ANTHROPOGENIC PRESSURE ON THE SOMEȘ-TISA BASIN

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Abstract. *Anthropogenic pressure was manifested in time due to human activity,where it came from emerging imbalances in the environment,expressing themselves by the air pollution,ground,subetrane and surface waters. This work is intended to describe the consequences on basin Someș-Tisa,because of negligence exploitation industry,agricultureand human settlements without be aware of environmental consequences and its resources on long term. Total area of the basin Someș-Tisa it is 22451,86 km2 representing 9,42% from country area.Hydrographical network include a total of 580 courses of cadastral water with a lenght 8.423 km and medium density of 0,35 km/km2. Industrial noxious are formed of various chemical substances running in atmosphere by the undertakings chemical, metallurgical, cement etc.In the years 2013-2015 at the level of basin Someș-Tisa a number of 41 industrialy sources have been identified as diffuse potentially significant pressures,belonging to the following sectors of activity: mining industry, urban waste management and industrial. Consequences which are described in this paper. In the basin Someș-Tisa the phenomenon of diffuse pollution is pronounced because of the fact that at the end of the year 2013 only percent of 54,79% from equivalence population was connected centralized sewerage systems. In period of the years 2013-2015 have been ascertain improve the situation on endowment with sewerage system and treatment plants wastewater of urban area, fact which led to reducing the effects of diffuse pollution from the sources urban pollution . To estimate modes of producing diffuse nutrient pollution and emissions of nutrients from sources and their contribution to total emissions was used model MONERIS.It quantifies the extent to which different categories of pollution sources in the total emission of nutrients. It presents the contribution of manufacturing modes of diffuse pollution with nitrogen and phosphorus for 2012-2015 having regard to atmospheric deposition: surface leak,leakage of drainage networks, soil erosion, groundwater flow, leakage from impervious urban areas. After analyzing and monitoring the basin Someș-Tisa for 2013-2015 period we can say that is gets an negative anthropogenic poluation because of agriculture, industry and human settlements by not use centralized sewerage systems, atmospheric deposition of nitrogen and phosphorus and other nutrients with.*

Key words*: basin Somes-Tisa,nitrogen,phosphorus,nutrients,preasure,poluation*

INTRODUCTION

Interest on this study comes from the fact that it is a global topic the pollution of our's environment, it is a phenomenon of human actions. The big cities, like the others, are formed along a river, a watercourse.

Reporting purposes on WISE sistems of evaluation methodsfor quality elements of water bodiesheavily modified and artificialwere createddistinct typological codes for this category, from typologywatercoursesfrom which they deriveriver, lake.

In accordance with requirementsWater Framework Directive, is considered significant pressures that pressures resulting innot achieving environmental objectives forbody of water studied.

Analysis and evaluation of potentially significant pressures, this analysis he had as a starting point pressures list identified on the Somes-Tisa hydrographic areaso, the identification of all types of pressure was carried aut concidering integration of data and information available infofmation from implementation processreporting requirements of the European Directives; data contained inpermits and authorizationsof water managementresults

of application tools modeling for nutrient emissions from point sources and diffuse; statistical data on land use; application of fertilizers; hydromor- works forming national infrastructure of water management.

MATERIALS AND METHODS

To establish the biotic typology was necessary monitoring data processingbeing investigatedphytoplankton and phytobenthos. As a resultof processing and analyzing dataconcerning the biological elements,some types of abiotic natural lakes they were grouped based on characteristics common biotic. The result of this process has reduced to 9 types, so: ROL01,ROL02,ROL03,ROL04,ROL05,ROL07,RLO08,ROL09,ROL10,ROL11 and ROL13.

MONERIS model (MOdelling Nutrient Emissions in RIver Systems) it's used for estimating emissions coming from diffuse and punctiform pollution sources. Research platform ANAR-Satu Mare, Somes-Tisa it was used for interpretation and processing of the obtained results from geographic space.

