

Analysis of the Impact of Industrial Waste on River Water Quality Towards Using the Dynamics of Land Quality

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ABSTRACT

Natural resources are the basis of all material goods which are of special importance for the life and development of mankind. Therefore, sustainable management of natural resources is of great importance for modern society. The concentrations of heavy metals in the soil such as: (Cu, Fe, Cd, Mn, Pb, and Zn), have a negative impact on the contamination of crops. Human activity should be developed on the basis of the principles of environmental sustainability to achieve economic and social prosperity and environmental protection as well as, improve the environment polluted by human activity. Natural resources must be preserved and regenerated. Moreover, well-being, environmental management and maintaining the purity of the environment in the future enable the production of safe food. Preservation of good quality water resources creates security and maintains soil quality. Recently, there has been a marked increase in awareness of natural resources, especially the preservation of water quality, soil, and their importance to our lives. The study included various methodologies, qualitative and quantitative analyses, and statistics.

Keywords: environment, water, soil resources, and sustainability.

INTRODUCTION

The land has many environmental functions, such as economic, social, and cultural. However, the multiple functions of the Earth are being threatened by numerous human activities (Jobbágy et al. 2017.) Physical, chemical, and biological changes of soil and ecosystems closer to the surface can result in soil degradation, loss, or reduction of its vital functionality (Taszakowski et al. 2017). The use of contaminated water resources for irrigation of agricultural crops contributes to the deterioration of soil quality (Sheoran et al. 2011). Moreover, due to the human activities in daily life, the Earth physically loses its quality in many cases, which is known as the destruction of the Earth (Łukowski et al. 2017). This occurs as a result of the surface use of minerals for the construction of settlements (Możdżer et al. 2017). The impact of soil pollution is increased by road transport, poor waste management from the municipality, the use of

contaminated water for irrigation, etc. (Chai et al. 2020). Large cities do not have wastewater treatment plants and wastewater ends up in rivers (Pashkevich et al. 2016).

Drini I Bardh basin is the main one for the irrigation of agricultural crops that are cultivated in the Dukagjini plain. The fate of the cultivation of agricultural products depends on the use of water of the Drini I Bardh river, which directly affects the quality of the soil and the black clotting of food.

METHODOLOGY

The study continues with the determination of sampling in 10 sampling sites in the Drin I Bardh river, where the municipal wastewater discharge has started. The study region is the Drin I Bardh river basin as a result of urban and agricultural activities is the analysis of heavy metals as Figure 1. Parallels in these sampling sites were taken from 8 soil samples for analysis in the region of

two municipalities. The samples were scanned and sent to the laboratory for analytical analysis. Samples were sent to the laboratory for analytical analysis according to the analytical technique: Inductively coupled plasma atomic emission spectroscopy (ICP-AES), also referred to as inductively coupled plasma optical emission spectrometry (ICP-OES), is an analytical technique used for the detection of chemical elements.

RESULTS AND DISCUSSIONS

Efforts were made to ensure the samples collected were as reliable as possible. The samples were collected using clean equipment so that the residues of some chemical compounds from previous water and soil sampling procedures did not prevent the authors from providing reliable analysis of the results. During the research, the amount of some heavy metals in agricultural lands was analyzed. The samples were also taken to analyze the water quality of the Drini I Bardh river and soil samples. The study aimed to analyze the accumulation of heavy metals in water systems and agricultural land, soil quality, and transport of toxic metals in the environment. There are over 500,000 vehicles in circulation on the roads of Kosovo, over 80% of which do not meet international standards. The use of poor quality oil, the release of gases from the use of coal for combustion has aggravated water and land systems.

Two main municipalities, i.e. Gjakova and Prizren, were selected for analysis because of the geographical position of the Drini I Bardh basin. The studies show the presence of heavy metals in

