

CONSIDERATIONS ON THE EVOLUTION OF ECOLOGICAL STATUS OF THE CIOBANUS AND UZ RIVERS

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Key words: *Ciobănuș and Uz rivers, physico-chemical indicators, water quality*

INTRODUCTION

Globally, water is a limited resource, which requires tackling the issues related to it so as to ensure water resources for future generations

Romania's main strategic objective in the field of water is related to European integration, which implies the harmonization and implementation of the acquis communautaire in the field of water quality protection.

The Ciobănuș and Uz rivers are right tributaries of the Trotuș River in the mountain range. Trotuș is a river in eastern Romania that springs from the Ciuc Mountains and flows into the Siret River. It goes through 3 counties: Harghita, Bacău and Vrancea. It has a length of 162 km.

Trotuș hydrographical basin has a rich surface water resource, especially in its upper and medium settlers. It has an area of 4456 km and an average altitude of 706 m, is the area on which this river together with all its tributaries is fed from rainwater, and underground sources.

At the Siret discharge, the average flow of the Trotuș River is 36.0 mc/s. In the Trotuș basin, the waters are spread differently in relation to relief forms, their lithological structure and climate. They are divided into three main categories: running waters, underground waters and lakes.

The Ciobănuș River, the Ciobănuș-Ciobănuș control section, is characterized by: abiotic type: Ro05a, geology: silicon, area 132 km², altitude: 465 m, slope: 24 ‰, average monthly specific annual flow with 95% insurance Q_{95%}: 0.009, bed structure of the bed: boulder, gravel, sand.

The Uz River, the upstream section of the Poiana Uzului lake, is characterized by: abiotic type: Ro04a, geology: silicon, surface: 157 km², altitude: 1090 m, slope: 19 ‰, specific multi-annual Q_m flow rate: 1.70 m³ / s, specific minimum monthly average with 95% insurance Q_{95%}: 0.36 m³ / s, bed structure of the bed: boulder, gravel, sand.

The Uz River, the downstream section of the Poiana Uzului lake, is characterized by: abiotic type: Ro04a, geology: silicon, area: 421 km², altitude:

1026 m, slope: 17 ‰, specific multi-annual Q_m flow rate: 1.70 m³ / s, average annual minimum monthly with 95% insurance Q_{95%}: 0.44 m³ / s, bed structure of the bed: boulder, gravel, sand.

MATERIAL AND METHODS

Data on surface water pollution levels were obtained from laboratory determinations carried out with the support of the Romanian Water Company through the Siret Water Directorate, Bacău, Romania.

The control sections for the three rivers studied were: Ciobănuș-Ciobănuș, upstream Lake Poiana Uzului, Poiana Uzului downstream and Slănic upstream.

Taking into account the variations in the physical and chemical indicators of the water (thermal regime and pH oxygen regime, nutrients, salinity, toxic pollutants and other relevant chemical indicators), in the study sections, at the time of collection, according to ORDIN No. 161 of 16.02.2006 (table1), some assessments have been made on the ecological status of the Slănic, Ciobănuș and Uz.

The quality classes were established according to table 2 and the calculation formula. The investigations were carried out in two stages: the first stage took place during the years 2003-2008, for the Ciobănuș and Uz rivers, and the second stage took place in 2014 when the Slănic, Ciobănuș and Uz rivers were monitored. The results were recorded in the tables as follows.

RESULTS AND DISCUSSIONS

Ciobănuș River, the Ciobănuș-Ciobănuș section. For the 2003-2008 study period, the physico-chemical parameters of the water are recorded in Table 3, and the classification of the section into the water quality classes in Table 4 (Cf ORDER No. 161 of 16.02.2006).

