Impact of Polluting Sources on Physico-Chemical Properties and Content of Heavy Metals in the Waters of the Morava e Binçës River — Kosovo

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Abstract—**The problem of providing an adequate supply and supply of drinking water and other necessary water, today more than ever is a global concern because climate change caused by environmental pollution not only has reduced water reserves but has also contributed to the degradation of aquatic biodiversity. Care for the preservation of surface water directly affects the preservation of groundwater quality. Therefore, such a thing has motivated us to explore the water quality of Morava e Binçës, a river that flows and refreshes the northeastern part of Kosovo. To have an accurate assessment, of the quality of river waters, in the research area, we have targeted four monitoring points (S_1, S_2, S_3, and S_4), and we are based on some standard ISO and EPA methods, which correspond to the quality of surface waters. The results have shown that during the four seasons of the year, we have encountered Physico-chemical pollution at all monitoring points, but more prominent excesses have resulted during the summer and autumn at the S_4 sampling site with COD (159.8mg/L) and BOD_5 (64.5 mg/L). While we encountered more pronounced excesses with heavy metals in the summer season in S_4 with Mn (0.052mg/L), while in the fall, in S_3 with Cd (0.090mg/L).**

Such pollution has occurred as a consequence of urban and industrial discharges; the use of chemicals in agricultural lands and the presence of the regional doping with the urban waste of Gjilan, located not far from the banks of this river categorizes these waters as poor ecological status.

Index Terms—**Morava e Binçës River, pollution, physico-chemical parameters, Cd and Mn, ecological status.**

I. Introduction

Fulfilling the needs with abundant amounts of water, both for drinks and another purpose is one of the most prominent concerns in Kosovo as well as in other countries of the world. This concern has arisen as a consequence of the rapid increase in population and scarce freshwater reserves. The ever-increasing population of the Earth adds to the ever-increasing need for water, which alarms that countries are approaching water shortages [1]. Insufficient water, as in the past and today, often not only has created great demographic movements in the world, there have been, and there are cases when sporadic conflicts and great struggles for the possession of abundant water resources have taken place [2].

Industrial development, deployment of industrial and urban landfills near rivers, sanitary discharges, drainage of water contaminated with preparations and chemicals used in agricultural lands, and so on, has affected and continues to affect environmental pollution in general and water in particular. Pollution of surface waters with chemical substances poses an enormous threat to aquatic organisms due to the accumulation of pollution in aquatic habitats, and acute and chronic toxicity, which leads to habitat loss and biodiversity and thus poses a serious threat to human health [3]. Approximately the same situation occurs with the surface and groundwater of Kosovo. The Republic of Kosovo has a territory of 10,887 km^2 and is considered with insufficient water reserves. Geographically, the waters of Kosovo rivers flow into three basins: the Adriatic Sea, the Aegean, and the Black Sea. The waters of the Morava River, our object of study, which is popularly known as the Morava of Binça, also flow into the Aegean Sea basin. This river originates in the mountains of Karadak, in the territory of Northern Macedonia, and with the crossing of the border Macedonia North-Kosovo, because it passes through the settlement Binçë is named Morava e Binçës. The river during its flow passes through the plain of Anamorava, which represents the lowest level of relief in the south-eastern part of Kosovo. After passing through or near the settlements of Korbuliq, Binçë, Viti, Kllokot, Ranillug, Gjilan, Uglarë, Korminjan to Dobërçan - territory administered by the Republic of Kosovo, the waters of this river were polluted by urban discharges, discharges from industry and milk processing oils; from the fruit processing industry for beverages, from the regional landfill of Gjilan (in Veleknica), and the discharge waters of the Marec River polluted by the metal processing industry (Korminjan village). The purpose of this study is to illuminate the water quality of the river Morava of Binçë, whose waters were not only used for irrigation of agricultural lands in the municipalities of Viti and Gjilan but also to prove the impact of the existence of biodiversity in the region of Anamorava. The restoration of the natural state, not only of the waters of the Morava e Binça river but also of the biodiversity should be a priority obligation, both at the local and central level, particularly for the Ministry of Environment that should draft the design and construction of plants for the disposal of polluting sources as well as the disposal of the regional landfill with urban waste, which is located in the suburb of Gjilan.

