

## THE COMPARATIVE ANALYSIS REGARDING THE QUALITY OF THE RUNNING WATERS FROM THE BIHOR-HAJDU-BIHAR EUROREGION

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### Abstract

*The management of the surface running waters has as an object the water flows: streams, rivers and springs. The main preoccupation of this field is the means of modification of the water resources, in time or on territory and the quality features of the waters so that it leads to a regime or to a territorial distribution which on one hand better corresponds to the needs of the different use of water and which on the other hand reduces or even eliminates the harmful effects of the waters.*

**Key words:** polluting agents, monitoring, physical chemical features.

### INTRODUCTION

In what the water quality management is concerned, the analysis of the polluting sources can lead to efficient solutions. The radical solution is to completely eliminate the dischargement of polluting or hard degradable substances in the water. There are many cases in which products that degraded the waters had been given up and are no longer used, an example in this sense is the replacement of the non-degradable detergents (which are actually forbidden) with degradable detergents. (Kerényi, A., 1995). Still, because the number of the polluting substances is bigger and bigger, in many cases these substances only come from a reduced number of sources. These polluting substances, once discharged in the sewers they pollute bigger and bigger water quantities, even if this means a dilution, a reduction of the concentration.

The destruction of these substances imposes the treatment of the whole water quantity with processes appropriate to the respective polluting substance through a correct management, the treatments being limited to the waters that come from the polluting points (Ungureanu I., 2005). The identification of such solutions asks for a detailed analysis of the net of each polluting substance.

### MATERIAL AND METHODS

The period analyzed regarding the quality of the running waters from the Bihor-Hajdu-Bihar Euroregion had been 1970-2005. Within the work methodology we must mention that the polluting substances are not always the same in the two counties due to a different monitoring existent in the two countries and also due to the polluting units that have different features. As a consequence it had been difficult to make a parallel of all the toxic elements in the waters of the two counties due to a different monitoring and due to the lack of some of the observation data.

The physical chemical features of the river waters of the Hajdu-Bihar county are analyzed in comparison over the period between 1970 – 1990 and in the year 2000. For the Bihor county the analyzed period differs from one river to another. In this work, the monitored and analyzed polluting factors for the Euroregion were: NH<sub>4</sub> (ammonium),

NO<sub>2</sub>(nitrates), NO<sub>3</sub>(nitrates), as well as some indicators like the value of the PH, the quantity of the dissolved oxygen, etc, and beside these for some of the rivers in Bihar county other indicators and chemical polluting factors had been analyzed. We must mention that all the data in this article come from the Debrecen Environmental Protection Agency (TIKOFÉ) and from the Environmental Protection Agency in Oradea. The data had been processed with the help of the Microsoft Office – Excel and Word programmes and the essential results are presented as follows.

## RESULTS AND DISCUSSION

We shall start directly with a surface flow from the west part of the Bihar-Hajdu-Bihar Euroregion, meaning The West Sewer. As it can be noticed in fig.1, following the evolution of the water quality of the West Sewer between the localities Újtíkös and Újszentmargita a slight improvement can be seen related to the concentration of the NO<sub>2</sub> and NO<sub>3</sub>. The oxygen dissolved in the water, the NH<sub>4</sub> and the value of the pH have maintained themselves at the same values. The general quality of the waters of the West Sewer totally belongs to the degraded water flow category.