Table 1. Elements and standards of chemical and physico-chemical quality in water

No.	Quality indicator	U/M	Quality class				
			I	II	III	IV	V
Thermal regime and acidification							
1	Temperature	°C	Does not adjust				
2	pH		6.5 – 8.5				
The oxygen regime							
1	Oxygen dissolved	mg O ₂ /l	9	7	5	4	<4
2	CBO ₅	mg O ₂ /l	3	5	7	20	>20
3	CCO-Cr	mg O ₂ /l	10	25	50	125	>125
Nutrients							
1	Ammonium (N-NH ₄ ⁺)	mg N/l	0.4	0.8	1,2	3.2	>3.2
2	Azotti (N-NO ₂ ⁻)	mg N/l	0.01	0.03	0.06	0.3	>0.3
3	Nitrogen (N-NO ₃ ⁻)	mg N/l	1	3	5,6	11,2	>11,2
4	Orthophosphate soluble (P-PO ₄ ³⁻)	mg P/l	0.1	0.2	0.4	0.19	>0.19
Salinity							
1	Chlorides (Cl ⁻)	mg/l	25	50	250	300	>300
2	Sulfates (SO ₄ ²⁻)	mg/l	60	120	250	300	>300
3	Calcium (Ca ²⁺)	mg/l	50	100	200	300	>300
4	Magnesium (Mg ²⁺)	mg/l	12	50	100	200	>200
5	Sodium (Na ⁺)	mg/l	25	50	100	200	>200
Specific toxic pollutants of natural origin							
1	Total chromium (Cr ³⁺ + Cr ⁶⁺)	µg/l	25	50	100	250	>250
2	Copper (Cu ²⁺) ⁵	µg/l	20	30	50	100	>100
3	Zinc (Zn ²⁺)	µg/l	100	200	500	1000	>1000
4	Lead (Pb) ⁶	µg/l	5	10	25	50	>50
5	Cadmium (Cd)	µg/l	0.5	1	2	5	>5
6	Total iron (Fe ²⁺ + Fe ³⁺)	mg/l	0.3	0.5	1.0	2	>2
7	Total manganese (Mn ²⁺ + Mn ⁷⁺)	mg/l	0.05	0.1	0.3	1	>1
Other relevant chemical indicators.							
1	Total phenols (phenolic index)	µg/l	1	5	20	50	>50
2	Active anionic detergents	µg/l	100	200	300	500	>500

According to the MINISTRY OF ENVIRONMENT AND WATER MANAGEMENT, ORDINANCE no. 161 of 16.02.2006.

Table 2. Criteria for assessment of surface water quality according to IPA

Water quality class	IPA	IPA changes to determine the quality of water quality, %
I – very clean	0.2	100
II – clean	0.2 – 1	50
III – moderately polluted	1 – 2	30
IV – degraded	2 – 4	25
V – polluted	4 – 6	20
VI – very polluted	6 – 10	15
VII – extremely polluted	10 >	

IPA is appreciated by 7 classes. Calculation of the IPA value is achieved after a fixed number of parameters (6): ammonium nitrogen, nitrogen nitrate, petroleum products, phenols, dissolved oxygen and biochemical oxygen consumption at 5 days. IPA is calculated according to the formula:

$$IPA = \frac{Ci}{CMAi/6}$$

where:

Ci - the average concentration of parameters;

CMAi - maximum allowable concentration of parameters;

6 - number of parameters taken into account

Table 3. Physical and chemical parameters of the water in section Ciobănuș - Ciobănuș

