

MONITORING OF CONTENT THE NITRATES FROM UNDERGROUND WATERS OF VULNERABLE ZONES FROM MARAMURES COUNTY



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ABSTRACT. – Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources and Governmental Decision 964/2000 regarding the approval of the Action Plan to protect water against pollution by nitrates from agricultural sources are documents who stay the basis to compiling the „List with localities who have sources of nitrates from agricultural activities (vulnerable zones) ”.

In this List are included 13 localities from Maramures county, all identified as current sources.

Activity management of water resources requires first, information concerning the water quality conditions from the different sources of water. Supervision “of their health” consists, in fact, making continuous measurements and specific, a variety of operational activities and drawing final evaluation reports for environmental quality. Assessment of groundwater quality is reported with limits permitted of Law no. 458/2002 –“The Quality of Drinking Water”, and the Law no. 311/2004 – on amending and supplementing Law no. 458/2002.

This paper will present the evolution of concentrations of nitrates from groundwater drillings monitored during 2007–2009 in vulnerable areas of Maramures county.

Keywords: nitrates, pollution with nitrates, underground water, agricultural sources, drinking water

1. INTRODUCTION

Peculiarities of relief, hydro-geographical conditions and the basin history of mining extractions, characterizing Maramures county by a big diversity of historical or actuale pollutions and who, have frequently exceeded the maximum concentrations stipulated by law norms.

Monitoring with programs „of health” of groundwater and current statistics have revealed that the nitrate content in groundwater located in agricultural areas operated improperly recorded significant growth of this indicator. The content and distributions (on horizontal and vertical) of the nitrate in soil is dependent on many processes of transformation of nitrogen in soil, in different conditions.

Transporting nitrates into soil, due to their solubility, is made mostly with water infiltration. Quantities of water infiltrates depend on several factors: the

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ability of soil to retain water, the intensity, frequency and the distributions of rainfall, the phenomenon of evapo-perspiration, etc.

“Quantity of water, her movement in soil and her availability for plants are decisively influenced by characteristics of soil, in particular, of the clay content, degree of compaction, of internal drainage and of structurare degree.

Water, as vegetation factor, determine the quality of tillage and potentiates effects other elements of technology: sowing, application of fertilizer, etc., and these in turn affect the amount of water and his availability for plants.” [4]

Maramures county has 13 localities included in the “List with localities who have sources of nitrates from agricultural activities (vulnerable zones)” (Order 241/2005). [3]

The following table shown the 13 localities in the Maramures county:

No	Localities in Basin Rivers Somes* and Tisa**	Affected area (ha)	Type source (historical)
1	ARDUSAT *	1522	Current source
2	FĂRCAȘA *	1829	Current source
3	GROȘI *	565	Current source
4	REMETEA CHIOARULUI *	1194	Current source
5	SĂCĂLĂȘENI *	2136	Current source
6	SĂLSIG *	1575	Current source
7	SEINI *	2550	Current source
8	RONA DE JOS **	595	Current source
9	RONA DE SUS **	605	Current source
10	SĂLIȘTEA DE SUS **	955	Current source
11	SIGHETUL MARMAȚIEI **	1430	Current source
12	VADU IZEI **	495	Current source
13	VIȘEU DE JOS **	555	Current source

The resources of usable water from the basin Somes-Tisza fall within the average category, estimative to the approx. 550 m³/inhabitant/year, although the resources of total water are of 3,200 m³/inhabitant/year. [2]

The resources of water who can be technical usable out of basin Somes-Tisza is as follows: basin Somes = 150x10⁶ m³ of underground waters and the Tisza basin = 50x10⁶ m³ of underground waters. [2]

2. DATA ON THE CONTENT OF NITRATE FROM MONITORED GROUNDWATER

Groundwater Monitoring is made by System of Water Management from Maramures county; their quality is monitored by the Laboratory of Quality Waters of Baia Mare, which is accredited RENAR.



In the county of Maramures, in basin Someș catchment are monitored every six months, 14 underground drillings water.

In this study it was considered:

- drillings located on territory or near the localities on the list mentioned above from the basin Someș river : F1 – Hideaga, FI / II-Seini, F6 – Ariesul de Camp, FI / II – Sarbi, F3 – Salsig and
- the highest values determined for the considered year.