Table1

Data regarding the characteristic sections of the water way sectors

MONITORING POINTS	ÚJTÍKÖS KÖZÚTI HÍD		ÚJSZENTMARGITA	
INDICATORS/PERIOD	1970-1990	2000	1970-1990	2000
pH	7,7	7,2	7,7	7,2
DISSOLVED OXYGEN (mg/l)	9,3	6,0	9,2	7,2
NH <sub>4</sub> (mg/l)	0,3	0,6	0,3	0,6
NO <sub>2</sub> (mg/l)	0,09	0,2	0,08	0,1
NO <sub>3</sub> (mg/l)	4,9	6,9	4,9	6,8

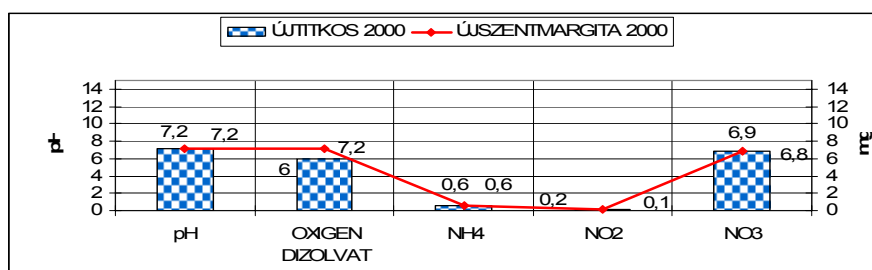


Fig. 1 The situation of the physical-chemical features of the West Sewer (Canalului Colector de Vest) between the localities Újtíkös and Újszentmargita for the year 2000

Table2

The physical-chemical features of the East Sewer

Monitoring points	TISZAVASVÁRI		BALMAZÚJVÁROS	
INDICATORS/PERIOD	1970-1990	2000	1970-1990	2000
pH	7,7	7,3	7,6	7,1
DISSOLVED OXYGEN (mg/l)	9,2	7,9	8,8	6,3
NH <sub>4</sub> (mg/l)	0,463	0,729	0,4	0,6
NO <sub>2</sub> (mg/l)	0,123	0,250	0,1	0,2
NO <sub>3</sub> (mg/l)	5,1	7,3	5,4	2

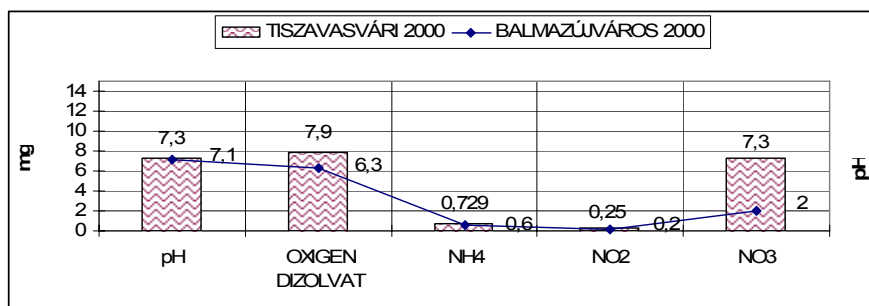


Fig. 2 The situation of the physical-chemical features of the waters of the East Sewer between the localities Tiszavasvári and Balmazújváros for the year 2000.

Following the evolution of the water quality for the East Sewer (Canalul Colector de Est) between the localities Tiszavasvári and Balmazújváros, a decrease of the dissolved oxygen in the water can be noticed for the year 2000(6,3 mg/l) in comparison with the period between 1970-1990 ( 9,2 mg/l), as well as a rise of the values of NH4 and NO2. It is also in this sewer that an improvement of the water quality can be observed from Tiszavasvári and Balmazújváros, decreasing the concentration values of the NH4, NO2 și NO3 (fig. 2). The evolution of the Hortobágy river water shows an improvement in what the Ph is concerned but an increase of the NO2, NO3 și NH4 concentration can be seen in the collecting points of the two localities (fig.3). The general quality of the Hortobágy river water belongs totally to the second category of quality (Ambrus, L., A., 2010).