II. Material and Methods

To know and have the most realistic information on the

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water quality of the Morava e Binçës River, we have established a monitoring network based on potential settlements of potential pollution (Fig. 1).

Precisely for this reason, we marked four sampling points, taking into consideration the potential causes of pollution, with a special emphasis on the sampling points that follow the settlements of Gjilan, Viti, and Banja e Kllokot, which for technical reasons we marked with: S_1, S_2, S_3 and S_4 and to be as objective as possible, we associated these points with coordinates reflected in Table I.

TABLE I: SAMPLING POINTS AND THEIR COORDINATES

Sampling point	Geographical width	Longitude	Altitude (m)
S_1- Korbuliq	42 °15'31.91"N	21 °20'35.18" E	626
S_2 - Kllokot	42 °22'15.20"N	21 °24'1.91"E	484
S_3- Uglare	42 °28'32.30"N	21 °34'50.67" E	440
S4- Korminjan	42 °30'17.62"N	21 °38'7.85"E	434

S_1- depicts the situation of low volume water of the river Morava e Binçës above the village Korbuliq, where there are no settlements, but as a result of agricultural and livestock activity, these are affected by these polluting sources.

S_2 – this monitoring site, located on the outskirts of the settlement of Kllokot, presents the state of the waters of the river Morava e Binçës, at a distance of 13.5 km from the monitoring site S_1. We have targeted this sampling site because from Kllokot and the city of Viti, there are large sanitary and urban discharges, numerous gastronomy discharges, two thermal baths of Kllokot; zinc plating industry; concrete processing, and agricultural activities. The principal role in surface water pollution is caused by urban and industrial discharges, as well as runoff (drainage) of agricultural lands, which penetrate natural beds, causing several sanitary and environmental problems [4], [5].

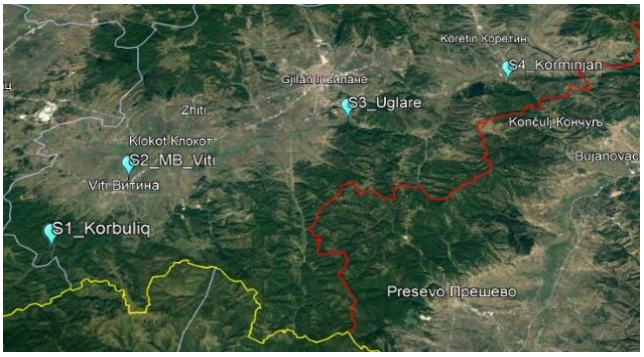

Fig. 1. Morava e Binçës river monitoring network.

S_3- Morava e Binçа in Uglare, located at a distance of 12 km from the monitoring site S_2. This monitoring site represents the water quality of this river after urban discharges from the city of Gjilan and reflects the pollution caused by discharges from the milk processing industry, oils, fruits as well as agricultural activities. Also, significant pollution is caused by the presence of the regional landfill of Gjilan, located in the village of Velekincë, not far from the course of the monitored river. See Fig. 2 for this.

S_4- represents the waters in the lower part of the monitored river in the village of Korminjan, at a distance of 13.5km from the monitoring site S_3. This monitoring site represents the cross-border point that separates Kosovo from Serbia. In addition to rural discharges, these waters, through the Curved River (Marec River) as a result of mining activities caused by the Artana Mine and the presence of industrial landfills on the banks of this river, these waters are also polluted with industrial waste. Mining by its nature consumes, diverts and can seriously pollute water resources [6].

Fig. 2. Position of the regional waste disposal lagoon of Gjilan-Veleknica village.

Such a polluting situation of the waters of the Morava e Binça river has motivated us to investigate the ecological status of this river through physicochemical parameters, such as pH, OT, BOD_5, COD, N- NH_4, NO_3^-, NT, PO_4 -P, PT. The use of such indicators is very important, especially when assessing the ecological status of the riverbed and its evolution over time [7], [8].

