

<p><b>Physical - Chemical and Bacteriological Analysis of the River ‘Drini i Bardhë’ (‘White Drin’)</b></p>		<p><b>Agro-Environment and Ecology</b></p> <p><b>Keywords:</b> White Drin, water quality, parameters, physical – chemical methods.</p>
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**Abstract**

White Drin River and the environment around it, are very important to human kind, thus we, as a society, need to take good care of White Drin River and keep it as clean as possible. Water quality in the basin of the White Drin River comes from anthropogenic activities, mainly from urban leaks and discharges from sewage, agriculture, as well as discharges from industry and the various factors that carry out their activities in White Drin river basin. In this study is presented the current situation of the White Drin basin, especially in thirteen locations where other tributaries flow into it, as the river Klina, Mirusha, river Ereniku and river Lumëbardhi Prizren, in order to assess the quality of the Drin river basin. This study analyzed the physical and chemical parameters, such as air temperature, water temperature, pH value, turbidity, total hardness, specific conductivity, dissolved oxygen, consumption of potassium permanganate, nitrates, nitrites, iron, manganese, ammonia, phosphates, etc. Water samples were analyzed in physical - chemical laboratory, with methods such as: volumetric methods, atomic absorption method (AAS), spectrophotometric methods, photometric methods, etc. The objective of this study is related to the determination of the physical - chemical parameters that are presented in tables and diagrams, which show the level of pollution of the river, mainly from the tributaries that flow into it, the anthropogenic factor, the effects of pollution from sewerage, waste discharge, etc.

**1. Introduction**

The waters of Oceans, seas, lakes and rivers cover over 71% of Earth's surface, which play a very important role in hydrological cycles of our planet. Recognizing the importance of the water for the development of the life processes, humans since antiquity have built their settlements near rivers that have water to drink, prepare food, clean etc. Over time, economic development and population and industry expansion, caused the pollution of rivers, lakes, seas and scarcity of the drinking water. Water, apart from being very important to meet life biological and physiological needs of the organism, it is a substance necessary for the development of the industry and agriculture such as irrigation, fisheries, tourism and industry. The waters of the river Drin white occupy a substantial portion of the Kosovo hydrographic network and represent a great wealth of our country.

Drini begins from foot of Rusolia Mountain in Radavc cave near Peja, at 586 m above sea level. The amount of source reaches 30 m<sup>3</sup> per second. Surface of the White Drin basin is 4265 km<sup>2</sup> in Kosovo. His tributaries are Peja Lumbardhi, Erenik, Prizren Lumbardh. Uncontrolled use of white Drin River is mainly from anthropogenic factor, the effects of sewage pollution, waste discharge, etc.

The objective of this study is related to the determination of the physical - chemical parameters that are presented in tables and diagrams, which show the level of pollution of the river, mainly from the tributaries that flow into it, the anthropogenic factor, the effects of pollution from sewerage, waste discharge, etc.

**2. Material And Methods**

In this study is monitored the water quality the white Drini river basin, for its physical - chemical characteristics, such as temperature, turbidity, total hardness, specific conductivity, dissolved oxygen, potassium permanganate consumption, nitrites, ammonia, phosphates, iron, manganese, etc.

Sampling was carried out during 2012 and 2013. There were taken 2 liter of water for each sample. Sampling locations were chosen mainly in places where tributaries flow into White Drini River. The monitoring plan includes measurement of physical - chemical parameters, sampling methods, analytical methods of definitions, volumetric methods, atomic absorption (AAS) method, spectrophotometric methods, data storage and use of information.