Table3

The physical-chemical features of the Hortobágy river water

Monitoring points INDICATORS/PERIOD	GÖRBEHÁZA		APAVÁRA	
	1970-1990	2000	1970-1990	2000
Ph	7,6	7,2	7,6	7,2
DISSOLVED OXYGEN(mg/l)	7,6	6,2	4,7	1,3
NH4(mg/l)	2,8	4,9	3,2	5,9
NO2(mg/l)	0,3	0,8	0,3	0,7
NO3(mg/l)	5,1	8,1	9,1	4,1

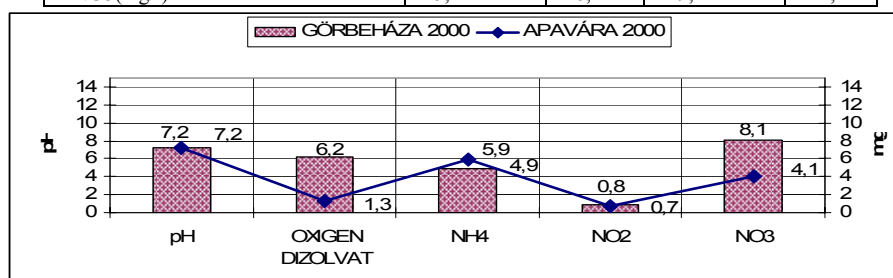


Fig. 3 The situation of the physical-chemical features of the Hortobágy river water between the localities Görbeháza and Apavára.

Comparing the values of the water quality from the Kondoros river for the period 1970-1990 and for the year 2000 (fig.4), it can be asserted that the situation of the water quality has improved at the level of the analyzed elements, like the Ph, the quantity of the dissolved oxygen and the NH4 concentration, but we must remind that, in what the NO2 and NO3 concentration values are concerned these have doubled. The cause for this is the increase of the polluting factors discharged in the river, polluting factors that come from the urban area of the Debrecen town.

Table4

The physical-chemical features of the Kondoros river water

INDICATORS/PERIOD	1970-1990	2000
pH	7,6	7,4
DISSOLVED OXYGEN(mg/l)	3,5	4,7
NH4(mg/l)	9,8	0,9
NO2(mg/l)	0,5	1,3
NO3(mg/l)	5,1	10,3

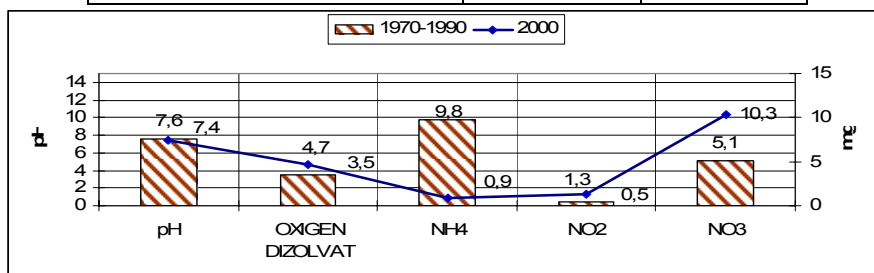


Fig. 4 The evolution of the physical-chemical features of the Kondoros river water from Debrecen between 1970-2000

The general quality of the Kondoros river water belongs to the second category of quality except the sector situated downstream Debrecen until the confluence with the Toco river which belongs to the degraded category of rivers (fig.4).

Analyzing the main water quality parameters of the Ier river at the Sălard station in bihor county (fig.5), it can be seen that the situation is a happy one for the period analyzed as an improvement can be seen for some of the analyzed elements. This improvement is due to the industrial economical restructuring and to the water purification phenomenon.

Table5

The physical-chemical features of the Ier river in Sălard

INDICATORS /PERIOD	1995	2000	2003
pH	8,2	8,3	8,2
DISSOLVED OXYGEN(mg/l)	5,8	6,5	7,2
AMMONIUM(mg/l)	5,3	0,7	0,1
PHENOL(μg/l)	0,007	0,009	0,007
DETERGENTS(mg/l)	-	-	-
ZINC(mg/l)	-	-	0,013
LEAD(mg/l)	-	-	0,003
IRON(mg/l)	0,6	0,11	0,26

