

## **WATER QUALITY IN THE URBAN ECOSYSTEM OF DROBETA - TURNU SEVERIN**

**Valentin Andrița**

“Ștefan Odobleja” Pedagogical College of Drobeta – Turnu Severin, Romania. e-mail: valentinandrita@yahoo.com

### **Abstract**

At present, the city is supplied with water from the Danube River by S.C. SECOM S.A.. The potable water distributor is obliged to assure a water supply meeting the water quantity and quality standards. Sometimes, the underground waters do not meet these standards, containing certain dissolved constituents coming either from natural sources, or from certain anthropic activities. In Drobeta - Turnu Severin city, all the citizens benefit from water that falls within the potable limits, as required by law; they are connected to the centralized drinking water supply. The water treatment station is new and modern, operating since 2010. In the area of Drobeta – Turnu Severin city, there are 24 wells, situated in the riverside area and on the Danubian terrace. Some of these wells meet the standards of potable water quality, while others are situated at the potable/non-potable limit, depending on the season, the precipitations regime and on other conditions influencing the underground waters. These public city wells represent an alternative water source to the centralized water supply system providing water from the Danube River.

**Keywords:** quality classes, surface waters, underground waters, eutrophisation.

### **The quality of the surface waters**

The surface waters in the areas neighboring Drobeta-Turnu Severin city are represented by the Danube River, Topolnița River and Crihala rivulet. The urban ecosystem of Drobeta-Turnu Severin is supplied with water in a centralized system from the Danube River, the water being taken from between the two storage lakes with mainly hydroenergetic functions. From the perspective of the water quality, the Danube – in between the two dams, namely Porțile de Fier and Ostrovul Mare – has a low exchange index, favoring the eutrophization process (Table 1).

**Table 1. The eutrophization index of the Danube River (according to SGA Mehedinți)**

Ostrovul Mare Lake	Eutrophization indexes			
	PT mg/dm <sup>3</sup>	Nmin mg/dm <sup>3</sup>	Bm.fit.max. Zf mg/dm <sup>3</sup>	Chlorophyll "a" mg/dm <sup>3</sup>
Upstream from Tr. Severin - surface	E	e	m	m
Upstream from Tr. Severin – photic area	E	e	m	m
Downstream from Tr. Severin - surface	E	e	m	m
Downstream from Tr. Severin – photic area	E	e	m	m

According to the results of the laboratory analyses carried out, Ostrovul Mare Lake, presents the following features:

- The value of the dissolved oxygen saturation degree corresponds to the 1<sup>st</sup> quality class, and that of the nutrients to the 2<sup>nd</sup> quality class (Table 1.)

One of the main pollutants of Drobeta – Turnu Severin city is S.C.CELROM S.A.. This industrial plant is situated in the south-east of the city polluting the Daubian waters with its used industrial waters. The effluent waters from CELROM are evacuated into the Danube through a sewerage chamber.

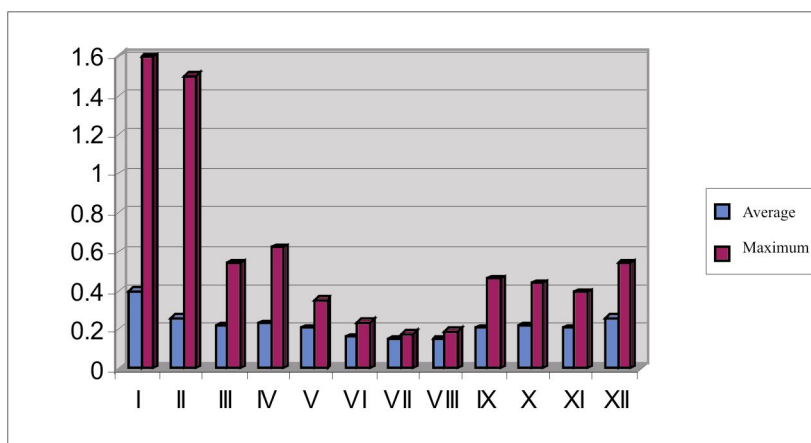
The quality of the Danube’s waters has been analyzed by SGA Drobeta - Turnu Severin and has been compared to the provisions of the Order of the Waters and Environmental Protection Minister no. 1146/2002.

Daily, the radioactivity station of Drobeta Turnu Severin measured the global beta radioactivity of the potable water samples taken from the city’s distribution network. The values recorded during the year were generally under the detection limit of the measuring instruments, the significant values varying

between 0.15-1.6 Bq/l. The maximum value was recorded in January (1.6 Bq/l). The average and maximum monthly values are presented in 2, from which it results that the values did not go over the warning level.