RESULTS AND DISCUSSIONS

Reporting purposes on WISE systems of evaluation methods for quality elements of water bodies heavily modified and artificial were created distinct typological codes for this category, from typology watercourses from which they derive. For water bodies heavily modified they were created 6 types and for artificial bodies 2 types. Consequence of consolidation type RO17 with RO18, to the hydrographic area Somes -Tisa are defined a number of 13 types watercourses Of the 25 ecoregions defined for Europe in Annex XI in the Water Framework Directive (Ilieș 1978), based on Environmental Characteristics and the geographical distribution of aquatic faunas indicated and in the first Management Planat Somes-Tisa hydrographic area two ecoregions were defined, namely: Carpathian Mountains Ecoregion 10, and Hungarian Plain Ecoregion.

To establish the abiotic typology reservoirs were considered the same parameters as the first River Basin Management Plan, namely: altitude which is located at the lake, catchment geology of the lake, the average depth of the lake and the retention time. To establish the biotic typology it was necessary processing of monitoring data, being investigated phytoplankton and phytobenthic. Based on the analysis of monitoring data abiotic types of reservoirs were reviewed, validated and regrouped based on characteristics common biotic. The result of the process was that the number of types was reduced from 14 to 7:

- by grouping ROLA01 with ROLA02 resulted new type of ROLA01.
- by grouping ROLA03 with ROLA04 resulted new type of ROLA02
- by grouping ROLA06 with ROLA08 resulted new type of ROLA04
- by grouping ROLA07 with ROLA10 resulted new type of ROLA05
- by grouping ROLA09 with ROLA11 resulted new type of ROLA06
- by grouping ROLA12 with ROLA13 and ROLA14 resulted new type of ROLA07

The old ROLA05 was named ROLA03. At the Somes-Tisa hydrographic area we have identified five types of ponds shown in Table 1.1.

Table 1.1.

Types of ponds in the Somes-Tisa hydrographic area

Type name	Characterization lake	Ecoregion	Altitude (m)	Average depth (m)	Alc.-geol. (meq/ I)	Retention time/ subtype
ROLA01	Plains,shallow,limestone / silicon	11, 12, 16	<200	3-15	silicon / limestone	Big ROLA01a
						Medium ROLA01b
						Small ROLA01c
ROLA04	the hillsides and plateaus, deep high limestone / silicon	10, 16	200-800	>15	silicon / limestone	Big ROLA04a
						Medium ROLA04b
ROLA05	the hillsides and plateaus, deep small limestone / silicon	10, 11, 12, 16	200-800	3-15	silicon / limestone	Big ROLA05a
						Medium ROLA05b
						Small ROLA05C
ROLA06	the hillsides and plateaus, deep very small limestone / silicon	10, 12	200-800	<3	silicon / limestone	Big ROLA06a
						Medium ROLA06b
						Small ROLA06C
ROLA07	mountain area, shallow and large, limestone / silicon	10	>800	3-15	silicon / limestone	Big ROLA07a
				>15		Medium ROLA07b

Given the results of the assessment of water status establishing significant pressures was conducted so: if the environmental objectives of the water body have been achieved, are not identified significant pressures; if environmental objectives have not been achieved, proceed to identify significant pressures. In the hydrographic area Somes-Tisa exist a number of 8 humans agglomeration (With less than 2,000 L. E.)Which are equipped with a centralized collection and a number of 8 human's agglomeration (With less 2,000 L.E.) with wastewater treatment plants. It states that during intense rain periods, not recorded events overtaking collection systems capacity of wastewater and rainwater. Industrial and agricultural pollution sources contribute to pollution of water resources, by evacuating of specific pollutants on the type of undertaken activity. So, they can evacuate: organic substances, nutrients(Food industry, chemicals industry, fertilizers industry, pulp and paper industry, animal farms etc.), heavy metals (mining and manufacturing industry, chemical industry etc.), like and hazardous organic micro pollutants (organic chemical industry, oil industry, etc.).

Point sources of pollution industrial and agricultural must comply with the requirements of Directive 2010/75 / EEC on industrial emissions(Integrated Pollution Prevention and Control)(IED Directive), Directive 2006/11/ECreplacing Directive 76/464/EEC looking pollution caused by hazardous substances discharged into the aquatic environment of the Community Directive looking protection of waters against pollution caused by nitrates from agricultural sources - 91/676/EEC, Directive 2012/18/CE regarding major accidents

(Directive SEVESO III),and the requirements of national legislation (GD 352/2005) amending and supplementing Government Decision no. 188/2002approving the rules on GD discharge conditions number 1038/2010 for amending and supplementing Government Decision no. 351/2005 Approving gradual elimination program of discharges emissions and losses of priority hazardous substances.

