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Significant punctiform and diffuse pressure in upper Crasna river basin

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Abstract. The preservation of healthy ecosystems which are biological valuable, whose actual status is convenient, as well as the improvement or transformation of those partially or heavily modified by anthropic interventions, should be targeted to achieve objectives of the ecological balance of any watercourse. The pressure on aquatic environment are generated by agglomerations, industry and agriculture, but also by hydromorphological area. In the upper of the Crasna basin the level of nutrient impurification due to human agglomeration sets a "sensitive" character for Crasna area and ranks the Crasna river in a lower class of quality. IPPC and NON IPPC industry generates dangerous substances, especially those on List II, which establishes the low state of the Crasna river. Dangerous substances cause toxicity, persistence and bioaccumulation in the aquatic environment. Impact of non-priority and priority pollutants, in terms of environmental impact is not distinct, therefore there is a tendency to pay attention to priority poluttants, even if non-priority substances create the gratest damages. Lack of clean technologies or non compliance with Best Available Technologies is the main cause of surface resource contamination by dangerous substances.

Key words: significant pressure, ecological balance, nutrients, dangerous substances.

Rezumat. Prezervarea ecosistemelor sănatoase și valoroase biologic, la care starea actuală este convenabilă, precum și ameliorarea sau transformarea celor parțial sau puternic modificate de intervențiile antropice, trebuie să constituie obiective țintă în atingerea echilibrului ecologic al oricarui curs de apă. Presiunile asupra mediului acvatic sunt generate de aglomerările umane, industrie și agricultură, dar și de hidromorfologia spațiului hidrografic. In bazinul superior al Crasnei nivelul de impurificare al aglomerarilor umane cu nutrienti stabileste caracterul "sensibil" pentru spatiul hidrografic și încadrarea râului Crasna in clasa inferioară de calitate. Industria IPPC și NON IPPC generează clasa de poluanți de tipul substanțelor periculoase, în special din lista II, care stabilește starea slabă a râului Crasna. Substanțele periculoase produc toxicitate, persistența și bioacumulare în mediul acvatic. Impactul poluanților prioritari și neprioritari, sub aspectul impactului de mediu, nu este distinct, fapt pentru care există tendința de a acorda atenție sporită poluanților prioritari chiar daca substantele non-prioritare crează cele mai mari deteriorări. Lipsa tehnologiilor curate și nerespectarea celor mai avansate tehnologii este principala cauză pentru impurificarea resursei de suprafață cu substante periculoase.

Cuvinte cheie: presiuni semnificative, echilibru ecologic, nutrienti, substante periculoase.

Resume. La préservation des écosystèmes sains et de grande valeur biologique, et l'amélioration et la transformation de partiellement ou fortement modifiées par l'intervention humaine, doit être l'objectif principal de parvenir à un équilibre écologique dans un cours d'eau. Les pressions sur l'environnement aquatique sont générées par les agglomérations, l'industrie et l'agriculture, mais aussi du bassin hydromorphologiques. Dans le bassin supérieur de Crasna niveau de contamination dans l'agglomération avec d'éléments nutritifs détermine sensibilité auxbassin et classe inférieure de la qualité pur Crasna River. IPPC et NONIPPC industrie génère catégorie de polluants comme des substances dangereuses, en particulier dans la liste II, qui établit le mauvais état de la rivière Crasna. Substances dangereuses causent la toxicité, la persistance et la bioaccumulation dans l'environn ement aquatique. Impact de la non-prioritaires et polluants prioritaires, ne se distingue pas, pour lesquels il existe une tendance à prêter attention aux polluants prioritaires, même si des substances non-prioritaires, nous créons le plus de dommages. Manque de technologies propres et l'échec des meilleures technologies est la principale cause de contamination de surface ressource avec des substances dangereuses.

Mots-clés: des pressions importantes, l'équilibre écologique, les nutriments, les substances dangereuses.

1. Introduction

According to the Water Framework Directive, significant pressure is considered to be the pressure that results in attainment of environmental objectives for water bodies studied. From the way the receiving system of water body works can know if a pressure can cause an impact. This approach correlated with the list of all the pressures and particular characteristics of the catchment leads to the identification of the significant pressures (Management Plan of Someș Tisa River Basin 2009).

Also in this Directive there are defined limits beyond which pressure can be called significant and substances and groups of substances to be taken into account. By applying the set of criteria imposed by the provisions of EU Directives have identified significant pressure point on the discharges of treated or untreated water in water resources.

The significant pressures are grouped according to:

a. Agglomerations identified according to the provisions of 91/271/EEC Directive concerning urban waste-water treatment, having over 2000 equivalent inhabitants, who have sewer systems with or without treatment plants and which drains in water resources; also agglomerations having under 2000 equivalent inhabitants are considered significant point sources if they have central sewage system;

b. Industry:

i. installations falling under the Directive on integrated pollution prevention and control - 96/61/EC (IPPC) – including units that are inventoried in Pollutants Emission Register (EPER) which are relevant to environmental factors – water;

ii. units which evacuate dangerous substances (list I and II) and/or priority substances beyond the limits of legislation in force 9in accordance with the requirements of Directive 2006/11/EC, which replaces Directive 76/464/EC on pollution caused by dangerous substances discharged into the aquatic environment);

iii. other units which releases into water resources and which do not conform to current legislation on water environmental factor;

c. Agriculture:

i. zootechnical farms under the Directive on the protection of waters against pollution caused by nitrates from agricultural sources – 91/676/EC.