Chemical analysis of nitrates from groundwater was made in accordance with standard SR ISO 7890/3-2000 – “Water quality. Determination content the nitrates from water. Spectrometric method with sulphosalicylic acid. “

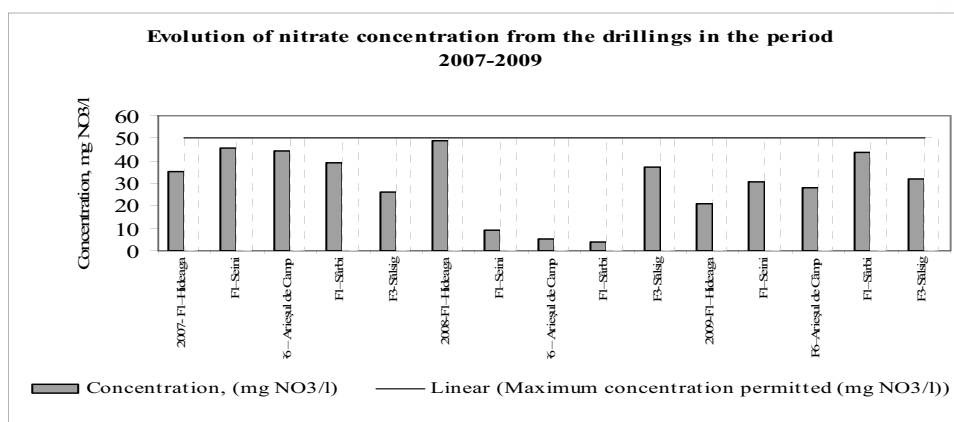
The concentrations of nitrates in drillings monitored are given in the table below:

Characterization of groundwaters

Year	Drilling monitored	Highest concentration determined, in% of CMA* (maximum concentration permitted) (mg NO ₃ /l)
2007	F 1AD – Hideaga	70.74
	FI/II– Seini	90.78
	F6 – Ariesul de Camp	88.14
	FI/II – Sarbi	78.28
	F3 – Salsig	51.84
2008	F 1AD – Hideaga	98.40
	FI/II – Seini	18.86
	F6 – Ariesul de Camp	9.98
	FI/II – Sarbi	8.44
	F3 – Salsig	74.14
2009	F 1AD – Hideaga	42.26
	FI/II – Seini	61.88
	F6 – Ariesul de Camp	56.32
	FI/II – Sarbi	87.86
	F3 – Salsig	63.84

* – maximum concentration permitted of the Law no. 458/2002 – “The Quality of Drinking Water”, and the Law no. 311/2004 – on amending and supplementing Law no. 458/2002, setting the content in water at maximum 50 mg NO₃/l

Evolution of nitrate concentrations from the drillings in the period 2007–2009 is highlighted by the chart below:



3. DISCUSSIONS AND CONCLUSIONS

It is known that one of the main factors who had direct consequences for soil pollution and groundwater pollution is wasteful use of various fertilizers.

Of “Annual Report of the Environment” for 2008, published on the website of The Environmental Protection Agency Maramures county I synthesized developments in the use of fertilizer and sanitary products in the table below. [2]

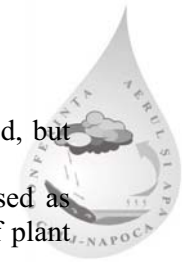
Evolution quantity of fertilizers and plant protection products used in Maramures county

Year	The nitrogen fertilizers, (kg active substance/ ha arable land)	Fertilizers (N+P ₂ O ₅ +K ₂ O) (kg/ ha arable land)	Manure, (kg/ ha arable land)	Plant protection products (herbicides, fungicides, insecticide, etc.) (kg/ ha arable land)
2005	1761	31.18	–	0,58
2006	1773	31.57	–	0,60
2007	2543	58.16	–	1,24
2008	1829	90.00	26,0	2,00

It is noted that in 2007 the amount of nitrogen fertilizer applied was an increase from the previous year, with 770 tonnes the active substance/ha of arable land and 26.59 kilograms of fertilizers (N + P₂O₅ + K₂O)/ha of arable land.

As consequence, the concentration of nitrate in the drillings from Ariesul de Camp and Seini almost achieve the maximum concentration permitted by law, but exceed.

In 2008 the complex fertilizers (N + P₂O₅ + K₂O) have the same trend of growth, while nitrogen fertilizers have a downward trend. Accordingly, only one of



drillings monitored (Hideaga) is very close to the maximum amount allowed, but not exceed.

It is noteworthy that appear monitored the quantities of manure used as fertilizer but, and that in 2008 increased by almost 4 times the quantities of plant protection products applied per hectare of arable land compared to 2005.

In conclusion, the drillings monitored by the Management System of Waters from Maramures county, in above mentioned areas, in the period 2007–2009 have not found the concentrations of nitrate who exceed permissible concentration, but is necessary careful monitoring of groundwater in these areas of the county.

The possibility and even, the contamination of groundwater is an issue impossible to ignore. We should be aware of this risk and protect them is absolutely imperative. That's why, the responsible factors take continuous appropriate measures to implement techniques responsible for the alignment of their quality levels supported by the EU until 2015.

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