At the Somes-Tisa hydrographic area, taking into account the emissions inventory, discharges and losses of priority substances, of the 29 Industrial and agricultural point sources identified significant potential,7 have installations covered by Directive IED. Also, there are 22 industrial units other than establishments covered by Directive IED.After applying validation process significant potential pressure point- industrial and agricultural pollution sources with environmental objectives (status / potential ecological and chemical status of water bodies)at Somes-Tisa hydrographic area was identified a number of significant pressure point 19 (18 industrial and agricultural one).

- Pollution sources urban / urban agglomerations

In hydrographic area Somes-Tisa, diffuse pollution phenomenon's emphasized by the fact that the end of 2013, only a percentage of 54.79% of the population equivalent (agglomerations with more than 2,000 L. E.) was connected to central sewage systems. Of the 130 agglomerations (> 2000 L. E.) identified in 2013, a total of 37 agglomerations were equipped with sewer systems. Diffuse pollution contributes for 91 agglomerations with more than 2,000 L. E. not receiving wastewater collection systems, and a number of clusters 635less than 2000 L. Without collection systems, considered potentially significant pressures for water bodies that do not meet environmental targets. In the period 2013-2015 was found improve the situation regarding equipping with sewage and wastewater treatment plants in urban areas, this has led to the reducing the effects of diffuse pollution from urban sources of pollution / urban agglomerations. Improper management household waste in townships constitute an local diffuse pollution. As well, collection module/ sludge disposal derived from treatment plants can lead to pollution of water resources. Development of urban requires more attention from the point of view of collection household waste by building ecological landfills and elimination of uncontrolled waste disposal, often found alongside rivers and lakes. Following the application process of validation diffuse potentially significant pressures – urban agglomerations with environmental goals status / potential ecological and chemical status of water bodies at Somes-Tisa hydrographic area was identified a total of 119 urban diffuse significant pressure.

In addition to pressures exerted point, agricultural activities can lead to diffuse pollution of water resources. The ways in which pollutants (In particular nutrients and pesticides, and other pollutants)get into water bodies they are different (draining surface, percolation etc.). Diffuse pollution sources are represented in particular by:

- storage and use of organic and chemical fertilizers;
- farm animals;
- use of pesticides for pest control.

Data on quantities of fertilizer and the number of domestic animals at county or national level were taken from Romanian Statistical Yearbook 2013 (data for the year 2012).At the national level they were used in 2012 average specific quantities of fertilizers(expressed as active substance) of approx. 19.84 kg N / ha / year of agricultural land, approximate 7.73 kg PE / ha / in farmland; compared to 2006, the quantities of manure used dropped by approx. 10.78%.

Comparing specific quantities of fertilizers used in Romania the amounts used in the EU Member States, it appears that Romania is well below average.

In 2012, at Somes-Tisa hydrographic area equivalent number of animals (livestock unit) is estimated at approx. 0.611 million heads (representing an average density of 0.95 specific animal equivalent / ha agricultural area). The total amount of pesticides (all types) used in Romania in the 2000-2014 period was relatively steady, with average values of between 0.62 to 0.92 kg of active substance / ha / year.

- Nutrient emissions from diffuse sources

Diffuse pressures due to agricultural activities are difficult to quantify. Diffuse agricultural pressures affecting the quality of surface water and especially groundwater quality. By applying mathematical models can estimate the quantities of pollutants emitted by diffuse sources of pollution.

The MONERIS model (Modelling Nutrient Emissions in River Systems) is used to estimate emissions from stationary sources of pollution and diffuse.

MONERIS is used to calculate emissions of nitrogen and phosphorus in surface water retention and nutrient loads in rivers results at the district level of the Danube international, national and local. The model is suitable for several key management parameters in drawing up future management scenarios relevant to basin level and assess their impact on water quality.

In case of diffuse sources of pollution, estimate water pollutant loads is more difficult than for point sources, considering how different the production of pollution. In addition to the release point, MONERIS model considers the following ways (ways) to produce diffuse pollution - atmospheric deposition; - Runoff; - Leakage of drainage networks; - Soil erosion; - Groundwater flow; - Leaking from impervious urban areas.