2. Short description of the qualitative status of Crasna River Basin

The Crasna river basin, part of Someș Tisa area, identified as RO 07 water body by typology of water courses, is located in northwest of area, with surface of 2100 kmp and 54 coded water courses with total length of 708 km. The Crasna river has a length of 134 km from its source to the border with Hungary (Popa & Bud 2010).

The Crasna river hydrological regime is as follows: the multiannual average flow was 5.54 cubic meters s^{-1}, and monthly insurance rates 80%, 90% and 95% were of 0.33 mc s^{-1}, 0.21 mc s^{-1} and 0.14 mc s^{-1}.

In terms of groundwater resources inventory, are formed at a rate of 62.3% and 37.7% of the groundwater aquifer depth.

Summary of abiotic characteristics of RO07 is comprised in Table 1.

Table 1

The typology of water courses

Type	Parameters												
	Symbol	*Ecoregion*	Surface (km^2)	Geology	Lithological structure	Slope (‰)	Altitude (mdMN)	Rainfall (mm $year^{-1}$)	Temperature (^0C)	Flow ($L\ s^{-1}\ kmp^{-1}$)	Flow with 95% assurance ($L\ s^{-1}\ kmp^{-1}$)	Biocenotic type potential (fish)
Watercourse sector located in the plains	RO07	11	1000-3000	a-siliceous b-limestone c-organic	sand, shore, clay	<1	<200	400-500	9-11	1-3	0.2-0.4	*Leuciscus cephalus cephalus* (Linnaeus)

According to ecological zoning criteria for flowing waters proposed by limnology expert J. Ilies (1978), based on longitudinal geomorphologic and biological structures, the Crasna river may be included in ecological zone II potamon, the area surrounding the hilly parts and the plains of the river, where the temperatures range between cold / stable and hot / unstable, and the nature of the water varies between oligotrophic and eutrophic.

The ecological area of the rivers is also defined on the basis of the particular ichthyic fauna in accordance with the variables of abiotic (physical-chemical) and biotic (biocenotic) factors (Bănărescu 1964; Bușniță 1967; Brezeanu 1996).

The ecological status represents the structure and function of aquatic ecosystems and it is defined in accordance with Annex V of the Water Framework Directive, through elements of biological quality, physicochemical and hydro-morphological general elements that support the biological ones, as well as specific pollutants (the synthetic and non-synthetic ones).

In terms of abiotic factors, the quality of the Crasna river in the studied area shows all characteristics of a body of water in "very good" environmental status, with slight contamination levels due to sporadic farming activities, while at the border area the quality of the water deteriorates to "poor". The intake of pollutants from human settlements alongside the water course and its tributaries, the lack of appropriate sewage and wastewater cleansing infrastructure, the many diffuse sources of contamination whose contribution is difficult to quantify, nitrate-vulnerable areas due to farming activities and not least the hydro-morphology of the river featuring low slope drainage and insufficient dilution of pollutants constitute the causes of the Crasna's contamination and change in ecological balance (Popa & Bud 2010).

In the case of the Crasna river, the continuous stress source is represented by its nutrients (ammonium and phosphorus), particularly in the section between Supur and Berveni, highlighted by Someș Tisa Water Basinal Administration monitoring for compliance with Order 161/2006 of Environmental Ministry:

- Ammonium concentrations from 0.53 mg L^{-1} to 1.88 mg L^{-1}, compared to limit 0.8 mg L^{-1} corresponding quality class II (good chemical status),
- total phosphorus concentrations from 0.401 mg L^{-1} to 0.911 mg L^{-1}, compared to limit 0.4 mg L^{-1} corresponding quality class II,

- nitrites concentrations from 0.040 mg L^{-1} to 0.173 mg L^{-1} and to 0.404 mg L^{-1}, compared to limit 0.03 mg L^{-1} corresponding quality class II.

3. Significant pressure point

In the Crasna river basin there are identified a total of 63 water uses which are using surface water resources as a receiver of discharged water, based on a operating system monitoring certified by Someș Tisa Water Division Laboratory. After analyzing the point sources of pollution, taking into account the criteria mentioned above, have resulted in a total of 47 significant point sources (7 urban, 35 industrial and 5 agricultural). From the quantitative point of view these sources of pollution evacuated in the surface resource area, in 2009, a total volume of sewage of 7.747 million cubic meters, of which only a volume of 3,820 million cubic meters has been sufficiently treated, estimation made by Someș Tisa Water Division in "Annual summary of water quality protection".

In Table 2 there are presented the categories of wastewater discharged into surface resource and the volumes for the year 2009 discharged.

Table 2

The categories of wastewater discharged into surface resource and the volumes for the year 2009 and discharged (million cubic meters)

TOTAL (million cubic meters)	NO NEED PURIFICATION (million cubic meters)	NEED PURIFICATION			
		Not purified (million cubic meters)	Be purified (million cubic meters)		
			Total (million cubic meters)	Insufficient (million cubic meters)	Sufficient (million cubic meters)
7.747	0.497	2.881	4.369	0.549	3.820

The most representative activities developed are most related to human congestion management and metallurgical industry, for this reason the volume of water discharged from these areas are relevant, too.