Date of harvest		28.05	18.09	3.11	31.05	4.07	18.10	29.05	27.09	6.06	1.08	19.09	30.07
Year		2003	2003	2003	2005	2005	2005	2006	2006	2007	2007	2007	2008
Physical indicators													
Temperature (T°)		20	15	8	18	20	16	15	16	16	22	10	22
pH		8,4	7	7,4	7,8	7,8	7,9	8,2	8,1	8	8,1	8,1	7,8
The oxygen regime													
Dissolved O ₂	mg/l	8,8	10,1	11,2	8,3	8	8,8	9,6	9,1	9,8	8,3	11,3	8,4
CBO ₅	mg/l	-	-	-	2,2	1,4	1,4	1,9	5,2	1,7	1,3	3,1	3,8
CCOCr	mg/l	-	-	-	16,2	8	8	7	6	9,9	7	4,8	10,1
Nutrients													
Nitrates	mg/l	0,2	0,7	0,3	1,3	0,9	0,7	0,4	0,2	0,5	0,5	0,2	0,3
Nitrites	mg/l	0,003	0,003	0,005	0,027	0,009	0,009	0,003	0,008	0	0,003	0	0,01
Ammonium	mg/l	0,05	0,13	0,11	0,824	0,423	0,202	0,2	0,1	0	0,07	0	0,02
Orthophosphate	mg/l	0,02	0,11	0,01	0,12	0,8	0,06	0,11	0,02	0	0,006	0,001	0,05
General salinity ions													
Na ⁺	mg/l	6	15	23	42	32	14	5	20	13	9	20	3
Ca ²⁺	mg/l	59	59	55	47	46	46,6	36,8	17,9	37,2	41	39,5	55,5
Mg ²⁺	mg/l	5,7	6,7	3,7	10,5	21,8	14	17,5	23,8	14,5	14,1	13,9	9
Total iron	mg/l	0,17	0,01	0,01	0,05	0,02	0,02	0,3	1,14	0	0,06	0	0,1
Total Manganese	mg/l	-	-	-	-	-	0,005	0	0	-	0,01	-	0,06
Chlorides	mg/l	7	9	11	3,1	9,3	9,2	5,7	3	5	10,8	7,4	6,7
Sulfates	mg/l	37	42	39	92	53	32	40	50	3,6	35	29	35
Organic toxic substances													
Phenols	μg/l	abs	abs	abs	-	-	-	-	-	-	-	-	-
Active anionic detergents	μg/l	abs	abs	abs	-	-	-	-	-	-	-	-	-
Metals													
Zn ²⁺	μg/l	abs	abs	abs	-	-	30,1	1,8	2,16	-	-	-	-
Cu ²⁺	μg/l	abs	abs	abs	-	-	1,6	10,2	8,9	-	-	-	-
Cr total	μg/l	abs	abs	abs	-	-	1,56	9,3	8,3	-	-	-	-
Pb ²⁺	μg/l	abs	abs	abs	-	-	-	-	-	-	-	-	-
Cd ²⁺	μg/l	abs	abs	abs	-	-	-	-	-	-	-	-	-

Table 4. The framing of the Ciobănuș - Ciobănuș section in the water quality classes
(Cf. ORDIN No. 161 of 16.02.2006)

Parameter	Classification in Quality Classes				
	2003	2005	2006	2007	2008
Dissolved oxygen	II	I	I	I	I
CBO ₅	I	I	III	I	II
CCOCr	I	II	I	I	I
Nitrates	I	I	I	I	I
Nitrites	I	I	I	I	I
Ammonium	I	I	I	I	I
Orthophosphate	I	I	I	I	I
Na ⁺	I	II	I	I	I
Ca ²⁺	I	I	I	I	I
Mg ²⁺	I	I	I	I	I
Total iron	I	I	I	I	I
Total Manganese	I	I	I	I	I
Chlorides	I	I	I	I	I
Sulfates	I	I	I	I	I
Phenols	I	I	I	I	I
Active anionic detergents	I	I	I	I	I
Zn ²⁺	I	I	I	I	I
Cu ²⁺	I	I	I	I	I
Cr total	I	I	I	I	I
Pb ²⁺	I	I	I	I	I
Cd ²⁺	I	I	I	I	I

In 2003, the control section was ranked in the first quality class, with the exception of the dissolved oxygen parameter (cl II).

In 2005, the control section was ranked in the first quality class, with the exception of the COCr and Na + (cl II) parameters.

In 2006, the control section was in the first quality class, exceeding the parameter: CBO5 (class III). In 2007, the control section was in the first quality class, all the parameters are in the first quality class.

In 2008, the control section was in the first quality class, with the exception of the parameter: CBO5 (cl II).

The Ciobănuș-Ciobănuș control section was in the first quality class. As far as the group of hazardous substances - priority hazardous substances from the laboratory analyzes were concerned, there were no exceedances, but the metals were found in low concentrations: zinc, copper and chromium.

Uz River - upstream Lake Poiana Uzului. For the 2003-2008 study period, the physico-chemical parameters of the water are recorded in Table 5, and the classification of the section into the water quality classes in Table 6 (Cf ORDER No. 161 of 16.02.2006).

In 2003, the control section was ranked in the first quality class, with the exception of the dissolved oxygen parameter (cl II).