In figures 1.1 and 1.2 shows the contribution of modes of production of diffuse pollution with nitrogen and phosphorus 2009-2012, given the ways listed above. It is noted that groundwater flow is the main way to diffuse emission of nitrogen and soil erosion presents the biggest contribution to diffuse phosphorus emissions.

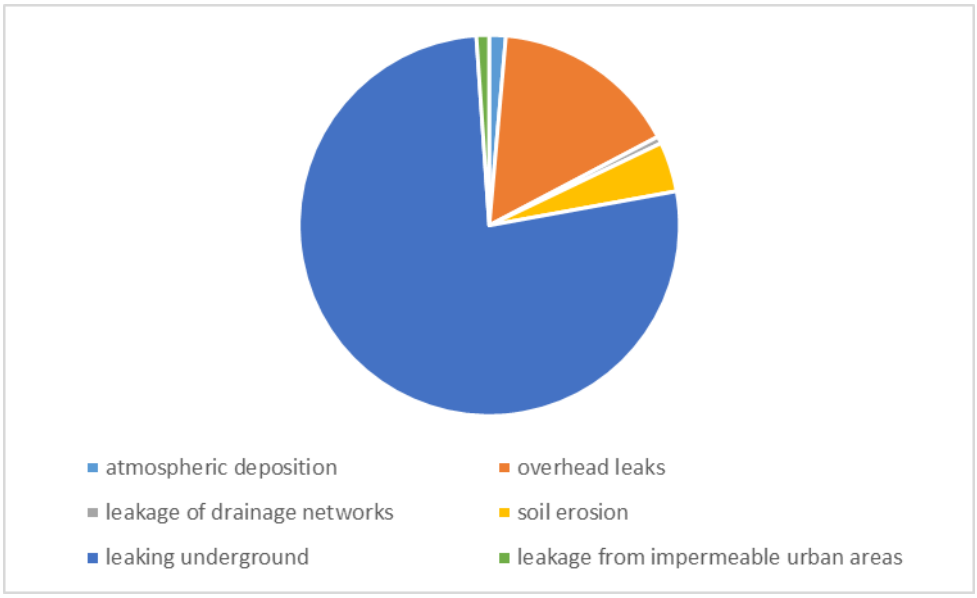

Fig. 1.1 Ways of producing diffuse nitrogen pollution in space Somes River Tisza

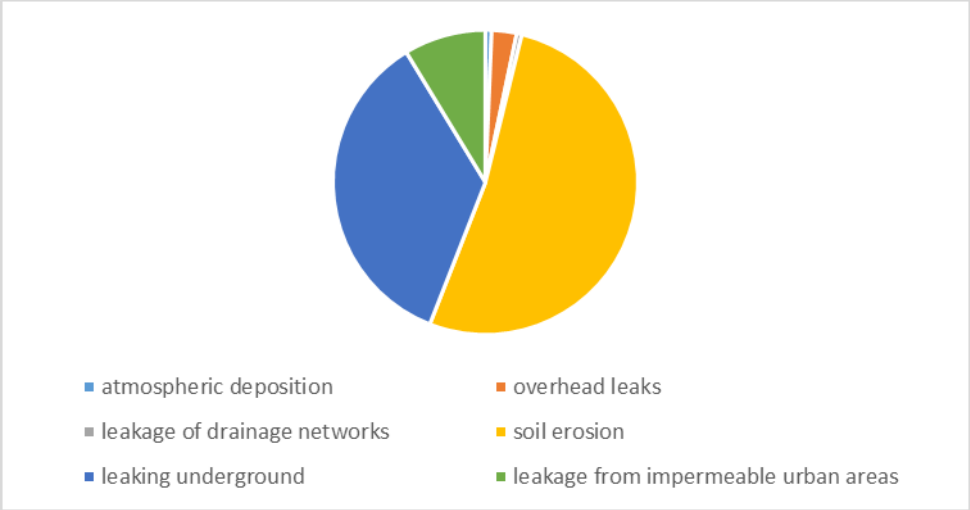

Fig. 1.2 Ways of producing diffuse phosphorus pollution in space Somes River Tisza

Also, the model quantifies the contribution MONERIS various categories of pollution sources in the total emission of nutrients. Such sources of pollution, these source categories are: agriculture, settlements (settlements) and other sources, and natural background.