Share pollutant-generating activities in the Crasna upper basin is featured in Figure 1, depending on the type of activity performed and the volume of wastewater discharged into the emissaries.

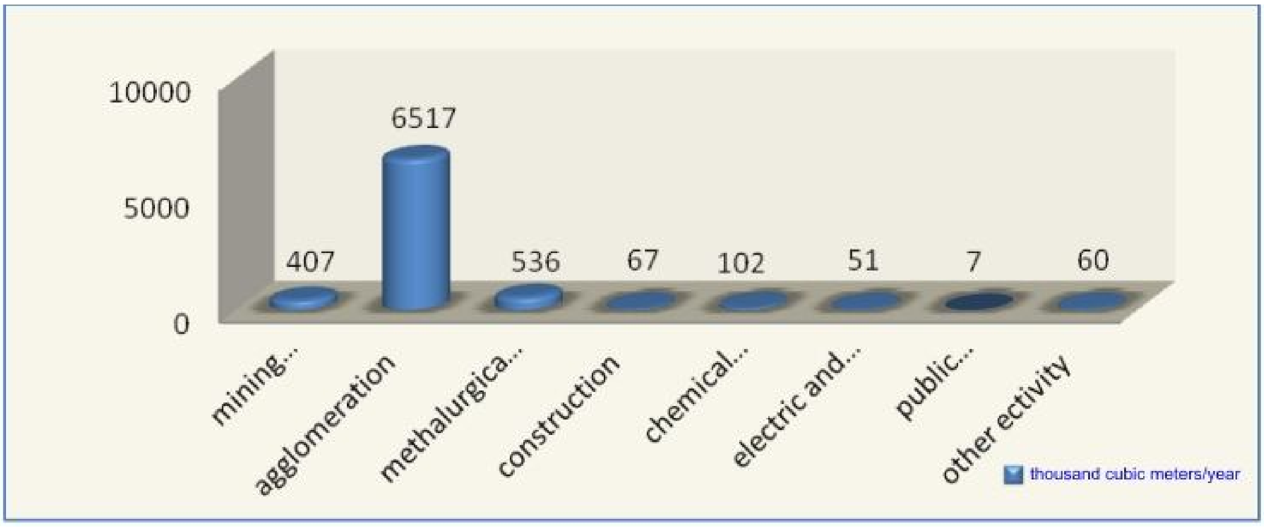

Figure 1. The type of activity performed and the volume of wastewater discharged into the emissaries.

These activities are reflected in the nature of pollutants discharged into surface resource. The nature and quantity of pollutants discharged into the upper basin of the river Crasna are shown in Figure 2.

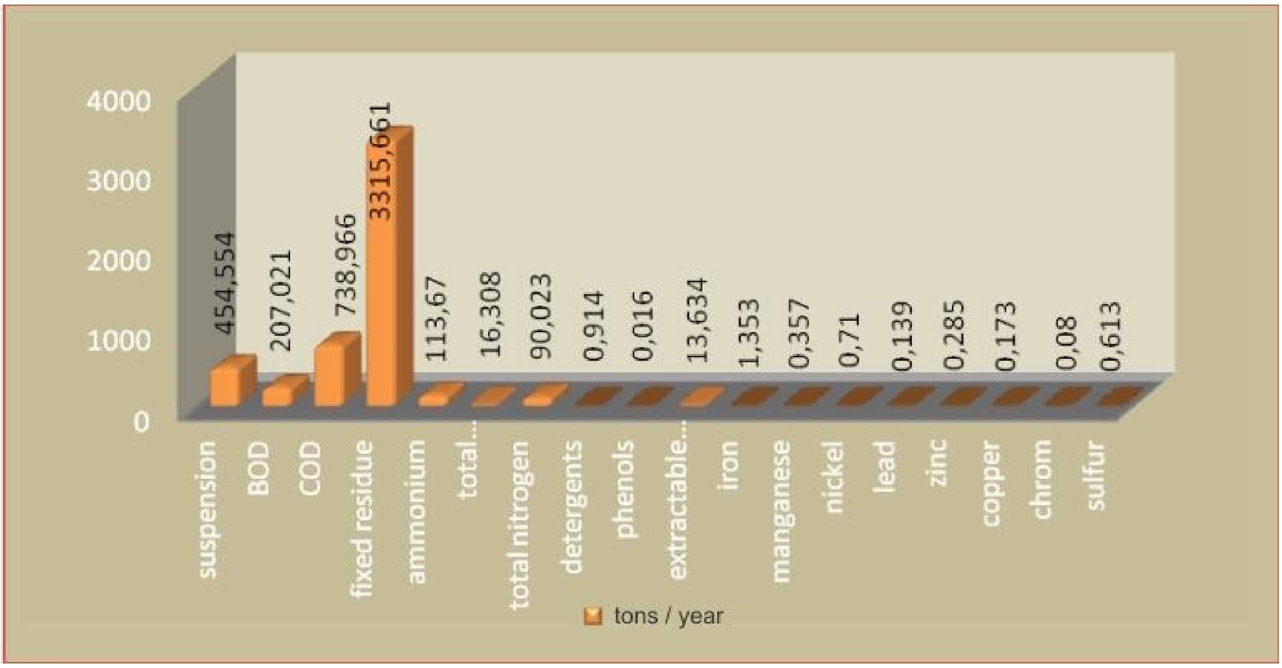

Figure 2. The nature and quantity of pollutants discharged into the upper basin of the river Crasna.

