THE SOURCES OF POLLUTION IN THE IARA BASIN

SURSELE DE POLUARE ÎN BAZINUL IARA

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Abstract: *The Iara basin represents a major point of attraction for the tourists. For having chances of development, the area has to adapt itself to the environmental conditions. The analysis regarding the existence of pollution sources in the hydrographical Iara Basin, accomplished in the year 2007, had proved a slight tendency of polluting the area. The polluting factors are natural or artificial.The water quality analysis put into practice at the Institute of Research for Analytical Instrumentation (ICIA) Cluj-Napoca, had proved normal results which were legally admitted in the minimal normative limits.*
It can be appreciated that from the water quality viewpoint, are created premises for organizing and development of touring activities in the area, which presume optimum conditions and repeatedly quality analysis.

Rezumat: *Bazinul Iara reprezintă un important punct de atracţie pentru turişti. Pentru a avea şansa unei dezvoltări, zona a fost adaptată la condiţiile de mediu. Analizele cu privire la existenţa surselor de poluare în bazinul hidrografic Iara, realizate în anul 2007, au arătat o uşoară tendinţă de poluare a zonei. Factorii de poluare sunt naturali sau artificiali.Rezultatele analizelor de calitate a apei, efectuate la Institutul de Cercetări pentru Instrumentaţie Analitică (ICIA) Cluj-Napoca s-au încadrat în limitele minime legale.Din punctul de vedere al calităţii apei sunt create condiţii pentru organizarea şi dezvoltarea activităţii turistice în zonă, în condiţiile repetării analizelor de calitate.*

Key words: *Water quality, water control and protection*
Cuvinte cheie: *calitatea apei, protecţia şi controlul apei*

INTRODUCTION

Water is an important factor in establishing ecological balances and its pollution (contamination) is a current problem that has more or less serious consequences on the population.

The pollution of water is defined as the tainting of its physiological, chemical and biological characteristics, produced directly or indirectly by human activities and which brings the water to a state in which it can't be normally used for the purposes it was used prior to the contamination.

The sources of contamination can be natural or artificial.

The natural pollution is due to natural sources and is produced as a result of the water's interaction with the atmosphere, lithosphere and the various organisms existing in the water. Thus, the quality of the water suffers major and important negative transformations.

Eventhough linking the term pollution to these sources is in some wise ill-suited, it must be considered throught the meaning of the inflowing of strain substances in natural waters which make those certain waters unsuited for use.

The artificial pollution is due to the incontroled and irrational interventions of man over the environment factors.[1,6,7]

SOURCES OF POLLUTION IN THE IARA DEPRESSION

The Iara Depression being watched over by the Great Mountain and the Agris Hill, is longitudinally crossed, from North-West towards South-East by the Iara Valley, eponymous to the most important settlement on its course until it inflows in the Aries river.

The Agris Valley, affluent of Iara, and The Ocolisel Valley, affluent of Aries, also gather their waters from across The Iara Depression.

Situated in a charmingly picturesque area, on the east side of the Great Mountain Massif (1st figure), The Iara Depression is an attractive spot, geographically speaking, here being set up several touring structures in the past few years, structures which give the promise of transforming this depression in a competitive area, representative for the North-West development area.