In 2005, the control section was in the first quality class, with the exception of the orthophosphate (cl II) parameter.

In 2006, the control section was classified as quality I, with the exception of CCoCr and Fe total (cl II).

In 2007, the control section was classified as quality I, with the exception of the dissolved oxygen (cl II) parameter.

The control section was ranked in the first quality. Concerning the group of dangerous substances - priority hazardous according to the laboratory analyzes, there were no exceedances, but the metals were found in low concentrations: zinc, copper and chromium.

Uz section downstream of the Poiana Uzului lake. For the 2003-2008 study period, the physico-chemical parameters of the water are recorded in Table 7, and the classification of the section into the water quality classes in Table 8 (Cf ORDER No. 161 of 16.02.2006).

Table 5. Physical and chemical parameters of the water in the section Uz river - upstream Lake Poiana Uzului

Date of harvest		6.05	1.07	28.10	22.06	30.08	26.06	25.09	9.10	12.06
Year		2003	2003	2003	2005	2005	2006	2006	2007	2008
Physical indicators										
Temperature (T°)		12	15	5	19	21	22	19	10	17
pH		6,7	8,5	7	8,2	7,9	7,9	8,1	8,2	7,8
The oxygen regime										
Dissolved oxygen	mg O/l	10,3	8,6	9,6	9,2	9,4	8,1	9,1	10,3	8,5
CBO5	mg O/l	1,5	0,5	1,1	2,3	1,3	1,9	2,3	1,6	1
CCoCr	mg O/l	-	-	-	14	6	12,6	10	4	9,7
Nutrients										
Nitrates	mg N/l	0,3	0,1	0,5	0,8	0,3	1,4	0,2	0,3	0,6
Nitrites	mg N/l	0,001	0	0,002	0,006	0,005	0,006	0,009	0,01	0,003
Ammonium	mg N/l	0,08	0,07	0,16	0,513	0,086	0,17	0,2	0,02	0
Orthophosphate	mg P/l	0,03	0,05	0,03	0,03	0,14	0,08	0,02	0,01	0,01
General salinity ions										
Na ⁺	mg/l	10	8	3	6	5	17	7	5	10
Ca ²⁺	mg/l	35,7	40,8	26,4	31,4	32,3	25,6	34,3	35,7	38,7
Mg ²⁺	mg/l	2,7	5,7	5,6	1,8	7,5	1	2,9	11,4	2,8
Total iron	mg/l	0,17	0,1	0,07	0,66	0,21	0,4	0,05	0,06	-
Total Manganese	mg/l	-	-	-	-	0,007	-	-	-	-
Chlorides	mg/l	15	7	8	0,7	5,1	3,4	2	4,7	-
Sulfates	mg/l	29	27	34	17	40	27	32,4	29	-
Organic toxic substances										
Phenols	µg/l	-	-	-	-	-	-	-	-	-
Active anionic detergents	µg/l	-	-	-	-	-	-	-	-	-
Metals										
Zn ²⁺	µg/l	-	-	-	-	10,7	-	-	-	-
Cu ²⁺	µg/l	-	-	-	-	0,04	-	-	-	-
Cr total	µg/l	-	-	-	-	0,82	-	-	-	-
Pb ²⁺	µg/l	-	-	-	-	-	-	-	-	-
Cd ²⁺	µg/l	-	-	-	-	-	-	-	-	-

Table 6. The framing the Uz river - section upstream of the Poiana Uzului lake in the water quality classes (Cf ORDIN No. 161 of 16.02.2006)

Parameter	Classification in Quality Classes			
	2003	2005	2006	2007
Dissolved oxygen	II	I	I	II
CBO5	I	I	I	I
CCOCr	I	I	II	I
Nitrates	I	I	I	I
Nitrites	I	I	I	I
Ammonium	I	I	I	I
Orthophosphate	I	II	I	I
Na ⁺	I	I	I	I
Ca ²⁺	I	I	I	I
Mg ²⁺	I	I	I	I
Total iron	I	I	II	I
Total Manganese	I	I	I	I
Chlorides	I	I	I	I
Sulfates	I	I	I	I
Phenols	I	I	I	I
Active anionic detergents	I	I	I	I
Zn ²⁺	I	I	I	I
Cu ²⁺	I	I	I	I
Cr total	I	I	I	I
Pb ²⁺	I	I	I	I
Cd ²⁺	I	I	I	I

