

CONSIDERATIONS ON THE EVOLUTION OF QUALITY INDICATORS OF WATER COURSES IN GORJ COUNTY

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ABSTRACT: Due to the functionality and multiple uses of water, the mismatch between the distribution in time and space of water resources and that the requirements and due to the phenomenon of reuse water along watercourses, it requires particularly necessary activities coordination of management and use of water resources. In this paper we present a study on the evolution of physical and chemical quality indicators of water courses in Gorj county, monitored in 2012-2014.

KEY WORDS: quality indicators, surface water, monitoring

1. INTRODUCTION

Water is an important factor in the environmental balances and its pollution is a current problem with consequences more or less serious on human population. The effects of pollution of water resources are complex and varied, depending on the nature and concentration of the contaminating substances. The complex nature of water management, involving different sectors of society and economy requires cooperation and coordination of actions of those who have a duty to administer water. Basically efforts of all stakeholders should focus the use, development and protection of water resources in an equitable manner and reasonable, by applying the concept of sustainable water management. Coordination of water management that the general interest of society imposes different users in order to capitalize on higher water resources, in terms of sustainable development, must be conducted in a most efficient way, using means most modern, provided by law and current practice in

Europe [1,2]. Water quality monitoring is the activity of standardized measurements and continues observations on long term for knowledge and assessment of water characteristic parameters in order to manage and define the status and trends in their quality and highlighting permanent state of water resources. The main reason for water quality monitoring is to verify whether it is suitable for use. Yet monitoring has revealed certain features of the aquatic environment and how this environment is affected by pollutants released by human activities or waste treatment operations. This type of monitoring is often known as the monitoring - impact. Since water is in most cases used for beneficial purposes, monitoring should reflect the needs of consumers [3,4].

Creating a monitoring and evaluation program can be focused on the spatial distribution of quality, on directions for use and aquatic life. Reaching these three areas of interest is almost impossible, or very costly, being necessary to carry out preliminary examinations. Monitoring and evaluation of water quality based on the

following fundamental traits: physical, chemical, biological and microbiological. It is a process of analysis, interpretation and communication of these properties within human activities, and conservation of the natural environment. So it is not a fixed process, adapted to the needs of local, national or international [5].

2. SURFACE WATER QUALITY IN GORJ COUNTY

Surface water quality is permanently controlled in the county Gorj by sampling. In 2012-2014 periods were analyzed samples taken from the river system of representative areas of our county. Analyzes were performed to determine some physico-chemical of surface water temperature, water pH, total suspended matter (TSM), dissolved oxygen (DO), biochemical oxygen demand (BOD₅), nitrates (NO₃⁻), nitrites (NO₂⁻), ammonium (NH₄⁺), total phosphorus (P total), chloride, sulphate. The values recorded for analyzed watercourses were relative to the maximum permissible concentration limits in accordance with Norm 161/2006 concerning the classification of surface waters in the way to determine the ecological status of water bodies. The Regulations provide five environmental

statuses for rivers category/graded as follows: very good (first class quality), color coded blue; good condition (II-nd class quality), color coded green; moderate condition (III-rd class quality), color coded yellow; weak state (IV-th class quality), color coded orange and poor condition (V-th quality), color coded red.

Quality evolution of Amaradia River

Gilort River is the most important tributary of the Jiu left side. He drains the southern slopes of Parang Mountains; the springs are located at altitudes of 1800 m. It crosses the western region of the Oltenia sub-Carpathian, the central Getic Piedmont, then confluence with Jiu, draining an area of over 1348 km² with an altitude average basin slope of 544 m and an average basin surface of 103 m/km. In the upper wedge out of Parâng (Novaci) has a typical mountain valley with steep slopes over 65%, profile V-shaped bed and a small portion limestone deposits formed keys.

Table 1 shows the values of the physico-chemical indicators of quality of Gilort River monitored in 2012-2014. Graphical representations of the evolution of quality indicators monitored for Gilort River are shown in Figures 1-4.