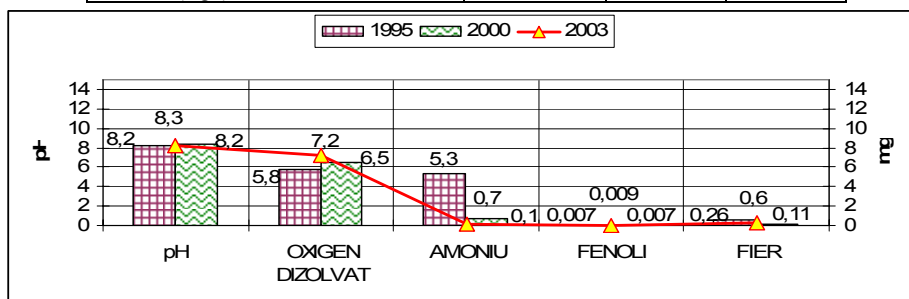


Fig 5. The evolution of the Ier river water quality in Sălard

The quality of the Barcău river water had been analyzed for the year 2000 with the help of the three hydrometric stations which are situated in Suplacu de Barcău, Marghita and Berettyóújfalu (fig. 6). During the same year, from the spring of the river to its shedding we have noticed the following: a decrease of the Ph, and a fluctuation of the quantity of the dissolved oxygen with the lowest values in Marghita and then its value was three times bigger in Berettyóújfalu.

Table6

Physical-chemical features of the Barcău river water

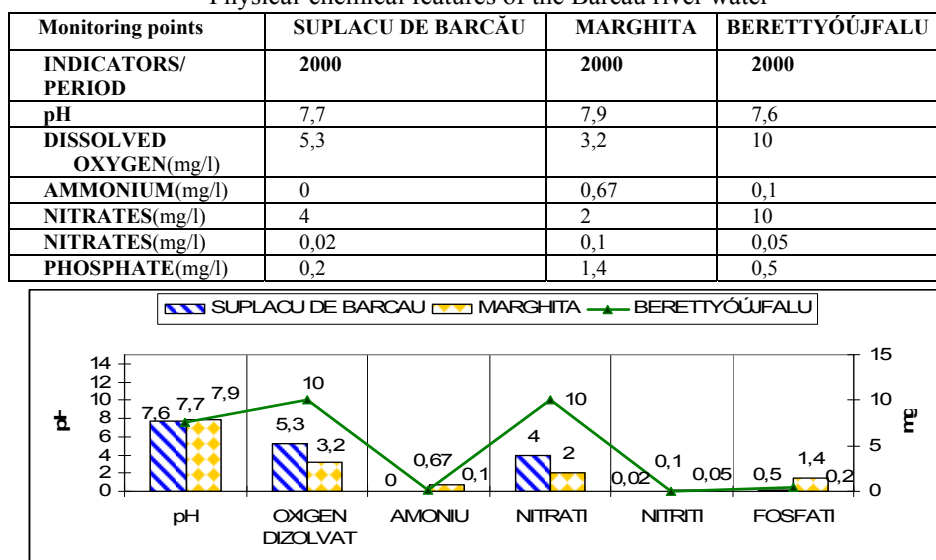


Fig 6. The situation of the physical-chemical features of the Barcău river water from upstream till downstream in the year 2000

Considerable quantities of ammonium and of phosphate appear only in Marghita locality, the nitrates show a significant increase to the west part due to the extension of the agricultural fields for which chemical fertilizers are used. The general quality of the Barcău river water belongs to the second category downstream Marghita but upstream Marghita we have a degraded flow due to the oil discharges.