From a quantitative point of view the components of the fixed residue and of the oxygen regime, have a significant increase compared with the other elements, nutrients and heavy metals, and they are those which are felt acutely in aquatic ecosystems, diminishing their role in maintaining a clean environment.

3.1. Urban/human agglomerations pollution sources

In general, in accordance with the requirements of the Directive on Urban Waste Water Treatment (Directive 91/271/EEC), urban wastewater that may contain domestic wastewater or mixtures of domestic wastewater, industrial and rain water are collected by seweage systems, led to the treatment plant and then discharged into water resources, by compliance with maximum allowable concentrations. Romania obtained a transition period for implementation of this Directive by more than 12 years of membership (31 December 2018) because, there are agglomerations that do not conform to these requirements.

Urban wastewaters contain, in particular suspended solids, organic matter, nutrients, but other pollutants like heavy metals, detergents, petroleum hydrocarbons, organic micropollutants, etc. depending on the types of industry existing in the human agglomeration, and the level of pre-treatment of industrial wastewater collected (Management Plan of Someș Tisa River Basin 2009).

In accordance with the Plan of Implementation of Directive 91/271/EEC concerning urban waste water, in hydrographic area of Crasna there are a total of 11 agglomerations (>2000 equivalent inhabitants) with a total organic loading of 126181 equivalent inhabitants.

In Table 3 is shown both the number of congestions (>2000 e.i.), also the stage of endowment with wastewater treatment plants, considering filling of biodegradable organic, expressed in population equivalents, in the middle of 2009.

Table 3

Situation of human congestion, waste water treatment plants, as well as total organic loads, collected and treated in the upper basin of Crasna.

Agglomerations size	Number of agglomeration	Nr. of treatment plant	Total organic loading (e.i.)	Total organic collected (e.i.)		Total organic treated (e.i.)	
				e.i.	%	e.i.	%
15000–150000 e.i.	2	2	86413	67966	78.7	59850	69.3
2000-10000 e.i.	11	2	39768	3292	8.3	3292	8.3
Total	13	4	126181	71258	56.5	63142	50.1

It mentions that there are a total of 9 agglomerations (>2000 e.i.) that are not yet equipped with wastewater treatment plants, and the total number of wastewater treatment plants none do comply with any legislative requirements.

Figure 3 shows the human agglomeration (>2000 e.i.) and the degree of connection to the collection system, and figure 4 shows the human agglomeration (>2000 e.i.) and the type of existing treatment plants.

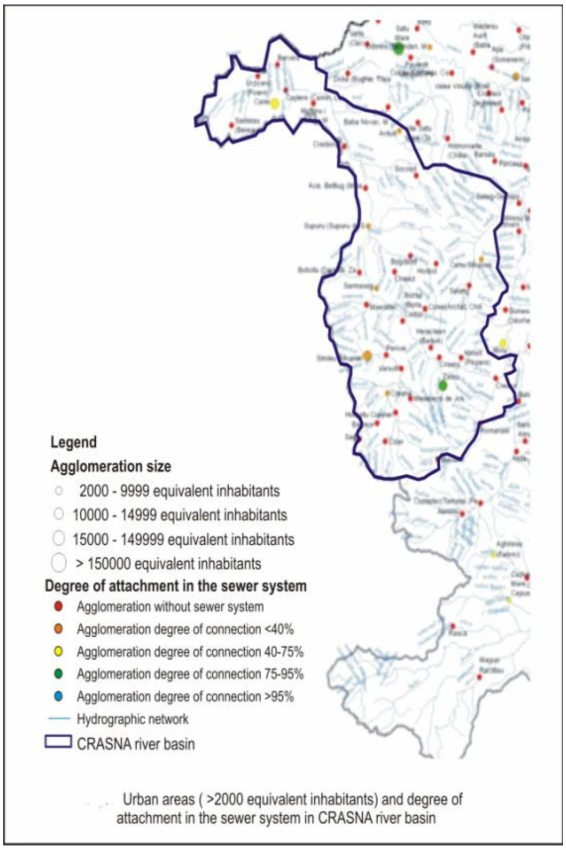

Figure 3. The human agglomeration (>2000 e.i.) and the degree of connection to the collection system.