**Table 2. Global beta radioactivity (Bq/l) in the potable water samples.**

Month	Average	Maximum
I	0.4	1.6
II	0.26	1.5
III	0.22	0.54
IV	0.23	0.62
V	0.21	0.35
VI	0.16	0.24
VII	0.15	0.18
VIII	0.15	0.19
IX	0.21	0.46
X	0.22	0.44
XI	0.21	0.39
XII	0.26	0.54



**Fig. 1. Global beta radioactivity (Bq/l) in the potable water samples.**

Table 3 presents the values of the quality indexes for the raw water samples collected from the chemical treatment filter and from the river waters, upstream and downstream from the effluents discharge point of S.C. CELROM S.A.. The influence of the evacuation of the used waters from CELROM can be seen in the increase of the concentration level near the effluents discharge point. Due to the fact that the flow of the Danube River is of 5487 m<sup>3</sup>/s, being much higher than that of the effluents from the cellulose and paper industrial plant, which is of just 0.188 mc/s, the mixture becomes visible about 500 m away.

According to the concentrations presented in the table, the water of the Danube River belongs to the 1<sup>st</sup> quality class. (Table 3)

**Table 3. Quality indexes for the Danube River water for the year 2004 (according to SGA Mehedinti)**

Indexes	Quality of the Danubian water				Limit values of the water quality according to the order of MAPM no. 1146/2002		
	Upstream from CELROM 15.07.04	Downstream from CELROM			Class I	Class II	Class V
		15.07.04 at 30 m	15.07.04 at 100 m	15.07.04 at 500 m			
pH	7.7	7.67	7.77	7.77	-	6.5 – 8.5	-
Suspensions, mg/l	26	27	26	25	-	-	-
Fixed residue, mg/l	218	220	218	218	fond	500	> 1300
CCOCr mg/l	9.77	11.95	10.32	10.86	10	25	>125
CBO5 mg/l	1.66	1.37	1.83	1.45	3	5	>25
Sulphides, mg/l	0.0	0.123	0.037	0.123	-	-	-

Phenols, µg/l	0.8	0.9	0.9	1	1	1	>50
Ammonium, mg/l	0.179	0.1	0.109	0.23	0.3	0.3	>1.5
Nitrates, mg/l	-	1.017	1.06	0.859	3	3	>15
Nitrites, mg/l	0.025	0.0225	0.0246	0.024	0.06	0.06	>0.3
Total nitrogen, mg/l	1.01	1.15	1.21	1.12	4	4	>20
Total phosphorus, mg/l	0.061	0.047	0.062	0.038	0.2	0.2	>1

As far as the Topolnița River is concerned, its water belongs to the second quality class upstream from the confluence with the Danube River and upstream from the Topolniței monastic residence. (Table 4). In point of its oxygen content and salinity, the waters of the Crihala rivulet belong to the second quality class, while in point of the nutrients present in the water, the rivulet has a third quality class water. (Table 5)

**Table 4. Surface water quality classes –Topolnița River (according to SGA Mehedinți)**

No.	Water course	Section	Quality class
1.	Topolnița	Before the Danube confluence	II
2.	Topolnița	Before Topolniței hermitage	II

**Table 5. Surface waters quality classes – Crihala Rivulet (according to SGA Mehedinți)**

No.	Water course	Quality class		
		RO (oxygen regime)	S (salinity)	N (Nutrients)
1.	3. Crihala, upstream from the Topolnița confluence	II	II	III

### Underground waters quality

The studies carried out on the underground waters show that the region presents significant water sources, both at the surface and especially underground. The underground waters are the most important from an economic perspective and the most fragile to the anthropic pressure. Because it was impossible to find a firm to carry out new drillings, the underground water samples were taken from recently realized drillings and a sample from the potable water source from the precincts of SGA Mehedinți, upstream from CELROM. The water samples were taken from a well situated in the courtyard of S.C. CELROM S.A., the only one available, according to the arrangement plan. The depth of the underground waters in the area is of 1-8 m below the ground level. The values obtained for the main quality indicators were compared and interpreted by comparison with the limits stipulated by the governmental decision HG100/7.02.2002 and the Order of MAPM no. 1146/2002. Following the measurements carried out by SGA Mehedinți, one can notice that the sulphides, the phenols and the oxydability determined using the CCOCr indicator do not go over the admissible limits according to the legislation in force. From the group of the heavy metals analyzed, the presence of Pb, Cd, Ni, Zn and Cu was noticed, yet none of these indicators was over the admissible limits (Table 6). Larger values were recorded in the treatment station area and at the crude oil deposit for the fixed residue (Table 6). The extractible values recorded the value “0”, no oil products infiltrations occurring from the crude oil deposit. One can highlight that the underground water samples did not record any pollutant concentration values over the level set by the governmental decision HG100/7.02.2002 and the Order of the Waters and Environmental Protection Minister no. 1146/2002 **class II**, except for the fixed residue from the drillings F1 and F2. (Table 6)