### 3. Results and Discussions

Physical and chemical analysis of the White Drini River in May 2012

Date: 29.05.2012	Radavc	River Klinë-Drini				River Mirushë-Drini			Ereniku-Drini			L.bardh i P.-Drini		
Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	
Sampling-h	8:45	09:50	11:10	11:20	12:00	12:10	12:20	14:30	14:45	15:00	16:00	16:20	16:40	
The air temperature	17.4	17.4	18	18	18.2	18.2	18.3	18.6	18.6	18.8	18.8	18.8	18.8	
Water Temperature	7.9	8.4	8.7	8.7	9.3	8.9	8.9	9.2	9.1	9.4	9	9.5	9.6	
Turbidity	1.02	7.9	6.2	6.8	5.9	4.8	5.5	8.3	7.1	7.4	6.8	6.1	6.5	
pH value	7.5	7.8	7.6	7.7	7.6	7.55	7.58	7.61	7.64	7.6	7.49	7.63	7.61	
KMnO4 consumption	3.16	11.05	8.53	9.16	9.79	7.9	8.84	11.06	7.58	9.16	10.74	7.58	8.84	
Spec. conductivity	305	482	376	383	351	398	389	365	438	417	324	441	435	
Total hardness	7.28	14.84	11.76	12.04	11.48	11.76	11.76	16.43	11.76	12.04	11.76	11.2	11.78	
Dry residue	183	289	225	229	210	238	233	219	262	250	194	264	261	
Chloride	9.92	12.05	11.34	11.69	14.18	11.69	12.4	14.18	11.69	12.76	12.05	11.69	12.05	
Dissolved oxygen	11.2	10.1	10.8	10.5	10.2	10.9	10.7	10.8	10.7	10.8	10.3	10.9	10.7	
Ammonia, N-NH3	0.15	0.28	0.22	0.24	0.25	0.2	0.22	0.29	0.22	0.25	0.26	0.23	0.24	
Nitrites, N-NO2-	0.006	0.034	0.019	0.026	0.019	0.015	0.016	0.022	0.018	0.02	0.025	0.018	0.02	
Nitrites, N-NO3-	0.09	0.39	0.31	0.32	0.35	0.29	0.31	0.39	0.33	0.34	0.41	0.36	0.34	
Phosphates	0.24	0.47	0.35	0.35	0.4	0.32	0.34	0.45	0.36	0.38	0.46	0.36	0.38	
Iron	0.08	0.09	0.12	1.128	0.745	0.18	1.43	0.56	0.21	0.25	0.31	0.26	0.28	
Manganese	0.012	0.038	0.022	0.035	0.038	0.018	0.028	0.042	0.026	0.021	0.031	0.024	0.028	

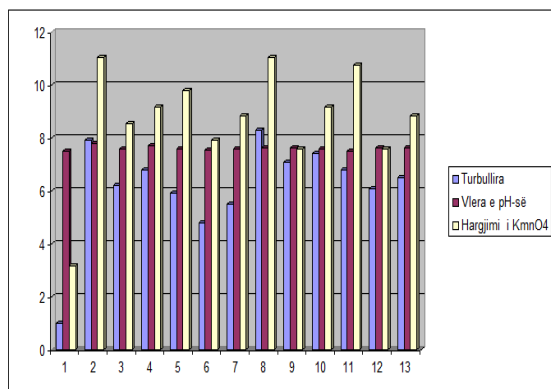


Diagram no.1: turbidity, pH value, KMnO4 consumption

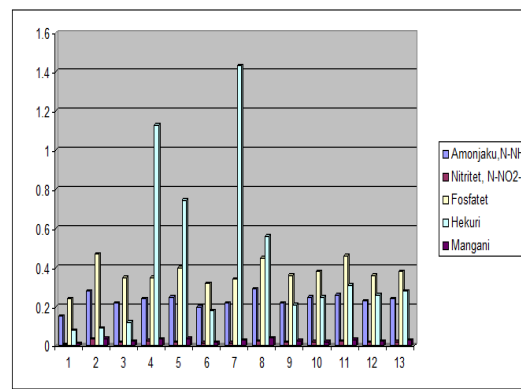


Diagram no.2: ammonia, nitrite, phosphates, iron, manganese.