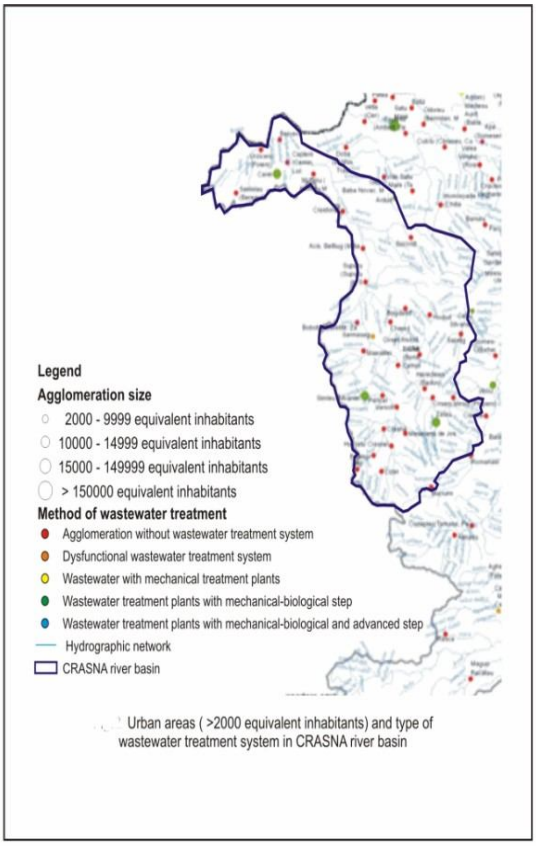

Figure 4. the human agglomeration (>2000 e.i.) and the type of existing treatment plants.

In terms of pollutant discharges into surface water resources, the Table 4 shows the monitored quantities of organic substances (expressed as BOD5 and COD-Cr) and nutrients in 2009 by categories of agglomeration. Also, Table 5 shows the same situation, considering the amounts of metals discharged and monitored.

Table 4

Discharging of organic substances and nutrients in the water resources from human agglomerations in the upper basin of Crasna

Agglomerations types/pollutants descharges	Chemical Oxygen demand (COD)	Biological Oxygen demand (BOD)	Total Nitrogen (Nt)	Total Phosphorus (Pt)
	t $year^{-1}$	t $year^{-1}$	t $year^{-1}$	t $year^{-1}$
10.000 – 100.000 e.i.	177.88	29.114	28.47	8.738
2000 - 10000 e.i.	18.29	5.132	3.497	0.21
Total	196.17	34.246	31.967	8.948

Table 5

Discharging of heavy metals in the water resources (kg $year^{-1}$) from human agglomerations in the upper basin of Crasna

Agglomerations types/pollutants descharges	Copper (Cu)	Zinc (Zn)	Cadmium (Cd)	Nickel (Ni)	Lead (Pb)	Mercury (Hg)	Chromium (Cr)
10.000 – 100.000 e.i.	102.5	-	-	11.76	15.69	-	136.66
2000 - 10000 e.i.	-	-	-	-	-	-	-
Total	102.5	-	-	11.76	15.69	-	136.66

The most important agglomerations (> 10,000 e.i.), in the upper basin of the Crasna river are:

- **Zalău**

Domestic wastewater and the most industrial wastewaters from units (59522 e.i.) are collected in sewers (with a length of 102.3 km) and discharged into Zalău Valley by two discharges, one of which is no treated (direct discharge) and other within the plant fitted with mechanical and biological steps. Exhaust flow through waste water treatment plant was 154,490 L s^{-1} and through direct discharges was evacuated. There were overtaking indicators: ammonium, copper and nitrogen.

- **Șimleu Silvaniei**

Some of the wastewater, sewage and industrial water from the units (6552 e.i.) are collected in the sewage system (with a length of 13 km) and discharged into the river Crasna by a single outfall within the wastewater treatment plant fitted with mechanical and biological steps belonging to Someș Water Company – District. The wastewater treatment plant exhaust flow was 31.520 L s^{-1}. There has been exceeded only the nitrite indicator.

3.2 Industrial and agricultural pollution sources

Industrial and agricultural pollution sources contribute to pollution of water resources by evacuating the specific pollutants for every type of activity. Thus, the organic matter, nutrients (food industry, chemicals, fertilizers, animal farms etc), heavy metals, (metallurgy, chemical industry etc), inclusive dangerous organic micropollutants (organic chemical industry, petroleum industry etc) can be discharged. Industrial and agricultural point sources of pollution shall comply with the Directive 96/61/EC concerning integrated pollution prevention and control, Directive 2006/11/EC, replace Directive 76/464/EC about the pollution due to discharges of dangerous substances in the aquatic environment, Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.

To implement the Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources, the Research Institute for Pedology and Agrochemistry (ICPA) with Romanian Waters National Administration (ANAR) considering prevision of Government Decision 964/2000 approving the Plan of Action for the protection of waters against pollution caused by nitrates from agricultural sources identify areas vulnerable.

Areas vulnerable in the Crasna basin are divided into two sub-areas:

- the Transylvania Plateau vulnerable area comprising a surface area of 31.94 kmp, which accounts 24.88 kmp agricultural area

- Someș vulnerable area which includes the lower Bobota - Sărmăşag, 126.8 kmp in area, which accounts for 84.89 kmp agricultural area

Units with livestock profile have implemented best practices in the field, especially if they are in vulnerable areas where regional-specific conditions are dominant.

Representative for the upper Crasna basin are poultry breeding farms, generating solid sludge used to fertilize agricultural land in the conditions imposed by good agricultural practices, which establish that application of solid sludge is depending on the level of nitrogen in the sediment and the affordability for the nitrogen in the soil.