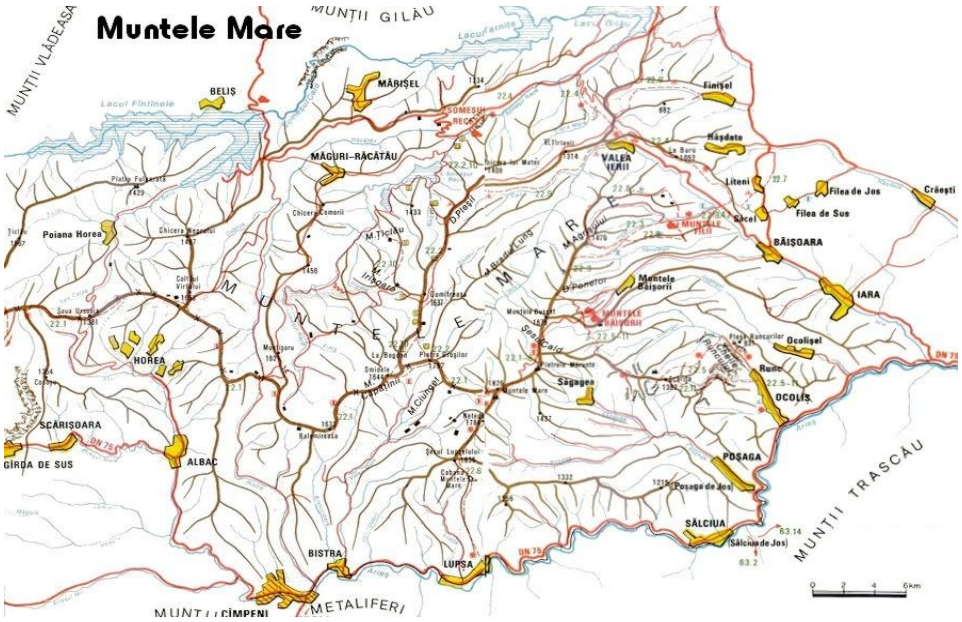

Figure 1. Great Mountain Massif

On of the incumbent conditions that the area must fulfill is that the main characteristics of the environment factors, water, air and soil, must be within the legal boundaries.

Throught the year 2007, observations and determinations were carried out by the Research for Analitical Intrumentation Institute of Cluj Napoca, to establish the main sources of water contamination on the Iara Valley and to what extent the quality of the water was affected.

The observations prior to the actual analysis showed a contamination of the Iara Valley as a surface water which in its flow carries different polluting substances. The water bed is also a favourable environment for numerous chemical reactions (e.g. disolving natural or artificial substances).

The main sources of natural water pollution in The Iara Depression are the water-soluble stones which have a relative impact on the surface waters.

Also, when waters pass through areas with high soil erosion phenomenons, they are subdued to contaminations because the soils are made up of fine particles which mentain themselves in suspension for a long time.

The aquatic vegetation, either fixed or floating can lead to variable phenomenons of contamination across time because of the low velocity of the water flow.

The vegetation on river banks can also be a polluting factor through the falling of leaves and whole plants. The organic elements are tributary to a putrefaction and disintegration process that is contaminating especially when the water level is low or when the water is under an ice bridge.

One of the main permanent sources of pollution is constitued of the used water reintroduced in the water circuit through different receptors. Sewage and industrial waters are such examples and they come from the meeting of household demands from the villages across the Valley as well as the fulfillment of sanitary and social needs of small industrial facilities. The number of polluting factors for a certain area is usually not high, an industrial used water basicaly having similar trades to the substances used in the technological process.

Used waters from small bird and calf farms full of organic substances are also polluting. Again, the meteoric waters which wash the atmosphere of the polluting factors before reaching the ground. These hydrometeors, can carry remnants, pesticides, chemical substances so that when they reach the Iara river they are abundant in polluting elements.

A particular category is represented by waters coming from campings, leisure facilities, which are similiar to urban waters. For the whole depression, major pollution sources are the sawdust and remnant dumps which are abandoned under the clear sky or directly on the ground.

They pollute either by direct inflow in the rivers or by infiltrating the soil.

Extremely severe are the cases of contamination throught the dumps and stock-piles of residuues placed in water beds which are then carried and spread by gullies. Iara was renowned for its mining activities, the region being packed with mineral resources, some of which can favourise pollution. Iron is being exploited for decades in Masca and Cacova Ierii. Chalkstones are found in Borzesti, Iara and Buru, findind its use both locally as construction material and in the process of ciment making. In Buru we can also find precious metals. On the valley of the river flowing from Remetea there are other mineral resources. The walls of rocks are formed of hard stone, volcanic rock and in the subsurface iron and mangan. Around Remetea there are various types of chalkstone, pyrite and important rock deposits. In Surduc lyes and old quarry, deserted at present (in conservation). Here we encounter lime pits, stones used in the making of caustic soda, and also as roar stone for earthwork and pavements.