During the research work, we have relied on some standard methods related to surface water quality, which have to do with the way of sampling, transport, and the duration of the sample stay before chemical analysis: ISO-6 [9], ISO-1 [10] and ISO-3 [11]. The determination of Physico-chemical parameters was done by the analysis laboratory of KHMI (Hydrometeorological Institute of Kosovo), applying the following methods: ISO 10523: 2008 (pH value); ISO 5814: 2012 (dissolved oxygen DO); ISO 5815-2: 2003 (Biochemical oxygen consumption BOD_5); ISO 15705: 2002 (Chemical Oxygen Demand COD); ISO 7150-1: 1984 (NH_4^+ ammonia ion); DIN 38405-9: 2011 (nitrate NO_3^-); ISO 11905-1: 1997 (Nitrogen Total NT); ISO 6878: 2004 (Phosphate ion (PO_4^{3-}); ISO 6878: 2004 (Total phosphorus).

Regarding the analysis and determination of the degree of concentration of heavy metals, such as Cr, Cd, Ni, Zn, Mn, Cu, Fe, and Pb, we have preserved the water samples under the APHA conservation procedure [12]. While the extraction of these metals from aqueous samples we have based on the mineralization method EPA 3015A [13], the degree of concentration of these metals, we have determined in correlation with the standard method EPA 6020A [14].

III. RESULTS AND DISCUSSION

After sampling and analysis, based on sampling sites and seasons of the year, as well as always starting to assess the ecological status and water quality of the river Morava e Binçës, for Physico-chemical parameters: pH, DO, BOD_5, COD, N-NH_4, NO_3, TN, PO_4-P, TP, the state reflected in Table II, is presented as follows: At the sampling site S_1 (above the village of Korbuliq). In addition to the winter season, in all other seasons of the year we have encountered poor ecological status. Exceeding the reference values of

physicochemical parameters (DO, BOD, COD, N-NH_4, NO_3, TN, and TP) in this sampling site, can not be explained otherwise, except as a result of agricultural and livestock activity, because the lack of such activity during the winter period reflects the moderate (Md^{**}) ecological status.

Table II Results of Physico-chemical parameters (mg/L), according to sampling sites and seasons of the year, and assessment of the ecological status of the river Morava e Binçës. The Physico-chemical parameters graphically depending on the seasons of the year are shown in Fig. 3-5.

TABLE II: RESULTS OF PHYSICO-CHEMICAL PARAMETERS (MG / L), ACCORDING TO SAMPLING SITES AND SEASONS OF THE YEAR, AND ASSESSMENT OF THE ECOLOGICAL STATUS OF THE RIVER MORAVA E BINÇËS

Sampling site	pH	DO	BOD_5	COD	N-NH_4	NO_3	TN	$P0_4$-P	TP	Final Classification
Methods standard	ISO10523: 2008	ISO5814: 2012	ISO5815-2: 2003	ISO15705: 2002	ISO7150-1: 1984	DIN38405-9: 2011	ISO11905-1: 1997	ISO6878: 2004	ISO6878: 2004	
Winter Season, 18.02.2021										
S_1	8.15*	7.29**	0.9*	2.3*	0.085*	1.13*	0.428*	0.046*	0.079*	Md**
S_2	8.15*	8.90*	24.2***	74.7***	0.939***	3.1***	2.263**	0.793***	0.935***	P***
S_3	8.34*	8.63*	19.0***	43.3***	1.134***	3.5***	2.375**	1.173***	0.916***	P***
S_4	8.51*	8.61*	27.4***	79.4***	0.855***	3.5***	2.425**	0.567***	0.953***	P***
Spring Season, 21.05.2021										
S_1	8.13*	5.98***	1.55**	3.61*	0.144**	5.97***	1.589*	0.031*	0.111**	P***
S_2	8.09*	5.61***	34.5***	43.2***	2.329***	4.8***	4.230***	0.060**	0.985***	P***
S_3	8.24*	5.68***	31.0***	40.7***	2.636***	4.2***	4.246***	0.022*	0.876***	P***
S_4	8.29*	7.46**	30.7***	40.0***	2.371***	7.1***	2.425**	0.031*	0.869***	P***
Summer Season, 20.08.2021										
S_2	8.40*	8.36*	5.67***	7.83***	0.259***	2.16**	0.968*	0.012*	0.222***	P***
S_2	8.65*	5.80***	26.9***	33.9***	2.035***	0.85*	2.780**	0.502***	0.939***	P***
S_3	8.19*	5.79***	46.0***	110.2***	1.039***	9.4***	4.718***	1.501***	1.777***	P***
S_4	8.41*	7.41**	59.4***	159.8***	1.638***	10.37***	2.425**	1.663***	2.205***	P***
Autumn Season, 22.11.2021										
S_1	8.38*	6.94***	2.2**	4.7**	0.274***	17.61***	4.361***	0.039*	0.136**	P***
S_2	8.22*	8.50*	42.9***	75.8***	0.064*	1.3*	2.938**	0.636***	2.33***	P***
S_3	8.36*	6.10***	59.7***	116.6***	0.428***	4.5***	5.016***	2.354***	4.033***	P***
S_4	8.52*	2.85***	64.5***	121.0***	0.097*	3.8***	2.425**	1.404***	2.263***	P***