Table 7. Physical and chemical parameters of the water in the Uz river - downstream Poiana Uzului Lake

Date of harvest		6.05	1.07	28.10	22.06	30.08	27.04	9.10
Year		2003	2003	2003	2005	2005	2006	2006
Physical indicators								
Temperature (T°)		15	6	14	11	19	10	12
pH		8,1	6,8	7	8	7,4	7,8	7,7
The oxygen regime								
Dissolved oxygen	mg O/l	9,4	11,8	9,5	9,9	8,3	9	9,4
CBO5	mg O/l	2,2	1,6	2,3	1	2,9	1,6	1,5
CCOCr	mg O/l	-	-	-	6	13	10,10	9
Nutrients								
Nitrates	mg N/l	0,5	0,2	0,4	0,88	0,65	1,5	0,2
Nitrites	mg N/l	0	0,001	0,002	0,011	0,008	0,005	0
Ammonium	mg N/l	0,11	0,11	0,16	0,2	0,08	0,08	0,05
Orthophosphate	mg P/l	0,04	0,04	0,02	0,03	0,2	0,03	0,1
General salinity ions								
Na ⁺	mg/l	8	6	7	11	3	3	3
Ca ²⁺	mg/l	36,1	35,7	32,6	29,8	30,7	28,8	37,3
Mg ²⁺	mg/l	2,9	9,5	6,9	1,9	3,8	5,8	8,5
Total iron	mg/l	0,12	0,18	0,05	0,17	0,19	0,75	0,03
Total Manganese	mg/l	-	-	-	-	0,002	-	-
Chlorides	mg/l	7	20	9	0,7	4,4	8,2	4
Sulfates	mg/l	34	32	33	30	21	9	15
Organic toxic substances								
Phenols	µg/l	-	-	-	-	-	-	-
Active anionic detergents	µg/l	-	-	-	-	-	-	-
Metals								
Zn ²⁺	µg/l	absent	absent	absent	-	17,55	-	-
Cu ²⁺	µg/l	absent	absent	absent	-	0	-	-
Cr total	µg/l	absent	absent	absent	-	2,7	-	-
Pb ²⁺	µg/l	absent	absent	absent	-	-	-	-
Cd ²⁺	µg/l	absent	absent	absent	-	-	-	-

Table 8. Framing of the Uz river - downstream section of the Poiana Uzului lake in the water quality classes (Cf ORDIN No. 161 of 16.02.2006)

Parameter	Classification in Quality Classes		
	2003	2005	2006
Dissolved oxygen	II	I	I
CBO5	I	I	I
CCOCr	I	I	II
Nitrates	I	I	I
Nitrites	I	I	I
Ammonium	I	I	I
Orthophosphate	I	II	I
Na ⁺	I	I	I
Ca ²⁺	I	I	I
Mg ²⁺	I	I	I
Total iron	I	I	II
Total Manganese	I	I	I
Chlorides	I	I	I
Sulfates	I	I	I
Phenols	I	I	I
Active anionic detergents	I	I	I
Zn ²⁺	I	I	I
Cu ²⁺	I	I	I
Cr total	I	I	I
Pb ²⁺	I	I	I
Cd ²⁺	I	I	I

In 2003, the control section was in the first quality class, all parameters are in the first quality class.

In 2005, the control section was ranked in the first quality class, all parameters are in the first quality class.

In 2006, the control section was ranked in the first quality class, with the exception of the COCr and nitrate (cl II) parameters.

The control section was classified as quality I In the case of the group of hazardous substances - priority hazardous according to the laboratory analyzes, there were no exceedances, but there were small metals, zinc, copper and chromium.

For the year 2014, the monitoring was done on the Slanic rivers, the upstream control section of Slanic, Ciobanus, the Ciobanus - Ciobanus and Uz section, the upstream section of Poiana Uzului.

Water samples were collected each month of the year. The results obtained and the classification in the water quality class were recorded in Tables 9, 10 and 11.