In Ocolisel there is a large, unexploited chalkstone reserves.

Magura Ierii has large reserves of crystalline chalkstone usable in road maintenance work. By abrading and polishing, these chalkstones can successfully replace marble.

The Crystalline chalkstones from Buru are highly used in the glass industry, in metallurgical engineering as well as in cement making and break stone for road. The reserves are estimated around 5, 5 million tons.

Important dacite supplies are found in the Agris Valley area. Likewise, dacite are found in Iara, where are being used for house foundations, roads, pavements etc.

Sand is found in Agris Valley village, used for building local utilities. Siliceous sand from Fagetu Ierii is exploited starting with the third decennium of the XX century with industrial purpose (glass industry, metallurgy, chemistry, abrasive material industry and others). The existence of this exploitation, determined the Government of Romania to build a charcoal silicide production factory at Turda, in the ‘80s. Granite exploitation source can be found at Magura Ierii and Surduc. Supplies are estimated to be tens of millions of tons.

Betonite is found at Borzeşti, which is used in ceramics industry and white cement. Iara village holds important clay supplies, which is being used at ceramics production. The villagers are practicing pottery for centuries.

At Borzesti, after researches were made in the second half of the XIX century, were found important magnezio-astihit (orthit). White, red and yellow clay were also found on the bank of a river, used as natural colorant and paint [2, 3, 4, 5, and 8].

RESULTS AND DISCUSSIONS

The main analysis done for determining the water quality, took into consideration: hydrogen ion concentration (pH), the content of filtered and dried at 150^0C residue, suspended materials, dissolved oxygen, chemical oxygen consumption, biochemical oxygen consumption, oil products, ammonium, nitrates, nitrites, phosphates.

Analysis evidence were gathered from ten spots of drawing, presented in table no. 1

Table 1

Assaying analysis sample centers

No.	Codification	Location
1	A_1	Confluence of Iara with Arieş
2	A_2	Iara village
3	A_3	Downstream of Băişoara commune
4	A_4	Băişoara commune
5	A_5	Upstream of Băişoara commune
6	A_6	Half way between Băişoara and LARA touring complex
7	A_7	Valea Ierii commune, downstream of LARA touring complex
8	A_8	Valea Ierii commune, touring complex LARA area
9	A_9	Between Valea Ierii commune and CAPS school camp
10	A_{10}	CAPS school camp

The assaying of samples and effecting analysis were done according to the methodologies recognized in the country.

The results of the analysis effected are presented in table no. 2, and the methods of determination and minimal values admitted for every determined factor, are presented in table no.3.

Table 2

Results of water quality analysis effected in the hydrological basin of Iara, 2007

Executed attempt		U M	Symbol evidence / determined values									
			A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}
Hard metals (T = total)	CuT	mg / dm^3	0,050	0,055	0,068	0,075	0,090	0,062	0,055	0,045	0,041	0,040
	CdT	mg / dm^3	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02
	PbT	mg / dm^3	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02	< 0,02
	ZnT	mg / dm^3	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01
Hydrogen ion concentration (pH)		unit pH	7,29	7,42	7,65	7,75	7,87	7,71	7,62	7,53	7,43	7,41
Filtered and dried at 150^0C residue		mg / dm^3	460	475	435	385	375	390	405	388	378	393
Suspended substances		mg / dm^3	28	25	18	17	18	23	21	18	15	16
Dissolved oxygen		mg O_2/dm^3	7,9	7,9	7,9	8,0	8,0	8,0	8,1	8,1	8,1	8,1
Chemical oxygen consumption		mg O_2/dm^3	45	39,0	26,5	14,3	13,0	13,5	18,5	13,1	12,8	12,4
Biochemical oxygen consumption		mg O_2/dm^3	21	19,5	12,8	6,5	6,2	6,7	7,9	5,9	6,7	5,8
Oil products		mg / dm^3	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01
Phenol value		mg / dm^3	0,012	0,011	0,008	0,007	0,006	0,005	0,006	0,004	0,005	0,005
Ammonium (NH4-)		mg / dm^3	0,20	0,18	0,17	0,22	0,19	0,21	0,25	0,12	0,14	0,11
Nitrates (NO3-)		mg / dm^3	1,80	1,40	1,40	1,60	1,60	2,25	2,30	2,00	1,50	1,70
Nitrites (NO2-)		mg / dm^3	0,20	0,17	0,16	0,16	0,14	0,15	0,21	0,17	0,15	0,15
Phosphates total		mg / dm3	0,35	0,27	0,20	0,16	blank	0,18	0,14	blank	0,10	blank