MESP-AI 16/2017 - Administrative Instruction "Classification of Surface Water Bodies" Explanations: status: pH; DO– |Dissolved Oxygen; BOD5 – five-day Biological Oxygen Demand; COD – Chemical Oxygen Demand; N-NH4-ammonia, NO_3-nitrates, TN – Total Nitrogen; $P0_4$-P-phophates TP – Total phosphorus. G* – good ; Md** – moderate ; P*** – poor .

TABEL III: PHYSICO-CHEMICAL PARAMETERS FOR DETERMINING THE ECOLOGICAL STATUS OF RIVERS IN MG/LMESP-AI 16/2017

Type*	Status	pH	DO	BOD_5	COD	NH_4-N	NO_3	NT	PO_4-P	TP
	G	7,0 - 8,6	> 8,0	< 1,50	< 4,0	< 0,10	< 1,50	< 2,0	< 0,05	< 0,09
T_1	Md	< 7.0; > 9.0	8.0 – 7.0	1.50 – 5.00	4.0 – 7.0	0.10 – 0.20	1.50 – 3.00	2.0 – 3.5	0.05 – 0.10	0.09 – 0.15
	P	< 7.0; > 9.0	7.0 – 5.0	5.00 – 6.00	7.0 – 12.0	0.20 – 0.80	3.00 – 6.00	3.5 – 10.0	0.10 – 0.20	0.15 – 0.30
	G	7.0 - 8,6	> 7.0	< 4.0	< 4.0	< 0.10	< 1.00	< 1.5	< 0.05	< 0.10
T_2	Md	<7.0 >9.0	7.0 – 6.0	4.0 – 6.0	4.0 – 7.0	0.10 – 0.25	1.00 – 2.00	1.5 – 3.0	0.05 – 0.10	0.10 – 0.20
	P	<7.0 >9.0	6.0 – 5.0	6.0 – 8.0	7.0 – 12.0	0.25 – 0.70	2.00 – 5.00	3.0 – 10.0	0.10 – 0.20	0.20- 0.40

Administrative Instruction "Classification of Surface Water Bodies"; Type*:T_1 - Small Mountain River and Medium River; T_2 - Small, medium and large Lendin River; Status G-good, Md-moderate, P-poor.

Sampling site S_2 (a suburb of Kllokot settlement) - reflects the waters of the river Morava e Binçës polluted by large sanitary and urban discharges of these two settlements Kllokot (two thermal baths) of Viti, by the galvanizing and zinc industry, concrete processing and activity agricultural. Such a polluting situation of the waters of this river, based on Physico-chemical parameters, reflects a poor ecological status in all four seasons of the year.

S_3 (Morava e Binçës in Uglare -Table results, based on Physico-chemical parameters, reflect poor ecological status in all seasons. This situation has occurred as a result of pollution of these waters from urban discharges, the food industry, agricultural activities, and regional landfill, with urban waste, located near Gjilan.