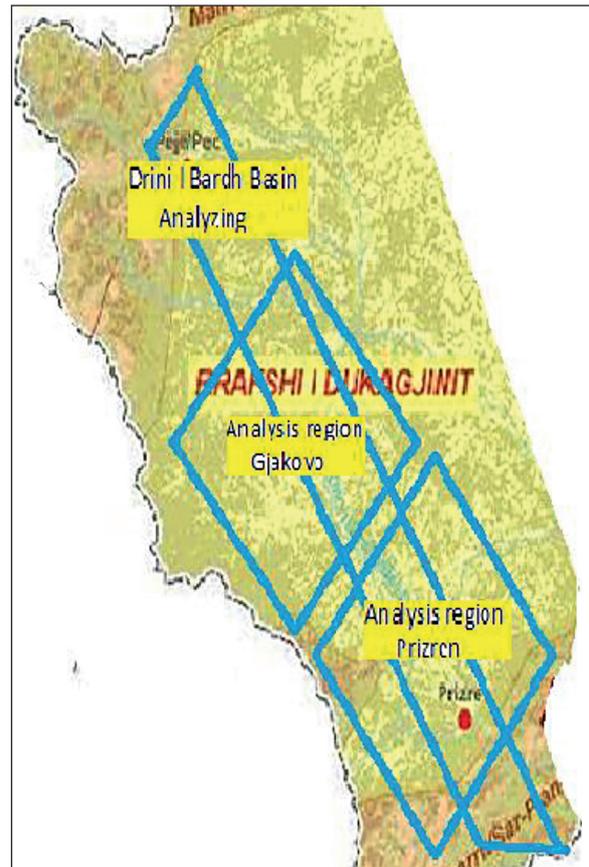


Figure 1. Sampling locations

various places near the Drini I Bardh river, the agricultural land of the basin. The transport of heavy metals in environments from the use of polluted water for agricultural crops has reduced the soil quality in the study regions. The analyzed results are also presented in graphic form as Figure 2. In addition to soil sampling, the organic carbon content was analyzed at the sampling sites. Soil,

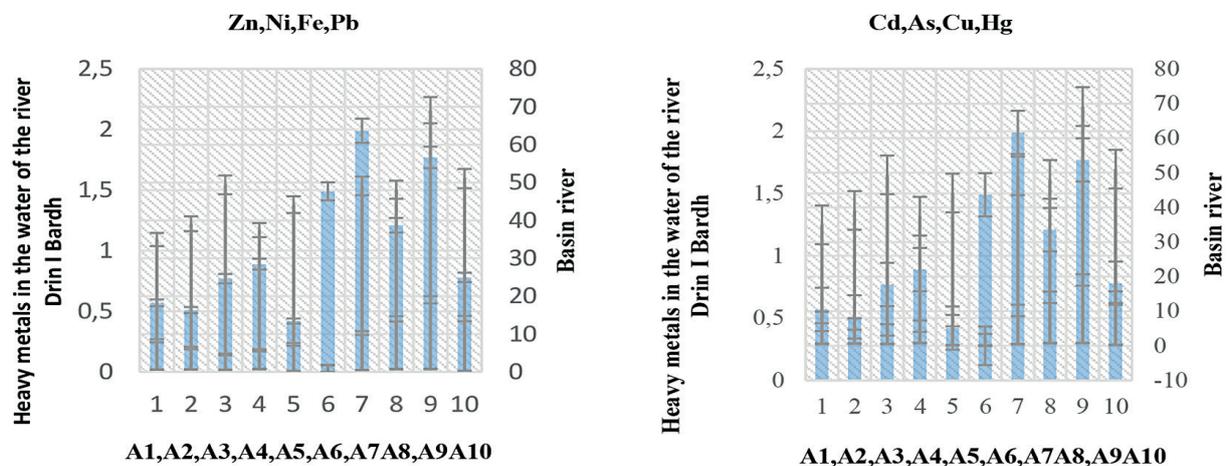


Figure 2. Graphic of heavy metals in the water of the Drini I Bardh river

one of the three important natural elements along with air and water, contains 5% organic matter which is essential for plant growth. The soil absorbs up to 10% of the amount of carbon dioxide (Table 1). Organic soil must be preserved because 5 cm of organic soil takes at least 1000 years to create, Figure 3. The Drini I Bardhi basin occupies an area of 4265 km². Most of this basin is arable land and all agricultural crops depend on the

use of water from the Drini I Bardh river. The protection of this basin from heavy metal pollution also depends on the quality of the soil, the preservation of essential minerals, and the management of soil erosion. Figure 4 shows the analysis of the concentration of heavy metals in agricultural lands and the graphic form. Table 2 results of soil samples in agricultural lands in the Gjakova region.