To implement the Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community, Romania obtained a transition period of three years (December 2009), considering certain industrial units which release cadmium and mercury (27 units al national level), hexachlorocyclohexane (3 units) and hexachlorobenzene, hexachlorobutadiene, 1,2-dichloroethane, trichlorethylene and trichlorobenzene (21 units), substances that are part of List I to this Directive.

By definition the dangerous substances are those substances or groups of substances that are toxic, which tend to be persistent and bio accumulated while priority substances are substances that represent a significant risk of pollution for the aquatic environment and for humans via water and land use.

Their effect on the quality of water courses can be summarized:

- aesthetic: visual and odor
- temperature: usually high
- oxygen deficiency: lack of oxygen in water influences on aquatic life
- toxicity: acute or chronic damage to aquatic life and human
- sublethal toxicity: disruption of development and biodiversity change
- acidity / alkalinity: pH disturbance regime
- eutrophication: the nutrients cause excessive growth of organisms

Monitoring substances in List I is more stringent than those on List II, marking a change in approach by applying the precautionary principle and best practice in eliminating these substances. Because there are uncertainties about the long-term effects on the environment caused by substances in List I, the target objective is to reduce their concentration as damage caused to the aquatic environment.

Monitoring substances in List I has been applied in the upper basin of the Crasna river, to those industries which have high susceptibility to generate in the effluent of this class of chemical compounds. Regarding organic micropollutants monitored in industrial effluents and human activities, quantities identified were in microgrames, usually just below the detection limits of the approved special equipment, the variety of their being imposed on raw materials used or the activity profile, so, until now, it is estimated that the resource area is not affected by this class of compounds. Monitoring was provided by specialized laboratory of Someș Tisa Water Division.

Among the monitored substances, chloroform was revealed in most cases. Unjustified, the chloroform $CHCl_3$ was identified in its non-specific activities, as a result of its use in technological processes of water taken from the centralized urban system, water previously treated with liquid chlorine disinfection. Thus this compound was found in discharged effluents in both resource area and in urban network operator, and in activities that have generated it are from the areas of administration of human agglomerations, metallurgy, rubber and wood. The level of effluent charge of these activities is featured in figure 5. Emission limit for chloroform in the resource area is 0, according to Government Decision 351/2005.

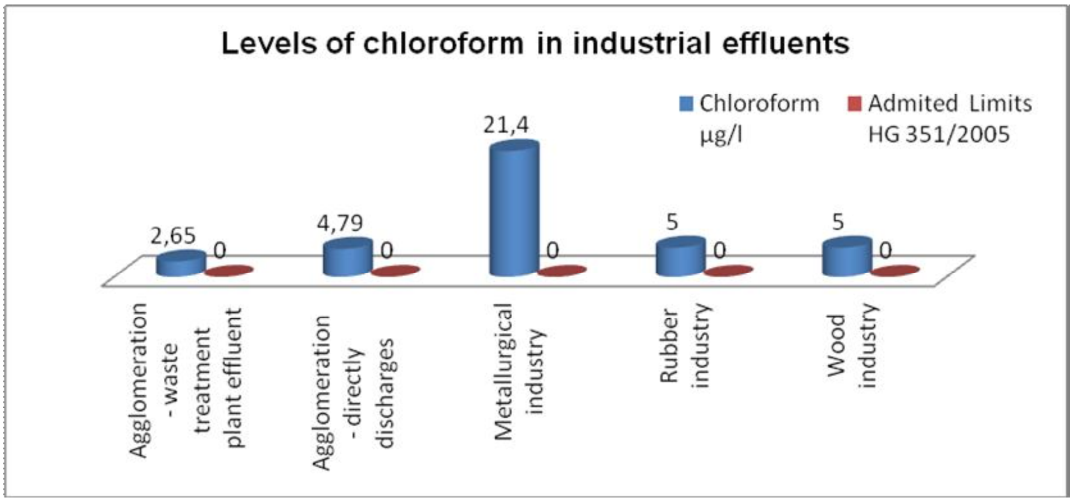

Figure 5. Levels of chloroform in industrial effluents.

The Carbon tetrachloride (Limit of Government Decision 351/2005 - 0 mg L^{-1}) was highlighted in the case of activities such as metallurgical, wood and rubber production, which are using water from the public network of drinking water, this indicator being itself a byproduct of the disinfection process. Have also been identified 1,2 dichloroethane, trichlorethylene, trichlorobenzene, hexachlorobenzene and hexachlorobutadiene, from the List I, in effluents of metallurgical activities and in rubber production, without exceeding the maximum limit permitted by Government Decision 351/2005.

Regarding cadmium and mercury, the monitoring revealed, for all existing activities, that the parameters were inside the permitted range, 0.2 mg L^{-1} for cadmium and 0.05 mg L^{-1} for mercury.

Figures 6, 7, 8, will illustrate each of the analytes of effluent charge for the activities monitored.