S_4- Morava e Binçës, the lower part of the river in the village of Korminjan, Kosovo-Serbia border. In this sampling site, in all seasons of the year, except for the presence of a small number of heavy metals, the tabular results reflect pollution with Physico-chemical parameters therefore, the waters of this river are classified with poor ecological status. However, more pronounced pollution, in this sampling site, we encountered COD (159.8mg/L) during the summer season, while BOD_5 at the level of 64.5mg/L.

It is known that high concentrations of BOD_5 create anaerobic conditions in aquatic environments in which living things cannot exist.

Testing of all chemical indicators of water quality is very rarely justified for economic and practical reasons, so in practice, only a few characteristics are tested that give a general answer to the question of water quality, ie indicate in which direction Research is ongoing [15], [16].

Therefore, for determining the ecological status of the waters of the river Morava e Binçës, based on Physico-chemical parameters, we relied on the Administrative Instruction, which deals with the Classification of Water and Surface Bodies of Kosovo - MESP-AI 16/2017 [17],

Appendix 4, Table IV (Table III) of this appendix, which is based on the parametric values for determining the ecological status of rivers, and for this reason we have analyzed only the parameters that are provided in this instruction.

As in the case of determining the ecological status, in terms of the degree of concentration of heavy metals in the

waters of the river Morava e Binçës, we have presented the representative results in Table IV.

We have compared the same results with the reference values of the Legislative Decree of Kosovo, of 1999, with no. 15232, relating to the Provision for the Protection of Waters against Pollution, which is in agreement with Directive 91/271/EEC on the treatment of urban wastewater [18].

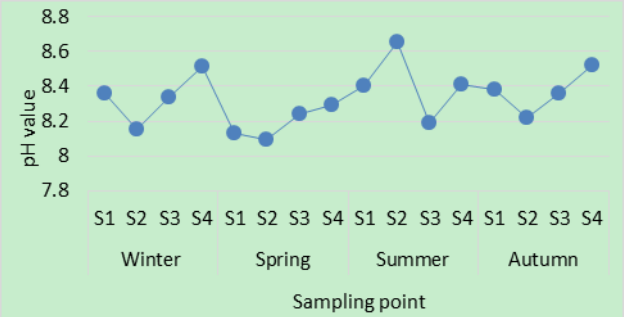

Fig. 3. pH values according to sampling points.

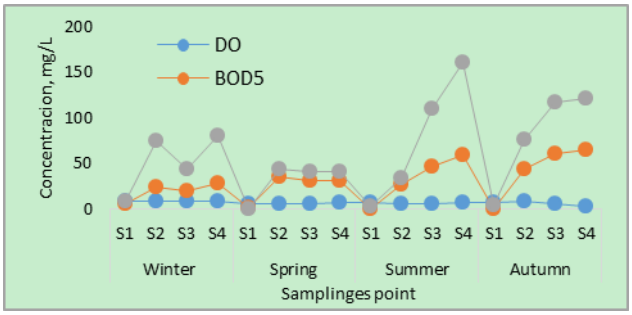

Fig. 4. DO, BOD_5, COD concentration according to sampling point.

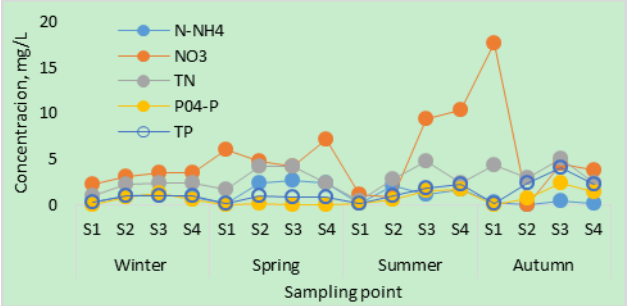

Fig. 5. $N–NH_4$, NO_3^-, TN, $PO_4–P$, TP concentration according to sampling points.

To have accurate information regarding the water quality of the Morava e Binçës River, we have also considered it reasonable to research, determine and record the presence or absence of heavy metals in the waters of this river.

Exposure to heavy metals in the environment may cause a decrease in microbial α-diversity [19]-[21].

During the analytical process, for all seasons of the year, we have researched these heavy metals: Cr, Cd, Ni, Zn, Mn, Cu, Fe, and Pb.