Physical and chemical analysis of the White Drini River in September 2012

Date: 03.09.2012 Parameters	Radavc	River Klinë-Drini				River Mirushë-Drini			Ereniku-Drini			L.bardh i P.-Drini		
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Sampling-h	8:45	9:50	11:10	11:20	12:00	12:10	12:20	14:30	14:45	15:00	16:00	16:20	16:40	
The air temperature	18.3	18.3	18.5	18.6	18.6	18.6	18.6	18.9	18.9	19.1	19.1	19.1	19.1	
Water Temperature	11.1	13.5	15.6	15.9	15.9	16.8	16.8	17.3	17.5	17.5	18	18.2	18.2	
Turbidity	1.18	8.3	8.2	8.3	7.6	7.9	7.8	14.2	9.2	13.5	11.1	12.3	11.8	
pH value	7.61	7.92	7.68	7.76	7.78	7.77	7.77	7.89	7.83	7.85	7.86	7.81	7.84	
KMnO4 consumption	3.16	9.16	8.53	8.84	8.37	9.16	8.05	11.4	10.74	10.11	11.1	10.7	9.48	
Spec. conductivity	316	491	368	376	364	401	392	372	429	413	342	429	435	
Total hardness	7.42	12	11.5	11.8	8.4	12	11.8	14	12.04	12.32	12	11.5	11.48	
Dry residue	189.6	295	221	226	218	241	235	223	257.4	247.8	205	257	261	
Chloride	9.92	12.4	11.3	11.7	14.9	12.4	14.2	15.2	12.4	14.18	14.2	12.4	11.69	
Dissolved oxygen	11.1	10.2	10.9	10.6	10.4	10.7	10.8	10.3	10.9	10.5	10.1	10.7	10.8	
Ammonia, N-NH3	0.14	0.29	0.21	0.25	0.26	0.21	0.23	0.28	0.23	0.24	0.28	0.25	0.22	
Nitrites, N-NO2-	0.007	0.04	0.02	0.03	0.02	0.02	0.02	0.03	0.019	0.022	0.02	0.02	0.021	
Nitrites, N-NO3-	0.092	0.4	0.33	0.33	0.37	0.29	0.32	0.39	0.34	0.35	0.42	0.37	0.33	
Phosphates	0.25	0.44	0.37	0.38	0.42	0.33	0.31	0.44	0.37	0.33	0.45	0.38	0.34	
Iron	0.07	0.08	0.13	1.12	0.73	0.19	1.45	0.52	0.24	0.24	0.32	0.25	0.26	
Manganese	0.011	0.04	0.02	0.03	0.04	0.02	0.03	0.04	0.028	0.025	0.03	0.03	0.026	

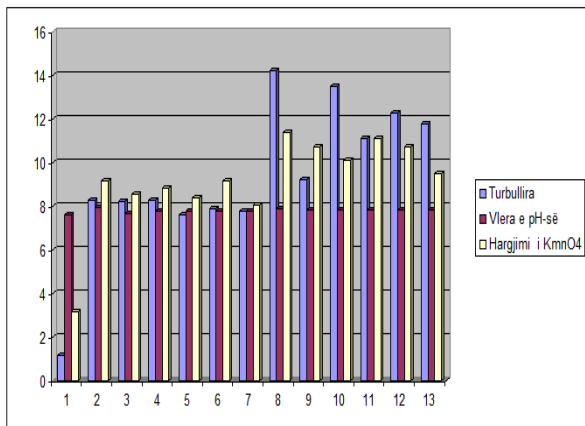


Diagram no.3: turbidity, pH value, KMnO4 consumption

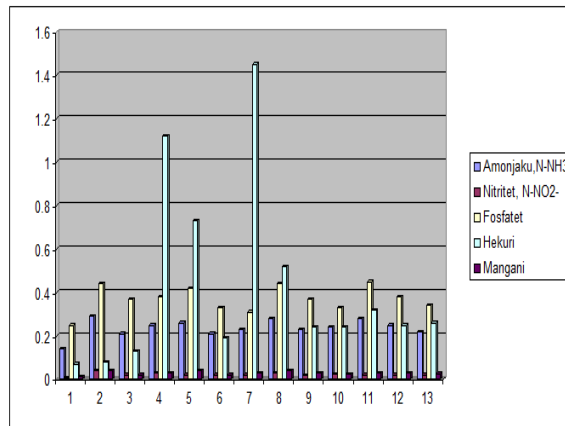


Diagram no.4: ammonia, nitrite, phosphates, iron, manganese.