The physico-chemical parameters of the water in the Slanic River, *the Slanic upstream section*, is classified as quality II (clean water) as there are slight exceedances of the maximum permissible concentrations of organic toxic substances, both for phenols and for detergents.

The other parameters also have slight overshoots, fitting into the quality class II (Table 9).

In *Ciobanuș-Ciobănuș section* of the Ciobănuș River, the physico-chemical parameters of the water fall into the II class (clean water) as a whole, there being slight overshoots of concentrations of phenols and active anionic detergents and of metals, except for Cd.

The physico-chemical parameters of the water in the *Uz River, the upstream section of the Poiana Uzului lake*, fit the section of quality class II (clean water), as well as the other study sections, with small overflows to anionic detergents and metals.

Table 9. Physical and chemical parameters of the water from the river Slanic, the Slănic upstream section and the classification in the water quality classes (Cf. ORDIN No. 161 of 16.02.2006)

Parameter	Number of samples	Number of samples	Medium value	Minimum value	Maximum value	Fitting in quality classes
Temperature	°C	12	11	1	20	-
pH	-	12	7.8	7.5	8.0	
Acidification conditions						I
The oxygen regime						I
Dissolved oxygen	mgO ₂ /l	12	10.14	7.91	12.7	
CBO ₅	mgO ₂ /l	12	1.88	0.97	3.24	
CCOCr	mgO ₂ /l	12	8.62	5.0	13.8	
Nitrates	mg/lN	12	0.12	0.020	0.39	
Nitrites	mg/l	12	0.020	0.008	0.059	
Ammonium	mg/l	12	2.80	1.57	5.27	
Orthophosphate		12	0.029	0.018	0.038	
General salinity ions						II
Na ⁺	mg/l	12	7	5	9	
Ca ²⁺	mg/l	12	67.76	37.86	91.49	
Mg ²⁺	mg/l	12	19.48	10.16	39.28	
Total iron	mg/l	12	0.012	0.012	0.012	
Total Manganese	mg/l	12	0.017	0.0039	0.025	
Chlorides	mg/l	12	208.51	11.06	795.6	
Sulfates	mg/l	12	44.70	22.05	72.12	
Bicarbonates	mg/l	12	188.7	110.0	277.6	
Organic toxic substances						II
Phenols	mg/l	12	3.0	3.0	3.0	
Active anionic detergents	mg/l	12	5.0	5.0	5.0	
Metals						II
Zn ²⁺ total	µg/l	12	5.0	5.0	5.0	
Cu ²⁺ dissolved	µg/l	12	3.689	0.70	10.48	
Cr total	µg/l	12	3.683	0.89	6.32	
Pb ²⁺ total	µg/l	12	0.25	0.25	0.25	
Cd ²⁺ total	µg/l	12	0.075	0.075	0.075	
Hg dissolved	µg/l	12	0.72	0.72	0.72	
Ni dissolved	µg/l	12	0.92	0.75	1.34	
OVERVIEW						II

Table 10. Physical and chemical parameters of the Ciobănuș River water, the Ciobănuș-Ciobănuș section and the classification in the water quality classes (Cf. ORDIN No. 161 of 16.02.2006)

Parameter	Number of samples	Number of samples	Medium value	Minimum value	Maximum value	Fitting in quality classes
Temperature	°C	12	10.62	2	19	
pH	-	12	8.29	8.17	8.43	
Acidification conditions						I
The oxygen regime						II
Dissolved oxygen	mgO ₂ /l	12	10.47	8.53	12.53	
CBO ₅	mgO ₂ /l	12	2.70	0.74	5.05	
CCOCr	mgO ₂ /l	12	9.8	5.0	20.2	
Nitrates	mg/lN	12	0.097	0.01	0.40	
Nitrites	mg/l	12	0.025	0.008	0.05	
Ammonium	mg/l	12	0.12	0.020	0.51	
Orthophosphate		12	0.05	0.007	0.14	
General salinity ions						II
Na ⁺	mg/l	12	7	9	10	
Ca ²⁺	mg/l	12	72.67	59.02	97.15	
Mg ²⁺	mg/l	12	15.7	5.83	50.0	
Total iron	mg/l	12	0.015	0.012	0.038	
Total Manganese	mg/l	12	0.028	0.0001	0.11	