The results shown in Table IV and reflected in diagrams, Fig. 6-13, result as follows:

The concentration of Cr in all sampling sites varies from season to season, but in all cases, the concentration of this metal remains within the reference values (Fig. 6).

Meanwhile, the concentration of Cd during the winter and spring seasons, although with a small fluctuation, remains within the allowed limits. In the summer season, the representative results reflect exceeding the reference values in all sampling sites, where the level of concentration of this metal varies from 0.006-0.009 mg/L. While, in the autumn season, in sampling site S_2, the concentration beyond the reference values with this metal reaches the level of 0.007 mg/L, while in S_3 the exceeding of the reference values is much more pronounced and reaches the level of 0.090 mg/L, see for this Fig. 8.

When cadmium enters the body, it is accumulated in the kidneys and can cause problems such as kidney dysfunction. Brittle bones, lung cancer, and acute pneumonia are other health effects that arise from cadmium exposure [22], [23].

Ni, except for the winter season, where there are no concentration fluctuations, in all other seasons, the concentration varies with low changes, but always in all seasons and sampling sites, it results within the reference values (see Fig. 8). The situation with the concentration of Zn, although with petite differences and fluctuations from sampling site to sampling site and from season to season, also correlates with the reference values (see Fig. 9).

As with Cd and Mn, only in the summer season, we encounter an exceedance of the reference values in sampling sites S_2, S_3, and S_4, at the level of 0.051-0.052 mg/L. While in other seasons, in all the sampling sites, the concentration of Mn is within the range of the reference values, see Fig. 10 for this.

The common presence of Mn in water according to [24], [25] determines the proper functioning of many cell enzymes, whereas the exceeding of referring values with Mn causes negative health effects such as muscle weakening, sensory problems, and inappropriate testosterone levels. One of the most worrisome problems, which arises in recent years and which concerns humanity in general, is the contamination with the heavy metals of aquatic environments, as these metals fail to disintegrate, and most of them have toxic effects on living organisms [8], [26].

The presence of Cu, as in all seasons, as in all sampling sites, results in an unchanged concentration, at a value of 0.001 mg/L, which means that this metal is within the reference values (Fig. 11).

Even the presence of Fe in the waters of the Morave e Binçës River, as in all sampling sites and seasons of the year, appears with small fluctuations, but within the allowed limits (Fig. 12).

Like Cu and Pb, in all sampling locations and seasons, and years, it appears with the same and unchanging concentration, at a value of 0.001 mg/L, that is, it stays within the allowed limits (Fig. 13).

The presence beyond the reference values in the waters of this river of Cd and Mn, we think has occurred as a result of urban and industrial discharges and perhaps also from chemicals used in agriculture.

It is known that heavy metals in water dissolve quickly and then sink to the bottom of riverbeds as carbonates, sulfates, and sulfides that are less soluble [27], [28], and due to their high toxicity can cause serious consequences for human health, and for this reason, their presence must be always kept under control [29].

The concentration beyond the reference values, during the summer and autumn seasons, with OT, BOD_5, COD, $N-NH_4$, NO_3^-, NT, PO_4-P, TP, and with heavy metals Cd and Mn, we

conclude that it happened as a result of rainfall few and drought, which has also directly reflected in the drop (decrease) in the water level of the Morava e Binça river. Now, it is known that the lower the amount of water, the higher the concentration of pollutants and vice versa, therefore we find that such a phenomenon has also happened with the waters of this river.

In Kosovo, due to the economic circumstances, the treatment of urban and industrial discharges is in the initial phase of implementation. Therefore, in most cases, except for self-purification occurs during the late autumn, winter, and spring seasons, river waters are discharged untreated into basins. This directly affects the depletion of freshwater reserves. The increasing demand for freshwater has prompted rapid developments in wastewater management by instilling water recycling and reuse [30]-[32]. Recycling wastewater and making it fit for consumption requires competent methods for the removal of emerging contaminants (ECs) [32].