Physical and chemical analysis of the White Drini River in January 2013

Date: 26.01.2013 Parameters	Radavc I	River Klinë-Drini				River Mirushë-Drini			Ereniku-Drini			L.bardh i P.-Drini		
		II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	
Sampling-h	8:45	9:50	11:10	11:20	12:00	12:10	12:20	14:30	14:45	15:00	16:00	16:20	16:40	
The air temperature	-4	-3.8	-3.5	-3.5	-3	-3	-3	-2.5	-2.5	-2.7	-3	-3	-3	
Water Temperature	5.1	5.2	5.2	5.2	5.4	5.3	5.3	5.4	5.4	5.4	5.3	5.3	5.3	
Turbidity	0.69	5.17	3.98	4.05	3.65	3.75	3.69	5.06	4.67	4.82	4.83	5.01	4.94	
pH value	7.61	7.92	7.68	7.76	7.78	7.77	7.77	7.89	7.83	7.85	7.86	7.81	7.84	
KMnO4 consumption	2.84	6.32	6	6.32	5.68	5.68	6	7.26	6.32	3.79	6.95	6.32	6.16	
Spec. conductivity	285	397	324	316	321	364	343	408	389	399	321	379	362	
Total hardness	7.14	8.12	8.4	8.12	7.84	8.12	8.12	8.68	8.4	8.12	8.12	8.4	8.12	
Dry residue	171	238.2	194	189.6	192.6	218.4	218.4	244.8	233.4	239.4	192.6	227	217.2	
Chloride	7.09	11.69	8.5	9.21	9.92	8.5	9.21	12.4	9.92	10.63	11.69	9.21	9.92	
Dissolved oxygen	12	11.3	11.5	11.4	11.3	11.8	11.7	11.6	11.8	11.4	11.5	11.7	11.8	
Ammonia, N-NH3	0.08	0.15	0.12	0.18	0.14	0.17	0.16	0.19	0.22	0.14	0.21	0.19	0.16	
Nitrites, N-NO2-	0.003	0.015	0.02	0.017	0.013	0.014	0.012	0.02	0.012	0.016	0.018	0.01	0.015	
Nitrites, N-NO3-	0.045	0.22	0.22	0.25	0.195	0.21	0.18	0.3	0.18	0.24	0.27	0.21	0.22	
Phosphates	0.19	0.29	0.25	0.28	0.27	0.26	0.25	0.29	0.26	0.27	0.28	0.24	0.25	
Iron	0.04	0.16	0.1	1.1	0.15	0.13	1.4	0.19	0.15	0.16	0.17	0.16	0.15	
Manganese	0.009	0.028	0.02	0.027	0.026	0.017	0.021	0.035	0.024	0.023	0.027	0.02	0.025	