Table 1. Organic carbon content in the Gjakova region in (%)

Organic carbon content in the Gjakova region (%)							
B1(a)	B2(a)	B3(a)	B4(a)	B5(a)	B6(a)	B7(a)	B8(a)
0.61	0.30	0.49	0.56	0.71	0.77	0.49	0.58
0.55	0.49	0.65	0.56	0.67	0.75	0.43	0.57
0.67	0.33	0.66	0.38	0.44	0.71	0.44	0.45
0.49	0.78	0.56	0.56	0.71	0.72	0.51	0.59
0.59	0.57	0.49	0.89	0.48	0.56	0.56	0.66
0.58	0.34	0.44	0.81	0.67	0.55	0.45	0.61

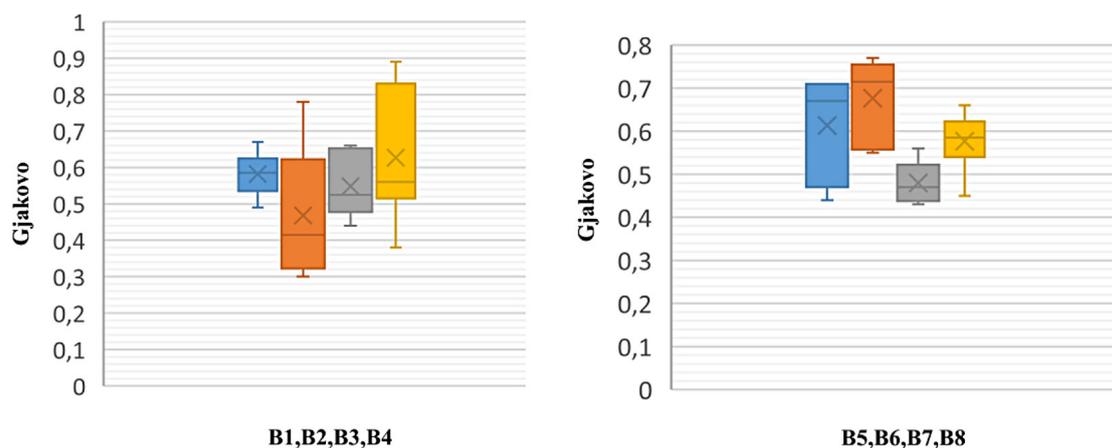


Figure 3. Organic carbon graph in the sampling sites in the Gjakova region (in %)

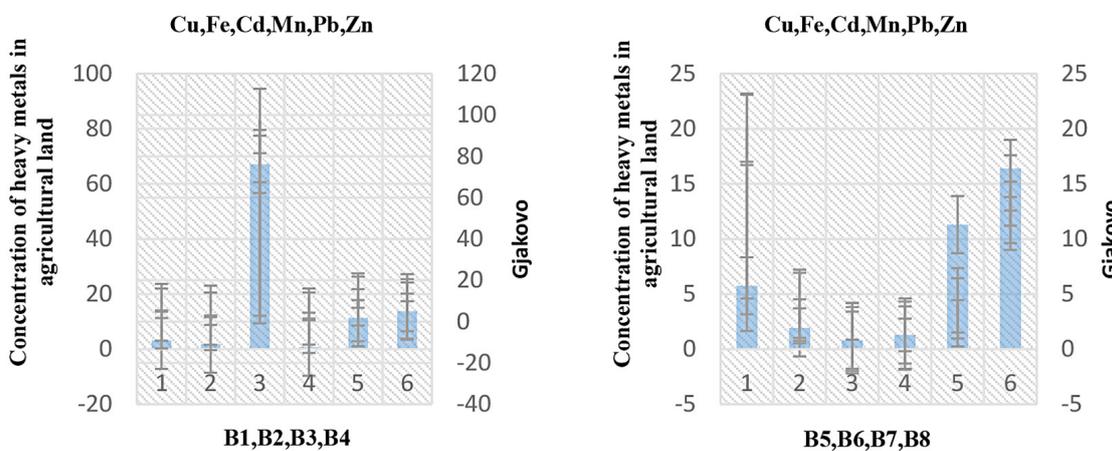


Figure 4. Graphic of heavy metals in agricultural crop – corn

Table 2. Heavy metal content in agricultural land of Gjakova

Heavy metal content in the Gjakova region								
Metals	B1	B2	B3	B4	B5	B6	B7	B8
Cu	3.19	2.62	3.56	3.38	5.75	19.9	20.1	3.12
Fe	1.83	1.82	0.25	1.42	1.93	3.73	4.12	2.23
Cd	67.1	97.1	0.97	80.1	0.82	0.99	1.11	2.34
Mn	0.72	0.44	2.47	1.48	1.29	1.41	1.23	1.29
Pb	11.4	6.13	8.56	10.7	11.3	4.16	3.34	2.98
Zn	13.8	7.34	11.7	7.97	16.4	14.4	12.1	11.1