TABLE IV: THE CONCENTRATION OF HEAVY METALS (MG/L), BY SAMPLING SITES AND SEASONS OF THE YEAR, IN THE RIVER MORAVA BINÇA

Sampling site	Cr	Cd	Ni	Zn	Mn	Cu	Fe	Pb
Methods standard	EPA 6020A	EPA 6020A	EPA 6020A	EPA 6020A	EPA 6020A	EPA 6020A	EPA 6020A	EPA 6020A
Reference value	0.05	0.005	0.02	3	0.05	1	0.2	0.01
Winter Season, 18.02.2021								
S_1	0.001	0.001	0.001	0.011	0.029	0.001	0.022	0.001
S_2	0.004	0.001	0.001	0.014	0.040	0.001	0.027	0.001
S_3	0.004	0.001	0.001	0.017	0.041	0.001	0.027	0.001
S_4	0.004	0.001	0.001	0.013	0.041	0.001	0.029	0.001
Spring Season, 21.05.2021								
S_1	0.006	0.001	0.002	0.013	0.042	0.001	0.029	0.001
S_2	0.006	0.002	0.004	0.017	0.045	0.001	0.031	0.001
S_3	0.006	0.005	0.006	0.018	0.045	0.001	0.031	0.001
S_4	0.006	0.003	0.005	0.016	0.045	0.001	0.031	0.001
Summer Season, 20.08.2021								
S_1	0.008	0.006	0.001	0.019	0.048	0.001	0.029	0.001
S_2	0.008	0.009	0.010	0.020	0.051	0.001	0.031	0.001
S_3	0.009	0.009	0.011	0.020	0.051	0.001	0.031	0.001
S_4	0.009	0.007	0.009	0.021	0.052	0.001	0.031	0.001
Autumn Season, 22.11.2021								
S_1	0.008	0.005	0.001	0.017	0.041	0.001	0.027	0.001
S_2	0.008	0.007	0.008	0.018	0.043	0.001	0.029	0.001
S_3	0.009	0.090	0.009	0.018	0.044	0.001	0.029	0.001
S_4	0.009	0.005	0.009	0.018	0.044	0.001	0.029	0.001

MAV-Maximum allowed values for some heavy metals in surface waters according to Legislative Decree 11 May 1999 no.152[32]. 32 LEGISLATIVE DECREE 11 MAY 1999, No. 152, Provisions on the protection of water against pollution, Directive 91/271/EEC on the treatment of urban waste water.

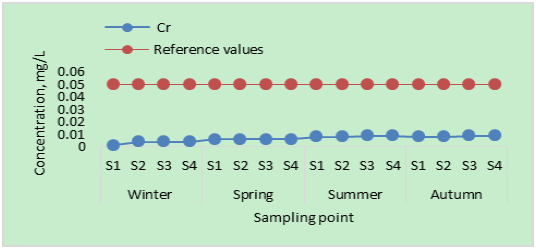

Fig. 6. Cr concentration according to sampling points.

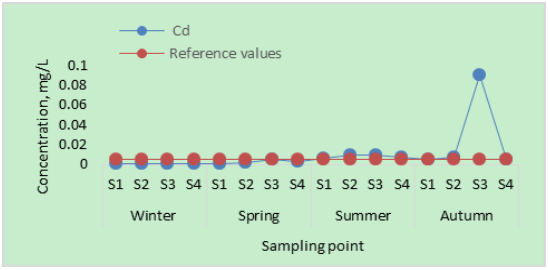

Fig. 7. Cd concentration according to sampling points.

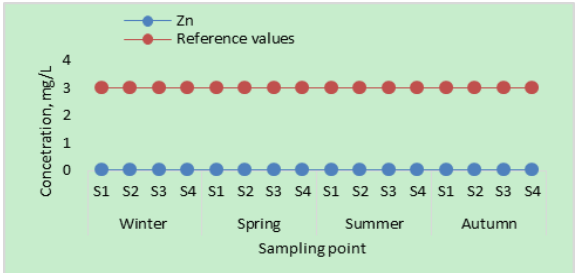

Fig. 8. Zn concentration according to sampling points.