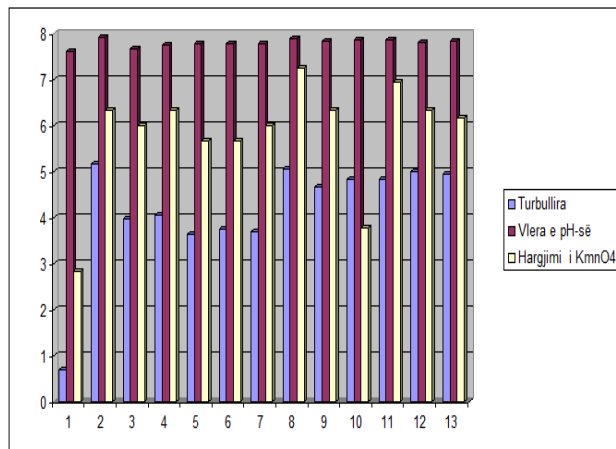


Diagram no.5: turbidity, pH value, KMnO4 consumption

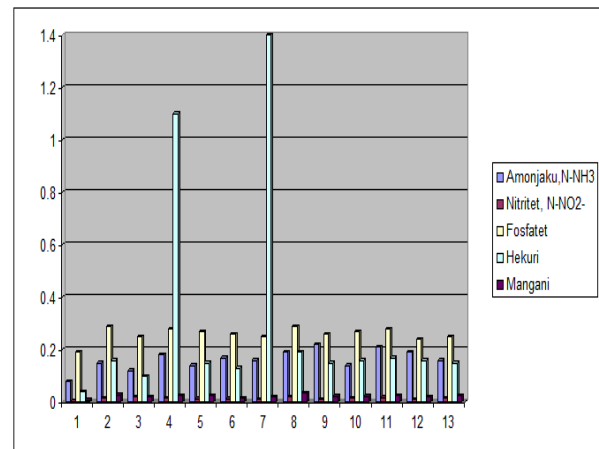


Diagram no.6: ammonia, nitrite, phosphates, iron, manganese.

Physical and chemical analysis of the White Drini River in May 2013

Date: 31.05.2013	Radavc	River Klinë-Drini			River Mirush-Drini			Ereniku-Drini			L.bardh i P.-Drini		
Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Sampling-h	8:45h	9:50	11:10	11:20	12:00	12:10	12:20	14:30	14:45	15:00	16:00	16:20	16:40
The air temperature	12	12.3	13	13.2	14	14.1	14.3	14.5	14.4	14.3	14.3	14	14
Water Temperature	9.9	10.2	10.4	10.5	10.5	10.8	10.8	11	11.1	11.1	10.8	11.2	11.2
Turbidity	0.88	5.92	4.8	5.1	4.5	4.1	4.3	5.76	4.69	5.3	5.2	4.9	5.1
pH value	7.68	7.93	7.75	7.79	7.82	7.84	7.81	7.91	7.86	7.87	7.88	7.84	7.86
KMnO4 consumption	3.002	6.95	6	6.32	6.32	5.37	6	7.26	6.95	6.32	6.95	6.32	6.32
Spec. conductivity	315	402	365	383	351	384	377	418	421	407	362	388	393
Total hardness	7.14	8.12	7.84	8.12	7.84	8.12	8.12	8.68	8.4	8.12	8.4	8.4	8.12
Dry residue	189	241.2	219	229.8	210.6	230	226	251	252.6	244	217	233	236
Chloride	7.09	11.69	9.12	9.92	9.92	9.12	9.21	12.4	10.63	11.7	11.7	9.21	9.92
Dissolved oxygen	11.8	10.8	11.1	10.9	10.7	10.9	10.9	11	11.1	10.9	11.1	10.9	11.1
Ammonia, N-NH3	0.09	0.17	0.14	0.19	0.16	0.18	0.17	0.2	0.23	0.15	0.22	0.19	0.17
Nitrites, N-NO2-	0.004	0.017	0.02	0.018	0.015	0.01	0.01	0.02	0.014	0.02	0.02	0.02	0.02
Nitrites, N-NO3-	0.046	0.23	0.23	0.25	0.2	0.22	0.19	0.31	0.19	0.25	0.28	0.22	0.23
Phosphates	0.19	0.29	0.27	0.28	0.28	0.26	0.26	0.29	0.27	0.27	0.28	0.25	0.26
Iron	0.04	0.17	0.11	1.12	0.15	0.14	1.4	0.19	0.16	0.16	0.18	0.17	0.16
Manganese	0.009	0.028	0.02	0.029	0.026	0.02	0.02	0.04	0.025	0.02	0.03	0.03	0.03