Table 1. Physico- chemical indicators of Gilort river

Indicators monitored	Monitoring of Gilort river S1- Turburea; S2- Bengesti; S3 – upstream Novaci								
	2012			2013			2014		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
Temperature (°C)	13	11	10	7	11	10	5	4	3
Total suspended matter (mg/L)	25	20	20	22	21	17	17	23	21
pH	7.72	7.48	7.56	7.66	7.34	7.43	7.38	7.44	7.31
Nitrates (mg/L)	0.78	0.49	0.35	0.59	0.37	0.31	0.71	0.31	0.26
Nitrites (mg/L)	0.019	<0.002	<0.002	0.031	0.003	<0.002	0.043	<0.002	<0.002
Ammonium (mg/L)	0.103	0.029	<0.018	0.070	0.022	<0.018	0.044	<0.018	<0.018
P- total (mg/L)	0.049	0.018	0.007	0.074	0.017	0.009	0.072	0.019	0.014
Dissolved oxygen (mg/L)	9.97	10.70	10.90	11.59	10.75	11.05	12.03	12.31	12.86

BOD ₅ (mg/L)	2.3	2.0	1.8	2.5	1.9	1.7	3.0	2.7	2.3
Chloride (mg/L)	25.348	7.799	5.228	22.86	3.806	2.666	36.87	6.736	4.254
Sulphate (mg/L)	65.37	21.63	16.93	27.87	14.94	12.66	23.62	15.70	11.95

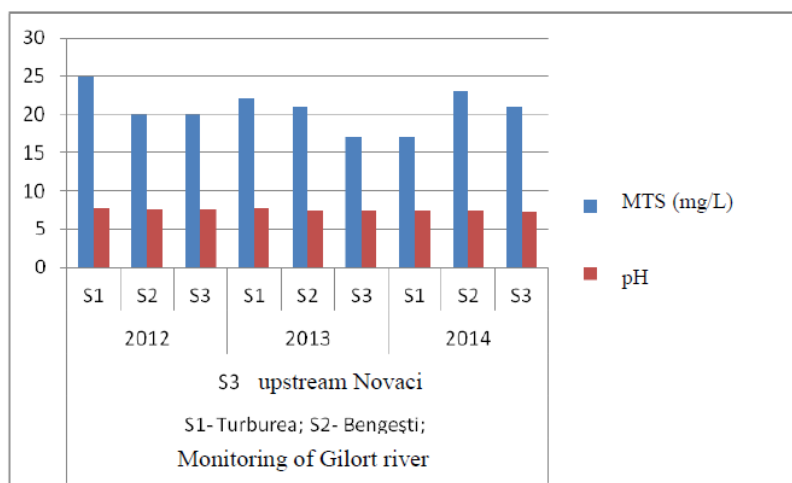


Fig. 1. Variation indicators pH and MTS (river Gilort).