**Table 6: Underground waters quality in Drobeta – Turnu Severin City in 2004 (according to SGA Mehedinți)**

No.	Indicator measured	Drilling			Source outside the precincts	Surface water		
		F1 6.5 m	F2 3.5 m	F3 0.5 m		HG100/02 NTPA013	Order 1146/2002	
					A1	Class II	Class IV	
1	pH	6.98	7.14	7.04	7.16	6.5-8.5	6.5-8.5	6.5-8.5
2	Suspensions, mg/l	47	35	29	16	25	-	-
3	Fixed residue, mg/l	865	2770	388	554	-	500	1300

4	CCOCr mg/l	24.26	23.28	9.7	11	10	25	125
5	CBO5 mg/l	4.45	3.52	1.05	2.08	3	5	25
6	Sulphides, mg/l	0.25	0.166	0.082	0.14	-	-	-
7	Phenols, µg/l	0.0009	0.0006	0.0001	0.0002	0.001	0.001	0.05
8	Extractible matter, mg/l	0.0	-	-	-	0.05**	0.1**	0.5**
9	Copper*, mg/l	0.003	0.0034	0.0042	0.0049	0.02	0.02	0.1
10	Nickel* mg/l,	0.0	0.0	0.0	0.0	0.05	0.05	0.25
11	Lead*, mg/l	0.0031	0.0026	0.0033	0.0056	0.05	1	5
12	Zinc*, mg/l	0.025	0.03	0.024	0.039	0.5	0.1	0.5
13	Cadmium*, mg/l	0	0	0	0.0042	0.001	0.001	0.005

Note: - \*) total metal concentrations; -\*\*) hydrocarbons dissolved after extraction with petroleum ether.

The realization of the centralized water supply for the localities south of the Turnu - Severin depression will reduce the use of the polluted underground water. In the area of the Drobeta - Turnu Severin city there are 24 wells, situated in the riverside and on the terrace of the Danube River. From the laboratory analyses carried out in time, one can notice that only 3 of these wells meet the standards of potable water quality established by the Potable Water Law no. 458/2002. Three more wells are situated at the potable/non-potable limit, depending on the season, the precipitations regime and on other conditions influencing the underground waters. These public city wells represent an alternative water source to the centralized water supply system, which depends on the quality of the Danube River waters.

## REFERENCES

- Costescu, P., (1956), Date hidrologice asupra fluviului Dunărea (Hydrological Data - the Danube River), *Meteorologie, Hidrologie*, nr. 2 Bucureşti;
- Gâştescu, P., (2002), *Fluviile Terrei* (The Earth's Rivers), Edit. Transversal, Târgovişte;
- Gâştescu, P., (2003), *Hidrologie continentală* (Continental Hydrology), Edit. Transversal, Târgovişte;
- Matei, Elena, (2004), *Culoarul Dunării între Orşova şi Ostrovul Mare. Impactul activităţilor antropice asupra componentelor mediului* (The Danubian Corridor between Orşova and Ostrovul Mare. The Impact of the Anthropic Activities on the Environmental Components), Edit. Universitară, Bucureşti;
- Ujvari, I., (1972), *Geografia apelor României* (The Geography of Romania's Waters), Edit. Ştiinţifică, Bucureşti;
- Vlad, P., (1972), *Aspecte ale poluării aerului şi apei în judeţul Mehedinţi, Studii şi cercetării* (Aspects of the Water and Air Pollution in Mehedinţi County. Studies and Research Work), Drobeta Turnu – Severin;
- Zăvoianu, I., (1967), *Variaţia elementelor morfometrice ale albiei minore în profil longitudinal al Dunării inferioare* (The Variation of the Morphometric Elements of the Longitudinal Riverbed of the Danube River), SCGGG - Geogr. XIV, 1 .
- (1967), *Limnologia sectorului românesc al Dunării-studiu monographic* (The Limnology of the Romanian Sector of the Danube - Monograph), Edit. Academiei, Bucureşti;
- \*\*\* (1967), *Dunărea între Baziaş şi Ceatal Izmail - monografie hidrologică* (The Danube in between Baziaş and Ceatal Izmail), Comitetul de stat al Apelor, Bucureşti;
- \*\*\* (1969), *Geografia Văii Dunării româneşti* (The Geography of the Valley of the Romanian Danube), Edit. Academiei, Bucureşti.
- \*\*\* (2004, 2005, 2006, 2007, 2008, 2009, 2010), *Raportul anual privind starea mediului în judeţul Mehedinţi* (Annual Report on the Environmental Condition in Mehedinţi County), Agenţia pentru Protecţie a Mediului (The Environmental Protection Agency) – Mehedinţi;
- \*\*\* (2008), *Raport asupra caracteristicilor fizico – chimici şi biologici ai apelor de suprafaţă* (Report on the Physical-Chemical and Biological Features of the Ground Waters), SGA Mehedinţi – Apele Române;
- \*\*\* (2009 - 2015), *Strategia de dezvoltare durabilă a municipiului Drobeta – Turnu Severin* (The Sustainable Development Strategy of the Drobeta-Turnu Severin City) - Primăria Municipiului Drobeta – Turnu Severin (Town Hall of Drobeta-Turnu Severin City).