Table 3

Analysis methods and minimal values admitted for water quality determination effected in the hydrological basin of Iara, 2007

Executed attempt		U M	Uncertainty of measuring	Attempt method	Admitted value
Hard metals (T = total)	CuT	mg / dm^3	10 %	ISO 11885 / 96	0,1
	CdT	mg / dm^3	10 %	ISO 11885 / 96	0,2
	PbT	mg / dm^3	10 %	ISO 11885 / 96	0,2
	ZnT	mg / dm^3	10 %	ISO 11885 / 96	0,5
Hydrogen ion concentration (pH)		unitate pH	10 %	SR ISO 10523 – 97 Electrochemical	6,5 – 8,5
Filtered and dried at 150^0C residue		mg / dm^3	10 %	STAS 9187 – 84	2.000
Suspended substances		mg / dm^3	10 %	STAS 6953 – 81	35
Dissolved oxygen		mg O_2/dm^3	10 %	SR EN 25813/1997	–
Chemical oxygen consumption		mg O_2/dm^3	10 %	SR ISO 6060 – 96	125
Biochemical oxygen consumption		mg O_2/dm^3	10 %	STAS 6560 – 82	25
Oil products		mg / dm^3	10 %	Chromatographic-gas	5,0
Phenol value		mg / dm^3	10 %	SR ISO 6439–2001	0,3
Ammonium (NH4-)		mg / dm^3	10 %	SR ISO 7150/1–2001	2,0
Nitrates (NO3-)		mg / dm^3	10 %	SR ISO 7890/3–2000	25,0
Nitrites (NO2-)		mg / dm^3	10 %	SR ISO 6777 – 1996	1,0
Phosphates total		mg / dm3	10 %	SR EN 1189 : 1999	1,0

After the analysis effected, the followings are determined:

The content in copper is situated, in all the analysis sample centers, below the minimal admitted limit of 0,1 mg/dm^3. One of the lowest values 0,040 mg/dm^3, 0,041 mg/dm^3 and 0,045 mg/dm^3,registered in the A_{10} spot (CAPS school camp), A_9 (between Valea Ierii and CAPS), A_8 (Valea Ierii, LARA touring complex).

The content of cadmium and lead are positioned below the minimal admitted limit of 0,02 mg/dm^3. The content of zinc also determined lower values than 0,01 mg/dm^3, a lot below the minimal limit of 0,05 mg/dm^3.

Hydrogen ion concentration had registered values between the limits: 7,29 and 7,87. The admitted pH values are situated between 6,5 and 8,5.

Filtered and dried at 150^0C residue were situated between 375 mg/ dm^3 and 475 mg/ dm^3, a lot under the admitted value of 2000 mg/ dm^3.

The biochemical oxygen consumption was close to the admitted value with 21 mg O_2/dm^3 of 25 mg O_2/dm^3.

The determination concerning establishment in oil products, phenol value, ammonium, nitrates, nitrites and phosphates, which were always situated below average.

CONCLUSIONS

The observations made in the hydrographic basin of the Iara Depression, conducted in the year 2007, have revealed a slight tendency of pollutionin the area, the polluting factors being natural but mostly anthropic.

The quality analysis of the water showed that in every case, the results were within the minimal legal parameters.Hence, as far as the quality of the water is concerned, leisure and turistical activities can be conducted in the area under optimal conditions.

However, there is the risc that by amplifying the effect of some polluting factors in the area, in some points, the legal boundaries be surpassed. It is imposed therefore, the close

survaillance of the area and the repeating of the quality controls and analysis whenever considered necessary.

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