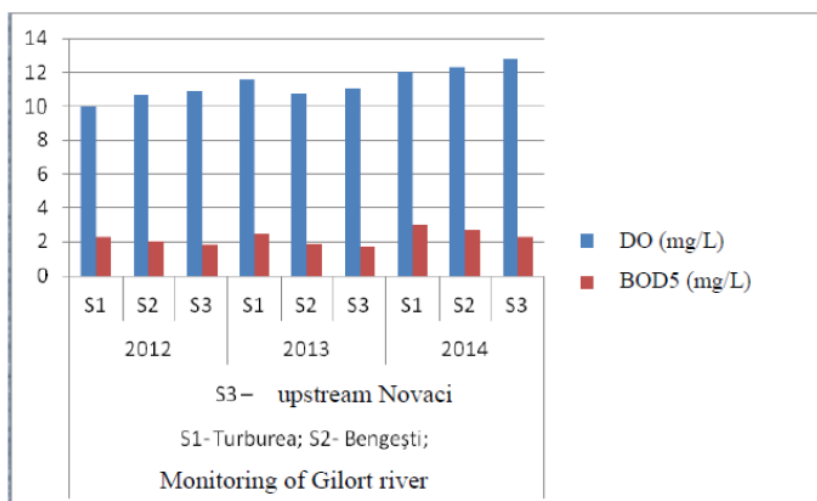
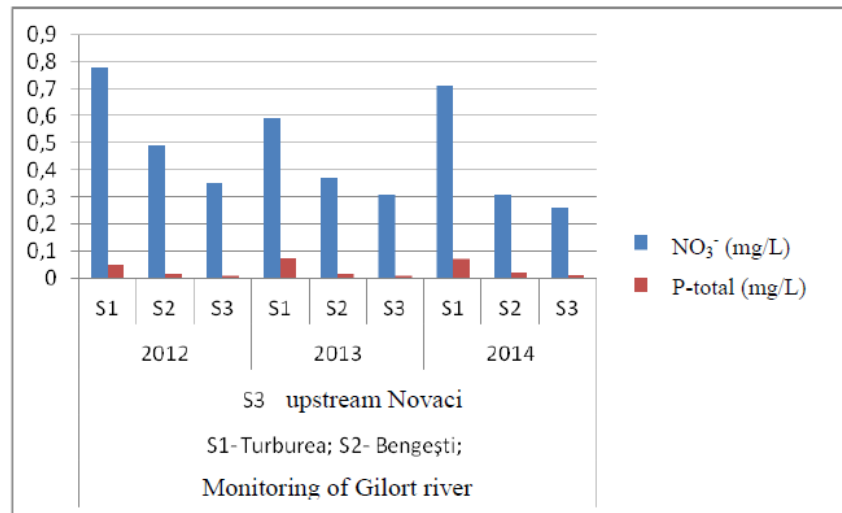
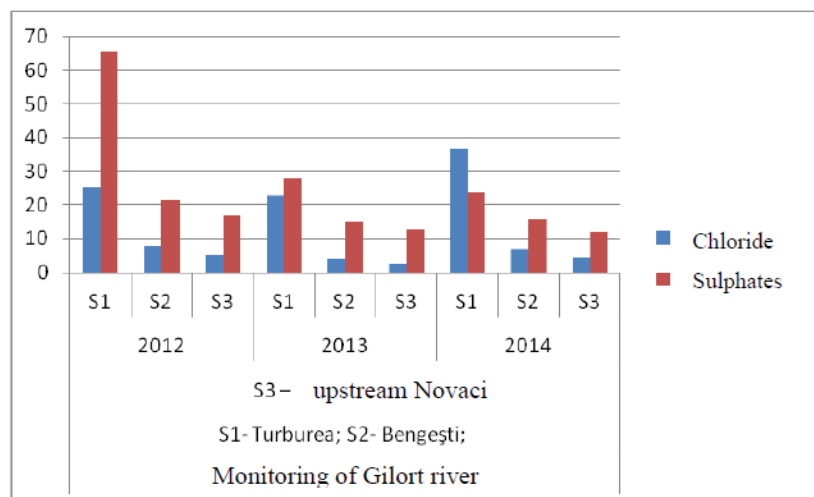


Fig. 2. Variation indicators DO and BOD₅ (river Gilort).

Fig. 3. Variation indicators NO₃⁻ and P_{total} (river Gilort).Fig. 4. Variation indicators Cl⁻ and SO₄²⁻ (river Gilort).

Data interpretation and recorded for Gilort river and reporting for the maximum values allowed by Norm 161/2006 indicates the following:

- pH values are within the limits permitted by the regulation (pH= 6,5-8,5);
- The average content of dissolved oxygen in the range of 9,97 to 12,86 mg/L limit value for first quality class of 9 mgO₂/L;
- The content of nitrates are below the limit value for I-st quality class (NO₃⁻ = 1mgN/L limit value);
- Total phosphorus content is between 0,017 to 0,074 falling below the limit (the limit value P_{tot}= 0,15 mg P/L);
- Chloride and sulphate content is above the I-st quality grade falling into II-nd class (quality limit value I-st class Cl⁻ = 25 mg/L,

SO₄²⁻ = 60 mg/L; limit value II-nd quality class Cl⁻ = 50 mg /L, SO₄²⁻ = 120 mg /L).

Quality evolution of Amaradia River

Amaradia is the second largest tributary of Jiu River as importance, on left side, springing from the foot of Parang Mountains, near the village of Rosia Amaradia in Gorj county. Pour in Jiu upstream of Craiova. Amaradia Pietroasa is a less tributary of Jiu. It rises in the Carpathians, gathers the waters of mountain slopes and hills, passing through Balanesti town flows through the city on the east and flows into Jiu near the Dragutesti town. In rainy times stormy down to the valley, swells, it becomes capricious tendency of jelly output. Usually dry in the summer, leaving behind small sand. It riverbed was not gravel.

Table 2 presents the values of water quality indicators reflecting the degree of nutrient loading, organic compounds and heavy metals, for Amaradia. Graphical representations of the evolution of quality indicators monitored for Amaradia River are shown in Figures 5-8.

