential areas, with industry and intense agricultural development. This caused increased water discharge without any prior treatment, beyond self cleaning capabilities of water. River flows constitute the main sources of freshwater. The main sources of pollutants to the water environment are organic substances that come from urban and industrial discharges. During flow, immediately after discharge, decay of organic matter reduces the amount of oxygen and causes the release of ammonium, which although it is not poisonous, depending on pH and temperature, turns into ammonia, which is poisonous to living things in water. In natural conditions organic matter in the water come from soil erosion and dead biomass of plants and animals, they are not soluble and have slow composition. On the contrary, organic matters from human activity are soluble, distributed uniformly and very decaying, causing immediate intake of oxygen in the water. With increasing population density in the watershed increases the amount of organic matter in the water and decrease the amount of oxygen. Biological need for oxygen (BOD_5) is lower than 2 mg / l O_2 in basins with less than 15 residents / km2, and exceeds 5 mg / l O_2 /km2 in basins with more than 100 inhabitants / km2. Human activity causes the increase of the content of chemicals in aquatic environments, i.e. minerals. All these pose a risk to aquatic ecosystems and the man himself. Surface water contaminated by fecal discharges by people and animals, can carry many pathogens, such as bacteria and viruses, more manifested in densely populated areas, especially near cities.

2.The material and methods

Ereniku is river in western Kosovo. Ereniku, by flow length, is smaller than Lumbardhi i Pejës and Lumbardhi i Deçanit but by the size of the basin and flow it differs from all branches in the right side of White Drin. Ereniku originates from the glacial lake in Gjeravica mountain and contributes in the White Drin river east of Terzi Bridge. Unlike other branches of the White Drin, Ereniku is rather field river since two thirds of the course passes through the lower part of the basin, which is between 300 and 500 m altitude. Erenik hydrographic system comprises from 80 water flows, which enrich the system with the largest amount of water.

Chemical analysis for the determination of COD and BOD_5, water samples were taken in 13 specific points (Point: 1-On Jasiq 2-Stubëll 3-B.Bokes 4 - Erenik before Krena; 5- Krena 6-Erenik after Krenes;7 - Erenik before Llukac 8-Lukac, 9 - Erenik after Llukaci; 10 - Erenik before Drin; 11 - Drini, 12 - Erenik after Drin and 13 Fierza Lake), water samples were taken in polyethylene bottles of 500 ml which are initially well cleaned, and for bacteriological analysis are use of glass bottles previously sterilized at a temperature of 121 ° C.

During chemical analysis were used various methods such as volumetric, photometric through photometer Nova 60, whereas for bacteriological analysis are used system of Membrane filter with porosity Φ 0.45 mm. Bacterial parameters were analyzed by the following parameters: total number of coliform bacteria, fecal origin coliform bacteria, total number of aerobic bacteria mesofilic.

3. Results and discussion

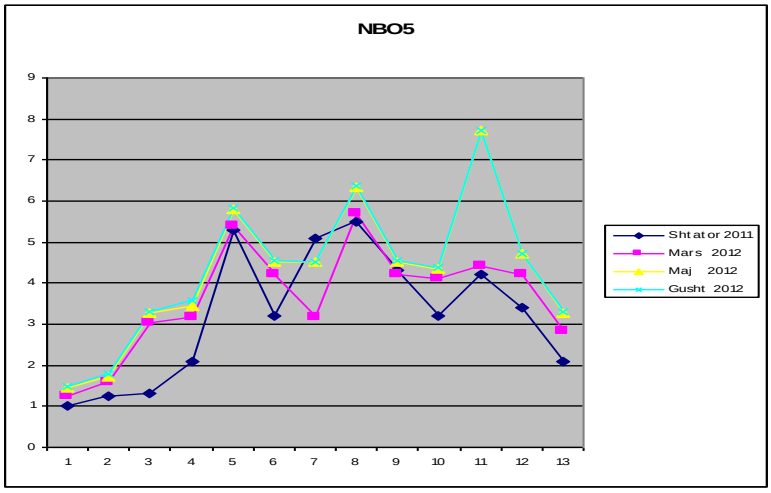
- Biological Oxygen Demand – BOD_5

This parameter shows the amounts of oxygen needed for aerobic microorganisms and it is related to competition of COD spent for oxidizing processes. The larger the value the higher need for oxygen therefore the water quality is deteriorating. According to the EU Directive (75/440/EEC) classes are I (<3 mg O_2 / l), often considered as natural background, class II (5 mg O_2 / l), Class III (6 mg O_2 / l), class IV (7 mg O_2 / l) and class V (> 7 mg O_2 / l).