Organic soil is important and filtering for the retention of water and essential minerals which are necessary for the cultivation of agricultural crops. Poor water quality impoverishes organic soil and degrades soil quality shows Figure 5. Agricultural crops that supply food close to one million inhabitants are cultivated on the surface of the Drini Bardh basin. Municipal governments, together with central governments are making

efforts to increase the number of wastewater treatment plants, but without success due to high financial costs. Table 3 presents the heavy metals studied along the Drini I Bardh river, with locations (A1–A10). The results of the study of heavy metals in the water of the Drini I Bardh river, in some sampling sites are higher. The zinc content is constantly increasing due to the increase of pollution during the river flow; in the A9 site it has a

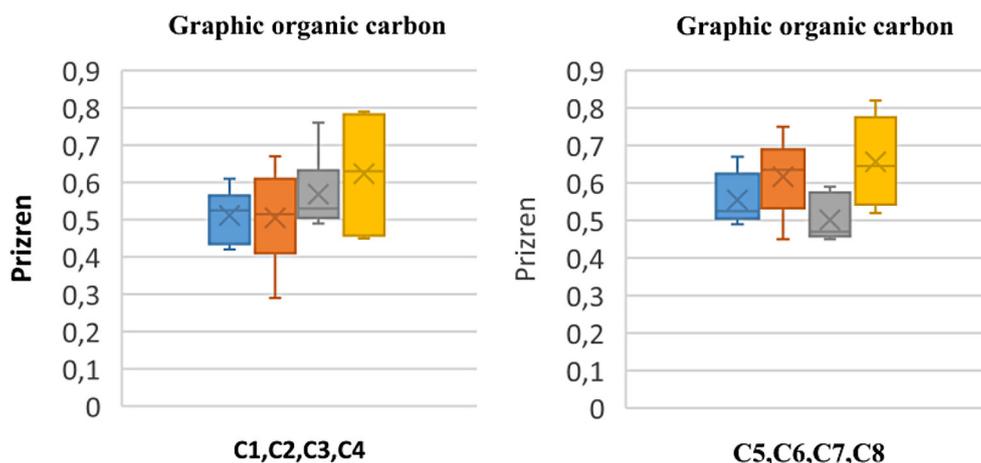


Figure 5. Organic carbon graph in the Prizren region (in %)

Table 3. Content heavy metals in the water of the Drin I Bardh river

Samples		Content heavy metals in the water of the river Drin I Bardh, µg/kg							
		Zn	Ni	Fe	Pb	Cd	As	Cu	Hg
Heavy metals in the Drin I Bardh River Basin	A1	123.4	30.37	13102	31.51	0.57	8.20	34.95	0.59
	A2	113.1	31.29	12681	33.11	0.51	6.30	39.12	0.66
	A3	101.7	35.16	17231	25.23	0.77	4.59	49.40	0.54
	A4	139.0	49.99	18247	29.99	0.89	5.67	37.45	0.79
	A5	106.1	13.19	11828	33.26	0.42	7.28	44.15	0.21
	A6	261.4	80.47	16533	68.96	1.49	1.80	30,93	0,50
	A7	223.2	62.28	13781	61.91	1.99	10.24	49.09	0.48
	A8	241.2	60.49	19713	59.67	1.21	14.01	48.09	0.78
	A9	292.1	41.30	15928	41.26	1.77	19.05	69.12	0.81
	A10	260.4	59.01	17236	45.05	0.78	14.08	51.04	0.25

very high value of 292.1 µg/kg. The lead content results in the Drin I Bardh river are of average values, except in two sampling sites with higher values because near the site (A6, A7), there is a factory for the production of tiles. The value of arsenic and mercury does not exceed European standards, see Table 3. The most dangerous heavy metals are thought to be mercury, arsenic, lead, and cadmium. Their circulation is a result of poor management of municipal and industrial waste. Figure 6 show the heavy metals in agricultural land Prizren. The symptoms of exposure to these metals in high concentrations result in acute poisoning of agricultural land. The soil quality can be different, depending on the type of contamination

with metals, concentration, also by the way and duration of exposure. In Table 2 we listed organic carbon content in Gjakova region and in Table 4 organic carbon content in soils in Prizren region (C1–C8). The content of heavy metals in the soil in the two regions analyzed in some cases has increased values of lead; in the sampling site C1 it has high values of 9.06 mg/kg.