Data recorded interpretation for Amaradia River and reporting at the maximum values allowed by Norm 161/2006 indicates the following conclusions:

- pH values fall within the limits described in Standard (pH= 6,5-8,5);
- the average dissolved oxygen leads to classification in I class quality for monitoring

sections ranging from 10,64-11,52 mg/l (DO limit value = mgO₂/L);

c) The content of nitrates is within a limit to I –st class quality ranging from 0,36-0,41 mg/L (limit value NO₃⁻ = 1 mgN/L);

d) Total phosphorus values between 0,013-0,018 mg/L is below the limit (P_{tot}= 0,15 mgP/L limit value);

e) chloride content and sulphate are below the limit value for I-st class quality (limit value Cl⁻ =25 mg/L; limit value SO₄²⁻ =60 mg/L).

Table 2. Phisico- chemical indicators of Amaradia river.

Indicators monitored	Monitoring of Amaradia river upstream Stancesti					
	2012		2013		2014	
	Average value	Maximum value	Average value	Maximum value	Average value	Maximum value
Temperature (°C)	9	30	11	30	6	30
Total suspended matter (mg/L)	27	35	29	35	30	35
pH	7.08	6.5-9.0	7.30	6.5-9.0	7.57	6.5-9.0
Nitrates (mg/L)	0.41	50	0.36	50	0.43	50
Nitrites (mg/L)	<0.002	0.5	<0.002	0.5	0.002	0.5
Ammonium (mg/L)	0.019	0.8	<0.018	0.8	<0.018	0.8
P- total (mg/L)	0.013	0.1	0.016	0.1	0.018	0.1
Dissolved oxygen (mg/L)	11.10	6.2	10.64	6.2	11.52	6.2
BOD ₅ (mg/L)	2.2	6.0	2.7	6.0	3.82	6.0
Chloride (mg/L)	5.760	50	2.540	50	2.793	50
Sulphate (mg/L)	7.40	120	14.25	120	13.03	120