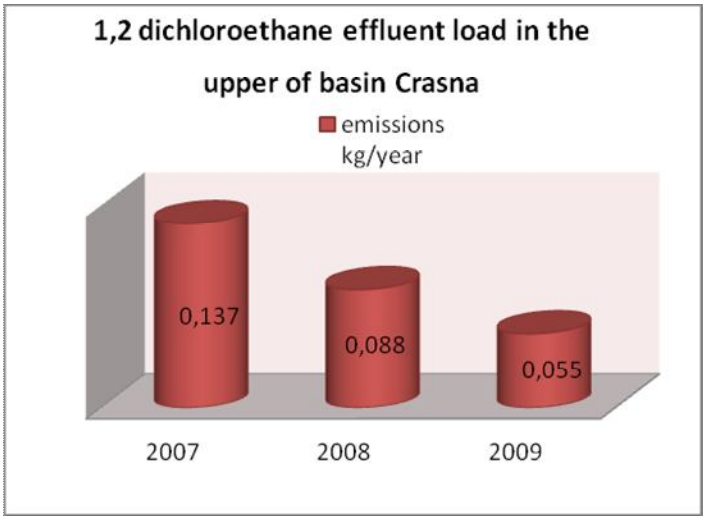

Figure 6. 1,2 Dichloroethane present in effluents.

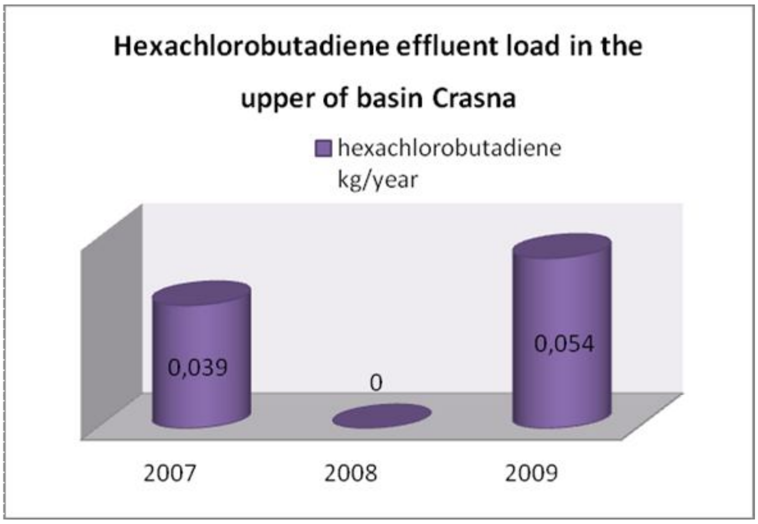

Figure 7. Hexachlorobutadiene present in effluents.

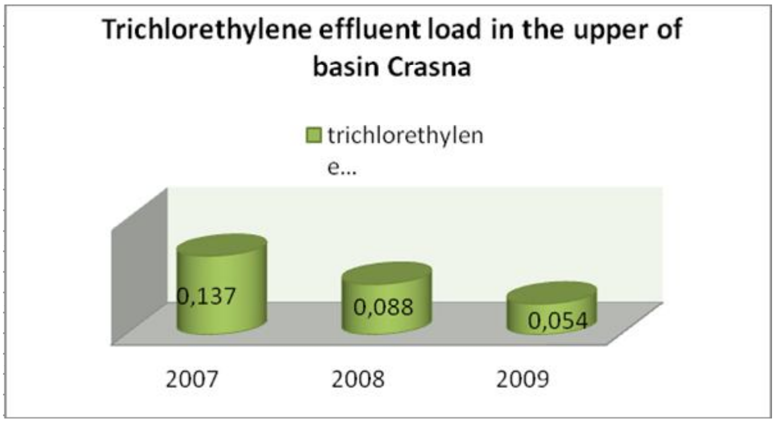

Figure 8. Trichlorethylene present in effluents.

The monitoring of substances from List II included both heavy metals and organic micropollutants. It was applied to activities susceptible to generate them, including industrial areas and having a wider range of parameters (Popa & Cosier 2009). Even if the monitoring revealed the presence of these substances under the maximum limits (set by Order 161/2006) or even below the detection limit of the equipment used for determination,for some parameters, and especially for some heavy metals (lead, zinc) cumulative effect of the effluent content produced direct negative effects on the emissary.

Figure 9, 10, 11, 12, 13, shows for each of the analyzed substances from List II, the level of effluent charge for the activities monitored.

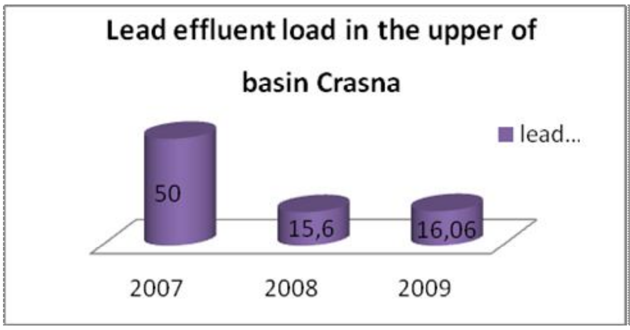

Figure 9. Lead prezent in effluents.