The cadmium value in some sampling sites has increased content, see Tables 2 and 5. The parameters of heavy metal content in agricultural soil were presented. In some cases, depending on the position, there are increased values due to poor wastewater management and their outflow into the aqueous arteries.

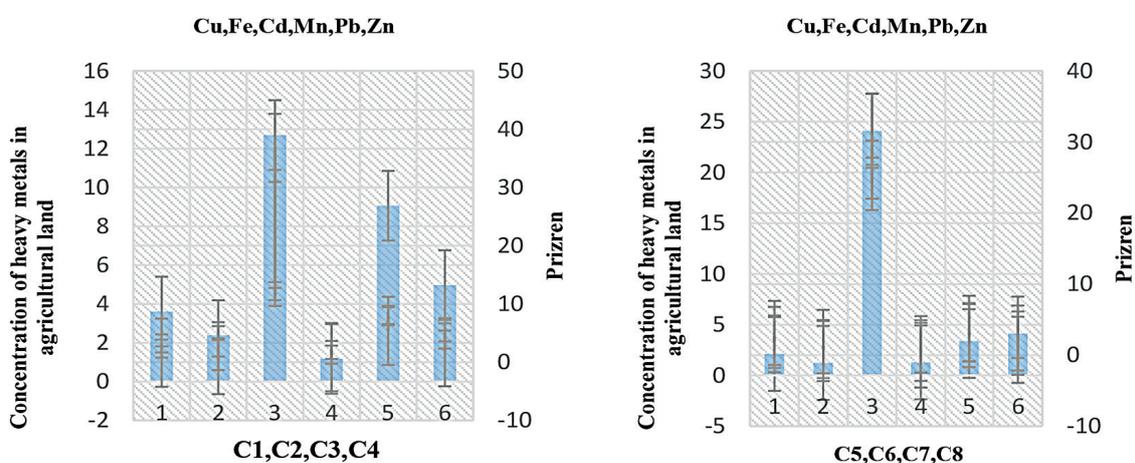


Figure 6. Graphic of heavy metals in agricultural land Prizren

Table 4. Organic carbon content in soils in the Prizren region (%) (C1–C8)

Organic carbon content in the Prizren region (%)							
C1(a)	C2(a)	C3(a)	C4(a)	C5(a)	C6(a)	C7(a)	C8(a)
0.55	0.29	0.59	0.46	0.61	0.56	0.46	0.82
0.54	0.58	0.55	0.59	0.53	0.61	0.47	0.76
0.61	0.45	0.76	0.45	0.51	0.45	0.57	0.55
0.42	0.67	0.51	0.67	0.67	0.67	0.59	0.52
0.44	0.59	0.51	0.79	0.52	0.66	0.45	0.61
0.51	0.45	0.49	0.78	0.49	0.75	0.47	0.68

Table 5. Heavy metal content in agricultural land of Prizren

Heavy metals content in the Prizren region								
Metals	C1	C2	C3	C4	C5	C6	C7	C8
Cu	3.61	3.22	2.34	1.63	2.11	2.61	2.69	1.88
Fe	2.39	2.52	5.33	0.35	1.23	1.35	0.85	1.11
Cd	12.7	11.2	12.2	36.8	24.1	31.8	26.1	24.1
Mn	1.17	1.29	2.11	0.86	1.28	0.46	0.46	1.23
Pb	9.06	8.11	7.89	5.38	3.39	3.33	3.22	2.78
Zn	4.97	3.89	5.12	1.71	4.12	1.11	1.31	3.28

CONCLUSIONS

The study concludes that people should be careful in preserving water basins as an indicator of agricultural land quality. Consumption of contaminated food is becoming increasingly toxic and dangerous to human health, depending on the quality of the soil. A wide variety of diseases are caused by the use of polluted water for irrigation of agricultural crops and the transport of heavy metals to black food. To prevent contamination of water containing heavy metals and to achieve normalcy within the limits of standards, the attention should be focused on: prevention of water pollution with heavy metals; ensuring the preservation of the quality and ecosystems of these waters, through adequate and uninterrupted monitoring in time and space; wastewater treatment in urban and rural areas, waste recycling; organization of systematization and collection of sanitary waste; construction of air, water, and soil measuring stations and chemical and microbiological monitoring of the level of pollution level in surface waters; encouraging interested institutions to become acquainted with analytical achievements in this field.

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