Chlorides	mg/l	12	6.37	2.50	12.80	
Sulfates	mg/l	12	33.06	26.4	50.08	
Bicarbonates	mg/l	12	188.4	134.2	232.0	
Organic toxic substances						II
Phenols	mg/l	12	3.0	3.0	3.0	
Active anionic detergents	mg/l	12	310	50	201	
Metals						II
Zn ²⁺ total	µg/l	12	12.7	5.0	21.89	
Cu ²⁺ dissolved	µg/l	12	3.46	1.90	7.08	
Cr total	µg/l	12	1.55	0.30	4.19	
Pb ²⁺ total	µg/l	12	0.59	0.25	2.21	
Cd ²⁺ total	µg/l	12	0.075	0.075	0.075	
Hg dissolved	µg/l	12	-	-	-	
Ni dissolved	µg/l	12	0.99	0.25	1.74	
OVERVIEW						II

Table 11. Physico-chemical parameters of the water in the Uz River, the upstream section of the Poiana Uzului lake and the classification in the water quality classes (Cf. ORDIN No. 161 of 16.02.2006)

Parameter	Number of samples	Number of samples	Medium value	Minimum value	Maximum value	Fitting in quality classes
Temperature	°C	12	10.12	3	20	
pH	-	12	8.05	7.85	8.26	
Acidification conditions						I
The oxygen regime						II
Dissolved oxygen	mgO ₂ /l	12	10.28	8.20	11.77	
CBO ₅	mgO ₂ /l	12	2.20	1.09	4.79	
CCOCr	mgO ₂ /l	12	7.45	5.0	15.5	
Nitrates	mg/lN	12	0.018	0.016	0.034	
Nitrites	mg/l	12	0.026	0.008	0.053	
Ammonium	mg/l	12	1.88	0.44	3.35	
Orthophosphate	mg/l	12	0.025	0.007	0.054	
General salinity ions						I
Na ⁺	mg/l	12	5	9	8	
Ca ²⁺	mg/l	12	44.58	32.22	58.87	
Mg ²⁺	mg/l	12	9.01	5.32	14.88	
Total iron	mg/l	12	0.080	0.01	0.44	
Total Manganese	mg/l	12	0.022	0.003	0.064	
Chlorides	mg/l	12	3.22	2.50	5.56	
Sulfates	mg/l	12	20.65	5.52	33.40	
Bicarbonates	mg/l	12	129.07	72.59	193.70	
Organic toxic substances						II
Phenols	mg/l	12	4.0	3.0	11.0	
Active anionic detergents	mg/l	12	230.62	50.0	140.0	
Metals						II
Zn ²⁺ total	µg/l	12	8.10	5.0	16.32	
Cu ²⁺ dissolved	µg/l	12	2.20	1.40	3.28	
Cr total	µg/l	12	0.99	0.12	2.32	
Pb ²⁺ total	µg/l	12	0.25	0.25	0.25	
Cd ²⁺ total	µg/l	12	0.075	0.075	0.075	
Hg dissolved	µg/l	12	-	-	-	
Ni dissolved	µg/l	12	0.94	0.70	1.40	
OVERVIEW						II

CONCLUSIONS

In conclusion, the quality of the water in all collection sections was kept clean ((I and II quality classes) as a result of the legislative measures that have been taken on the restoration and protection of

aquatic ecosystems, intensified operation with the accession of our country to the EU.

On the other hand, an indirect cause of improving water quality in the studied sections is the total or partial closure of some industrial centers.

ABSTRACT

During 2003-2008 and in 2014 the monitoring of the Ciobănuș, Uz and Slănic rivers, important tributaries of the Trotuș River, was carried out. Variations in water physico-chemical indicators (thermal regime and pH oxygen regime, nutrients, salinity, toxic pollutants and other relevant chemical indicators) have been taken into account in the study sections at the time of collection, according to ORDIN No. 161 of 16.02.2006 and some assessments have been made on the ecological state of the rivers.

Water quality in all collection sections was kept clean (Class II quality) as a result of the legislative measures that have been taken on the restoration and protection of aquatic ecosystems.

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