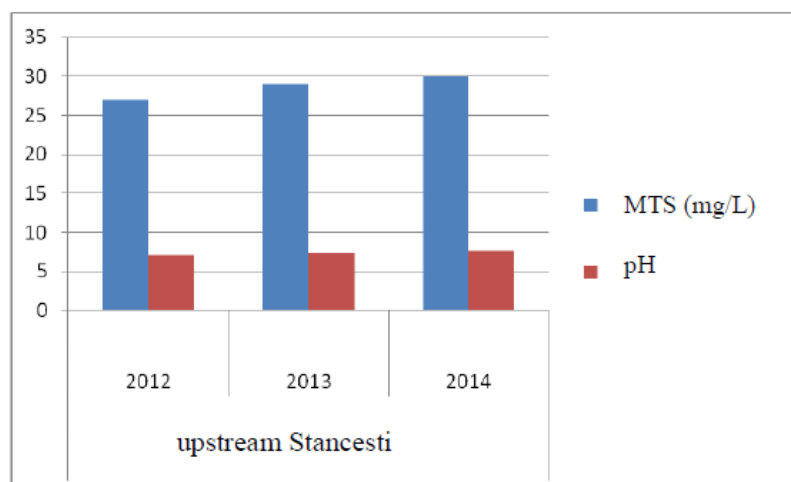
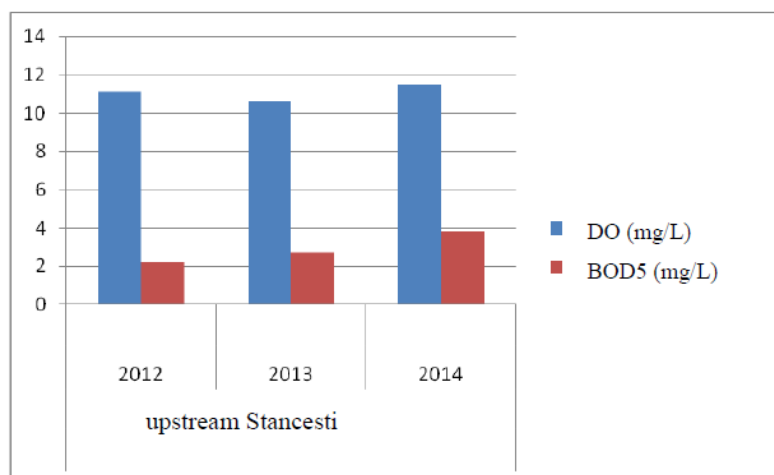
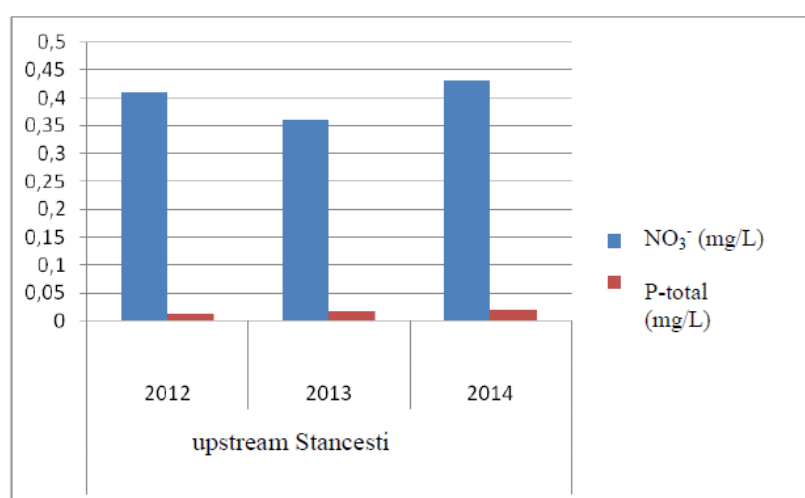
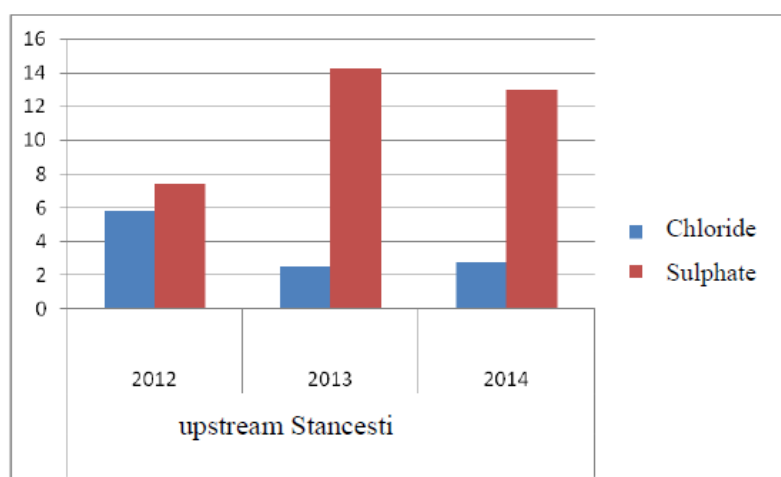


Fig. 5. Variation indicators pH and MTS (Amaradia river).

Fig. 6. Variation indicators DO and BOD₅ (Amaradia river).Fig. 7. Variation indicators NO₃⁻ and P_{total} (Amaradia river).Fig. 8. Variation indicators Cl⁻ and SO₄²⁻ (Amaradia river).

3. CONCLUSIONS

Evaluation of surface water quality in Gorj county is achieved by monitoring indicators of quality of watercourses and

reporting the obtained values to the normative 161/2006. In the study conducted during 2012-2014 were monitored temperature indicators, suspended solids, pH, nitrates, nitrites, ammonia, total phosphorus, dissolved

oxygen, biochemical oxygen, chlorides and sulfates for Gilort and Amaradia watercourses. Analysis of recorded data indicates the classification of rivers monitored in the first class of quality except Gilort river falling within second class of quality on chlorides and sulphates indicators. Monitoring surface water allows the four main objectives in the knowledge of the state of water quality, namely, monitoring, forecasting, warning and intervention. By monitoring water quality is assessed systematic water quality characteristics being in a permanent dynamic and significant social and economic implications.

Preventing water pollution can be provided from a system of supervision and rigorously control followed by implementing measures to reduce water pollution such as the widespread introduction of clean technologies in industrial processes, reducing the amount of wastewater discharged into rivers through introducing the practice of water recycling, recovery of useful materials from waste

water, thus having the advantage of ensuring true sources of raw materials, improve treatment efficiency through improvement of technologies, systems and operating them.

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