In the Crișul Repede underregion the pollution sources are represented by the following localities: Aleșd, Tileagd, Oradea from where chemical products, anorganic pigments, halogen alkyl and different oils reach the river water. Except the presented polluting factors ( like lead, ammonium, and zinc which shows a decrease tendency) another polluting agent is the temperature as a natural source (the Peta stream with a geothermal provider) as well as an entropic source caused by the flows of the cooling waters from the Oradea central heat plant CET I which determines a heat regime of the river with at least 7°...12°Celsius degrees higher than normally. It is interesting that self purification processes accelerate all year long due to the rise of the temperature and in winter time the heated water prevents the appearance of ice and allows the maintainance of a bigger number of aquatic species than in the rest of the waters (Măhăra Gh. and colab., 1999).

The used waters make the waters downstream Oradea belong to the second category of quality.

Table7

The physical-chemical features of the Crişul Negru river

MONITORING POINTS	CĂRPINET		ZERIND	
INDICATORS /PERIOD	1995	2003	1995	2003
pH	7,6	8.1	8	8.1
DISSOLVED OXYGEN(mg/l)	10.4	10.8	10.7	10.4
REZ. FIX(mg/l)	89.3	87.3	198.9	201.6
CHLORIDE(mg/l)	7.6	3.2	11.8	8.09
SULPHATE(mg/l)	14.8	10.3	21.8	20.52
AMMONIUM(mg/l)	0.1	0.002	0.28	0.03
NITRATE(mg/l)	0.01	0.01	0.05	0.03
NITRATE(mg/l)	4.4	3.4	6.3	4.52
CYANIDE(mg/l)	-	-	0.001	0.0005
PHENOL(µg/l)	0.005	0.003	0.005	0.004
S.EXTRA. (mg/l)			0.43	0.001
IRON(mg/l)	0.1	0.12	0.22	0.24
PHOSPHORUS(mg/l)	-	0.028	-	0.03
MANGANESE(mg/l)	-	0.03	-	0.02
LEAD(mg/l)	0.004	0.003	0.006	0.003
ZINC(mg/l)	0.01	0.018	0.012	0.019

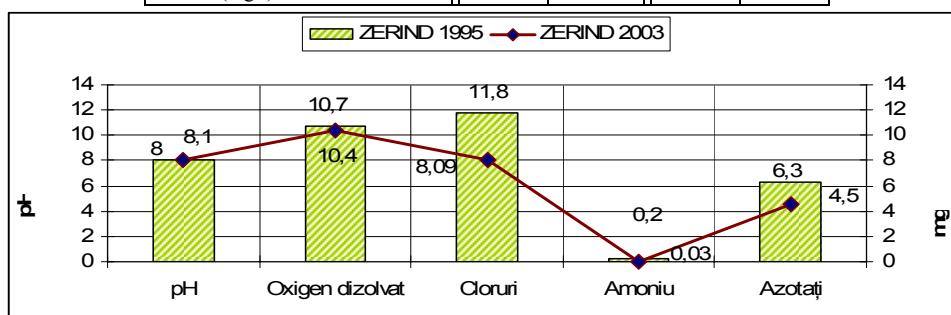


Fig.7. Some physical-chemical features of the Crişul Negru river in Zerind

Observing the quality of the Crişul Negru river water between the Cărpinet and Zerind localities between 1995-2003 (fig.7), the following can be noticed: the pH of the waters in both localities shows an increase, the quantity of the dissolved oxygen is decreasing from the spring to the shedding, the stable waste, the sulphate, the ammonium, the nitrates, the cyanide and the iron double in town and the chloride show a tendency to decrease.

## CONCLUSIONS

As a conclusion we can assert that the estate of the surface waters from the Bihor-Hajdú-Bihar Euroregion is a resembling one in the two counties, existing similar pollution sources coming from the existing industry, from the local management and from agriculture. The environment polluting factors, with small exception do not exceed the

standards imposed by the law. In order to improve some unpleasant situations it would be recommended that the sources of water pollution be analyzed, analysis which may lead to efficient solutions. The radical solution is to completely extinguish the dischargement of polluting or hard degradable substances in the waters and to have a controlled, periodic monitoring like a border collaboration related to this problem, a fact which is currently on going.

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