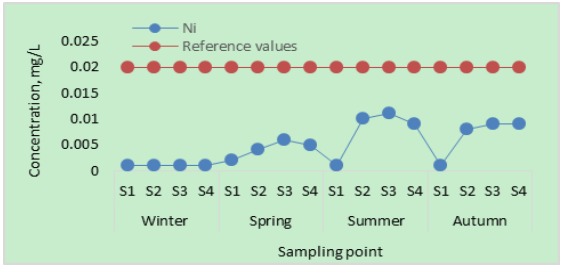

Fig. 9. Ni concentration according to sampling.

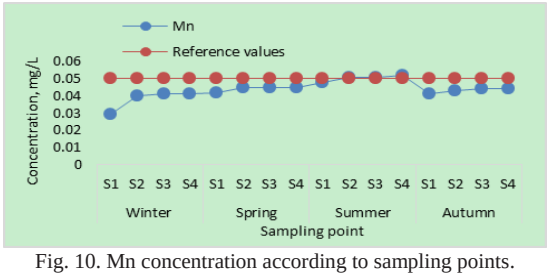

Fig. 10. Mn concentration according to sampling points.

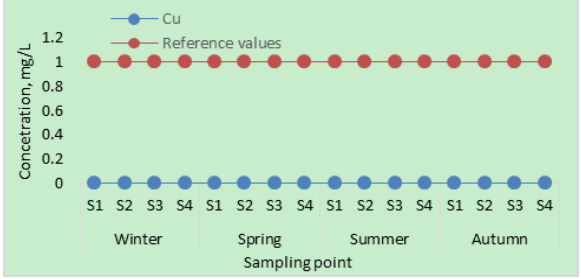

Fig. 11. Cu concentration according to sampling points.

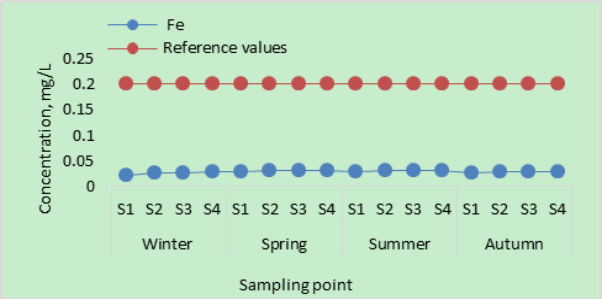

Fig. 12. Fe concentration according to sampling points.

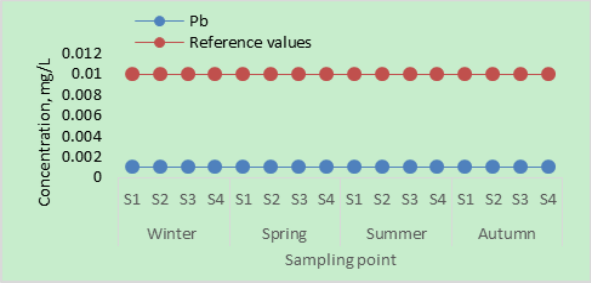

Fig. 13. Pb concentration according to sampling points.

IV. Conclusion

Like the waters of other rivers in Kosovo, the waters of the Morava e Binçës River, until the 1970s, were considered clean waters both biologically and physicochemically. However, especially after the '80s, with the increase of population, not only in rural settlements but also in cities such as Kllokot, Viti, and Gjilan, there was an increase in pollution of these waters from urban, industrial discharges and use without criteria of chemicals and agricultural preparations.

Specifically, the presence near the banks of the river Morava of Binça's and two thermal baths, then the Zn galvanizing industry, concrete processing, milk, fruit, and oil processing industries, and the presence of the Gjilan regional landfill have caused obvious pollution, not only in the waters of this river but also in the degradation of biodiversity in the whole Anamorava valley.

Therefore, to restore, to some extent, the quality of the waters of the Morava e Binça river and the biodiversity in the Anamorava valley, before the official-local institutions and other environmental institutions at the central-state level, it is laid out as a necessary need to design, project, invest and finalization of projects for the construction of plants for the purification of urban and industrial wastewater. The research and implementation of the most contemporary methods that were applied in the world; the remediation or possible removal of the pollution caused by the regional landfill and the rational use of the preparations and chemicals used on agricultural lands, which during drainage contaminate the surface waters of this river.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

All authors conducted the research; analyzed the data; wrote the paper, and all authors have approved the final version.

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