Table 1.2 shows emissions of nitrogen and phosphorus from diffuse sources / point pollution, given the contribution of each category of sources of pollution. It is noted that about. 84% of emissions of nitrogen are produced by diffuse sources and approx. 16% of the emission point and approx. 73% of phosphorus emissions are produced by diffuse sources and approx. 27% of the emission point. The average specific surface diffuse emission of total nitrogen is approx. 4.18 kg kg N / ha, and phosphorous is 0.26 kg P / ha.

Table 1.2

Emissions of nitrogen and phosphorus in Somes-Tisa Basin

SOURCES	**Nitrogen Emissions**		**Phosphorus Emissions**	
	tone	%	**tone**	%
Agriculture	1.414,716	15,14	335,510	58,56
Settlements	100,940	1,08	49,804	8,69
Other sources	6.353,024	67,97	76,410	13,34
Natural background	1.477,832	15,81	111,192	19,41
Total diffuse sources	9.346,512	100	572,916	100
Total emission point sources	1.769,088	15,92	216,683	27,44
Total emissions	11.115,600	100	789,599	100

It is noted that about. 15% of the nitrogen comes from diffuse sources emitted from agricultural activities, resulting in specific emission of 1.27 kg N / ha agricultural land and 0.30

kg P / ha agricultural area. It is noted that about 9% of the total emission is due to diffuse phosphorus settlements / agglomerations.

Thus, between 2009 – 2012vit was reduced the number of agglomerations without sewerage system by building new sewage networks and increased access them and in agriculture has applied the provisions of Programmes of Action for the Protection of waters against pollution caused by nitrates agricultural sources and the Code of good agricultural practice.

Adding the contribution of point sources (diffuse sources and unit E-PRTR) the contribution of human settlements (diffuse sources), given that large establishments E-PRTR are located in the suburban area, it appears that the total intake of settlements (urban and industrial) is 1870 tons N / year which is approx. 17% of total emissions, respectively 267 tons P / year which is approx. 34% of total emissions. After applying the validation process pressures potentially significant diffuse - farming with environmental objectives (state / ecological potential and chemical status of water bodies) in the hydrographic area Somes-Tisa has identified a total of 31 significant pressure diffuse agricultural .

- Industry

The main pressures potentially significant - diffuse sources of pollution are the industrial activities of industrial sites and warehouses: warehouses for raw materials, finished products, ancillary products, waste storage of non-conforming units producing diffuse pollution accidents, abandoned industrial sites, etc.

In 2013, at the hydrographic area Somes-Tisa number of 41 industrial sources were identified as pressures potentially significant diffuse, of the following sectors: mining (tailings ponds, waste dumps) and management of urban and industrial waste. After applying the validation process pressures potentially significant diffuse - industrial activity with environmental objectives (state / ecological potential and chemical status of water bodies) in the hydrographic area Somes-Tisa has identified a total of 26 significant pressure loudspeakers

- Pressures significant hydromorphological

Hydromorphological criteria for identifying pressures Somes-Tisa River Area or pressure intensity, determined on the basis of abiotic parameters and their effect on biota. Abiotic morphological criteria for defining potentially significant pressures are shown in Table 1.3. They are structured taking into account the recommendations of the European Guidelines for reporting of the secound Area Management Plan -Tisa Somes River.

Hydromorphological types of potentially significant pressures identified in the Somes-Tisa hydrographic area are due to the following categories of works:

•Cross barring works located on the body of water - type dams, bottom sills, lakes - with effects on the hydrological regime, riverbed stability, transport sediment and biota migration, interrupting the longitudinal connectivity of the water body

• Work in river - type dams, agricultural area and fishery regulation work and strengthen banks, cuts meanders - the effects on vegetation of floodplain and areas of reproductive and longitudinal profile of the river, the structure of the substrate and biota, giving rise to loss of connectivity side

• Levies and derivatives - water intakes, and derivatives with minimal effect on flow, bed stability and biotics.

Table 1.3.