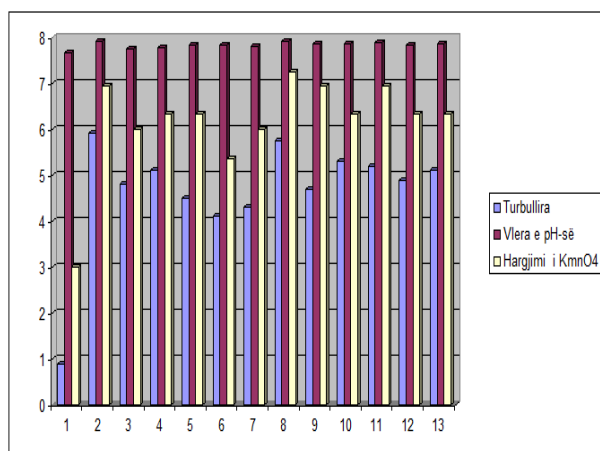


Diagram no.7: turbidity, pH value, KMnO4 consumption

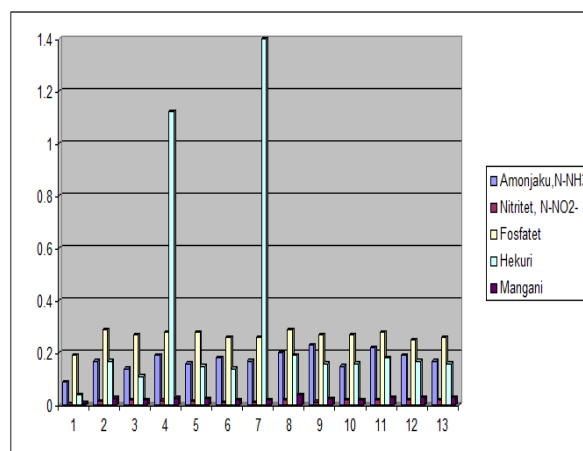


Diagram no.8: ammonia, nitrite, phosphates, iron, manganese.

#### 4. Discussion

Physical - chemical results of water samples taken at 13 locations of White Drin River, were analyzed during 2012 and 2013. Analyzed parameters were: air temperature, water temperature, pH value, turbidity, total hardness, specific conductivity, dissolved oxygen, consumption of potassium permanganate, nitrates, nitrites, iron, manganese, ammonia, phosphates, etc.

Water temperature - the results of the analysis show that there are differences from first location, with temperature 5.1 °C in January 2013 to the highest temperature at 18.2 °C at locations 12 and 13, in September 2012.

Turbidity - results of analysis shows values between 0.69 NTU in the first location in January 2013, up to 14.2 NTU in the location of twelve, in September 2012.

PH value - the results range from 7.49 in location eleven in May 2012, up to 7.92 in location two in September 2012 and January 2013. The results presented show that pH value is not raised much.

Consumption of potassium permanganate - resulting in location One (2.84 mg / l) in January 2013, which is lowest, and the highest in location Eleven (11.1 mg / l) in September 2012.

Dissolved oxygen in the water - results varies from 12.0 mg / l in location One in January 2013, which shows that the amount of oxygen is high due to the low water temperature, and the lowest oxygen is 10.1 mg / l in May 2012.

Nitrites - results show values from 0.003mg / l in location One in January 2013, up to 12.04 mg / l at location Two in September 2012.

Ammonia - lowest values are presented in location One (0.08 mg / l) in January 2013, while the highest values are in location Two (0.29mg / l) in September 2012.

#### Conclusion

During the monitoring done at River White Drin, in May and September of 2012 and January and May 2013, we can draw the following conclusions: White Drin River water samples were analyzed in order to determine the physical-chemical parameters.

White Drin river basin has more surface area than other river basins of our country. Monitoring of this basin has 13 locations for quality monitoring of physical – chemical parameters, starting from its source in the mountains of Radavc near Peja, then other monitoring locations where three sampling points are in Klina where Klina river flows, 3 sampling points where the river Mirushë flows, three sampling points where the river Erenik flows and three sampling points where Lumëbardhi Prizren flows.

Waters from all tributaries of White Drini River is not of a good quality, which is consequence of pollution from settlements with polluted water discharges, waste disposal sites, mostly near bridges. Results show that the situation is not good where Klina River flows in White Drin river. Therefore water of White Drin River is polluted by discharges of sub basins that were previously impacted by human activities.

It is recommended that governmental institutions exercise responsibility to institutions for preservation of water, in order to control water quality, to gradually reduce pollution, deterioration and other activities that constitute great danger to water environment as well as protection of water by gradually introducing European Union Standards.

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