Table No. 1, Results from analysis of BOD_5 -Ereniku River

Points	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
September 2011	1	1.26	1.32	2.1	5.3	3.2	5.1	5.5	4.3	3.2	4.2	3.4	2.1
March 2012	1.26	1.58	3.03	3.16	5.4	4.21	3.16	5.7	4.21	4.1	4.42	4.21	2.84
May 2012	1.44	1.72	3.26	3.44	5.79	4.52	4.52	6.33	4.52	4.35	7.71	4.71	3.26
August 2012	1.48	1.79	3.29	3.56	5.82	4.54	4.53	6.36	4.54	4.37	7.72	4.71	3.31

Diagram No. 1, results from analysis of river Ereniku - BOD_5

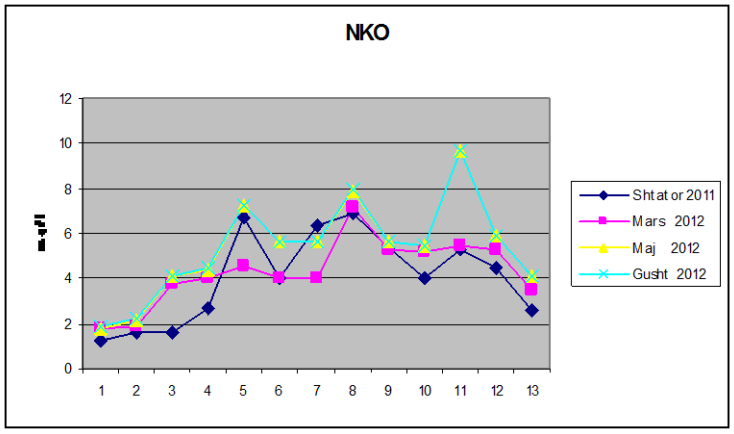


- Chemical Oxygen Demand - COD

Table 2, results of the analysis of river Ereniku - COD

Points	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
September 2011	1.25	1.6	1.65	2.65	6.7	4	6.4	6.9	5.4	4	5.3	4.5	2.6
March 2012	1.8	1.9	3.8	4	4.6	4	4	7.2	5.3	5.2	5.5	5.3	3.5
May 2012	1.8	2.18	4.12	4.35	7.23	5.65	5.65	7.92	5.65	5.44	9.64	5.89	4.12
August 2012	1.85	2.24	4.12	4.46	7.28	5.68	5.67	7.95	5.68	5.47	9.65	5.89	4.14

Diagram 2, results of the analysis of river Ereniku - COD



Average values found in water of Erenik range from 1 to 7.8 mg O_2 / L. Water is classified in class II for stations 6, 7 10, 12 and III and IV for stations 8 and 11.

- Bacteriological parameters

It is clearly seen from the results, that from point 5 to 12 we have increase of the bacteriological parameters that are due to sewage discharge ranging from 4-5 points up to 9-10 points.

Table No. 3, Results of bacteriological analysis

Date:28.09.2011	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
Tot Num. of Coli Bacter. in 100	>250	>300	>300	>8000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>400
Coli. Bac.with.fecal.origin.in 100	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli
Tot. num. aero mesofi bac..	>350	>400	>500	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>500

Table No. 4, Results of bacteriological analysis

Date:14 03 2012	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
Tot Num. of Coli Bacter. in 100	>350	>300	>400	>900	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>400
Coli. Bac.with.fecal.origin.in 100	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli
Tot. num. aero mesofi bac..	>450	>500	>600	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>500

Table No. 5, Results of bacteriological analysis

Date:31 05 2012	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
Tot Num. of Coli Bacter. in 100	>250	>300	>350	>8000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>450
Coli. Bac.with.fecal.origin.in 100	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli
Tot. num. aero mesofi bac..	>350	>450	>500	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>550

Table No. 6, Results of bacteriological analysis

Date:25 08 2012	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9	P-10	P-11	P-12	P-13
Tot Num. of Coli Bacter. in 100	>250	>300	>350	>8000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>450
Coli. Bac.with.fecal.origin.in 100	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli	E-coli
Tot. num. aero mesofi bac..	>350	>450	>500	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>550

4. Conclusions

Water is characterized by physical, chemical and bacteriological indicators. Based on studies conducted in Ereniku river, we analyzed chemical parameters BOD_5, COD and bacteriological parameters.

In Table 1 and diagram No. 1 are presented the results of analyzes of BOD_5, table 1 and diagram No. 11 presents the results of analyzes of COD, and in tables No.3-No.6 are presented results of bacteriological analysis (total number of coliform bacteria in 100, coliform bacteria with fecal origin in 100 and the total number of aerobic mesofilic bacteria), so we have come a conclusion. In most cases, differences in measured values were more different between points rather than between seasons. For all indicators Ereniku impacts on water quality of Drin but not significantly. It turns out that Drini was better quality water that Ereniku. Environmental problems are identified in section 2 which is not influenced by the sewage of Gjakova. During researches conducted in Ereniku River, the statements of the test results give an overall assessment of water quality of the river Drin based on the results of chemical, physical and bacteriological analyses that indicate the quality of the contamination of Drin River as a consequence of urban flows, quantities of pollutant dischargers etc. Therefore we recommend building a treatment plant for wastewater, so that Drin River is less polluted from Ereniku River.

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