Abiotic morphological criteria for defining potentially significant pressures

Nr.crt	Hydro construction	Effects	Parameters reflecting pressure	threshold
1.	Sealing works a) transversal-bottomsills,dams	On the hydrological regime, sediment and biota migration	Density thresholds (nr/km)	>1
			Obstacle height (cm)	≥30
	b) reservoirs-exhaust pulse wave	The minimum flow and biota	Minimum flow in the river bed/ Q (%)	≤100
		on the hydrological regime, riverbed stability and flora	Gradient rising water levels (cm)/ h	≥50
2.	Works along river a) Dams, design agricultural, fishery,etc	The connectivity side, floodplain vegetation and breeding areas	Length dams/ 2X Long body of water (%)	≥30
			Affected area/floodplain area (%)	≥30
	b) Works on building and sides, cutting meanders	The longitudinal profile of the river, substrate structure and biota	Length work regularization/ 2X Long body of water (%)	≥30
3.	Fairways	On establishing bed and biota	Length fairway/ width bed (%)	≥30
4.	Water intakes, restoration uses, derivations	The minimum flow, bed stability and biota	Intake flow or returned/Multiannual average flow (%)	≥10
			Minimum flow in the river bed Q (%)	≤100

1) just consider migrating biota 2) * Q = Q95% (m3 / s) Q95% + 0.1 for> 200 l / s; Q * = 1.25 x Q95% (m3 / s) + 0.05 Q95% <200 l / s, S <3000 km 2; if S> 3000 km2 sanitary discharge will consider the accumulation of rules of operation. For pools with Q95% <0.1 m3 / s, Q * = 1,1xQ95%; Q95% - minimum monthly average flow annually providing 95% (m / s)

Somes-Tisa River in space have been identified potentially significant hydromorphological pressures:

• Reservoirs were identified by 13 lakes whose area is more than 0.5 km2. Accumulations were built with multiple purposes: flood protection, drinking and industrial water, energy, recreational, fishing. The most important reservoirs in space river Somes, Tisa are the accumulation Colibiţa the Bistrita River, accumulating Straits-Firiza on the river Firiza and the chain of reservoirs on the river Somes Mic formed lakes Fantanele-Belis, Tarniţa , and Gilau Warm Somes.

• Regularization and the regularization dams have a total length of 640 km, while those for impoundments have a total length of 704 km (388 km on the left bank and right bank 316 km of watercourses). The most important regularization works and dams are located on rivers Somes, Krasna and Tur.

The loop derivatives channels are in number of 17 and have a total length of 129.32 km. They were made for different purposes: to supplement flow in Fantanele, Tarniţa, Straits-Firiza Colibiţa and Vârşolţ, ensuring the requirement of process water for towns Zalau and Aghireş and capture / drainage of hydropower plants, producing significant changes in flow watercourses that works. Ensemble derivatives most important are: Iara (Lindru, Calu) - Dumitreasa, Black Creek (Negri) Dumitreasa, Dumitreasa - I Somes Cold, Cold Somes I - Răcătău, Răcătău - needle. Fantanele - Belis, Fantanele throughput in a volume of 130 million

m3. Of this volume, approximately 20 million m3 are taken from the Mures river basin. 7 channels are represented drainage channels / irrigation under management ANIF and 5 channels built for different purposes, designated as artificial water bodies.

At level spatially River Somes, Tisza, applying the criteria in Table 1.9 it's identified 84 pressures hydromorphological potentially significant Following the application process validation pressures potentially significant - alterations -hydromorphological with environmental objectives by bodies of surface water in the Area Somes-Tisza basin has identified a number of significant hydromorphological five pressures.

CONCLUSIONS

1. In this work was studied human impact on basin area Somes- Tisa for 2013-2015.

2. Sources industrial and agricultural pollution contributes to the discharge of pollutants specific to the type of activities performed as follows: organics, nutrients from food industry, chemical industry, fertilizers, pulp and paper, animal farms and heavy metals by the extractive industry and manufacturing , chemical and hazardous organic micropollutants.

3. In conclusion the phenomenon of diffuse pollution is accentuate because only 54% of the population equivalent at the end of 2013, was connected to central sewage systems.

4. Therefore it follows that the main potential significant pressures are the locations and industrial provisions.

5. After studies showed that morphological types of potential significant pressures , Somes- Tisa river are due to the following categories: works of the transverse sealing located on the body of water works along the river and samplings and derivatives.

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