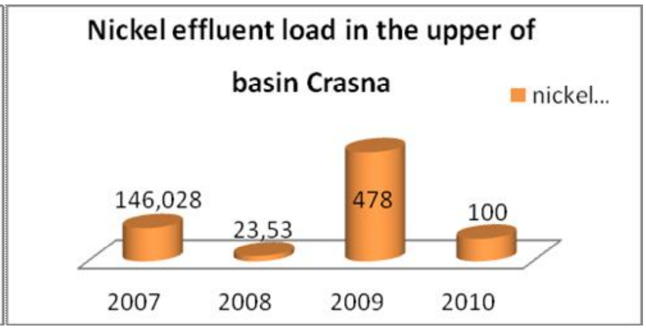

Figure 10. Nickel prezent in effluents.

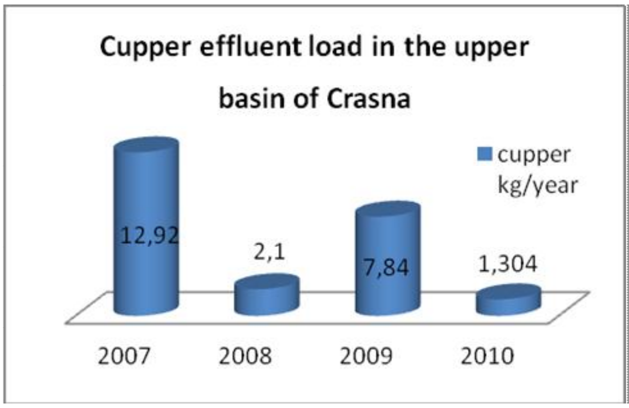

Figure 11. Cupper present in effluents.

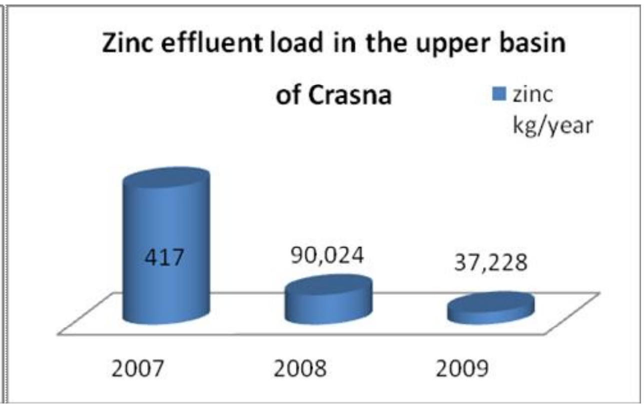

Figure 12. Zinc present in effluents.

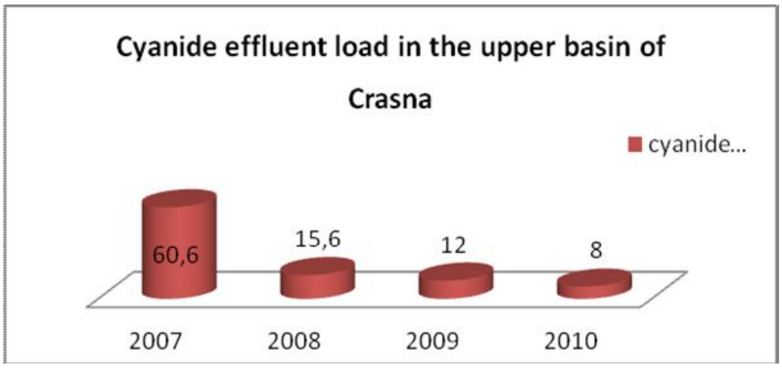

Figure 13. Cyanide present in effluents

For installations falling under IPPC Directive 96/61/CE, Romania obtained transition periods between 2 and 9 years (up to December 2015).

The aim of integrated system is implementing measures to prevent or reduce emissions to the atmosphere, water and soil, including waste management measures, for the activities listed in Annex I of this Directive, in order to achieve a high level of environmental protection as a whole.

Among specific requirements on an integrated approach, In accordance with Directive 96/61/EC, which are fully implemented by Government Order 152/2005 on the prevention, reduction and integrated control of pollution, include those relating to:
- Pollution Prevention Measures, use energy efficiently and minimizing the amount of waste products, in order to comply with Art. 3 of Directive 96/61/EC;
- Determination of emission limit values and technical parameters based on BAT (art. 9.18, Annex I, II and III of Directive 96/61/EC);

- Special measures for protection of air, water and soil quality (art. 8 of Directive 96/61/EC);

Necessary measures to implement the IPPC Directive, refers to implement of clean technologies and best available technologies in the field, so that the effluent is complying with the permissible limits. Of the 47 significant industrial and agricultural point sources, from Crasna area, 7 have installations falling under IPPC Directive, one of them, from metallurgical industry obtained transition period until 31.12.2013 to achieve compliance.

Industrial effluents, generally, are discharged in sewer systems after pre-treatment, and accounts for approx. 30% of the total wastewater treatment plant taken over. Content of effluents referes mainly to heavy metals and organic micropollutants and the load is minimal.

Instead, for rain water coming from industrial sites without appropriate treatment, pollutants are picked up through the rain network and then discharged in resource area.

3.3. Diffuse sources of pollution

Main categories of diffuse sources of pollution are:

a. **Agglomerations** that haven't sewage systems and adequate systems of collection and disposal of sludge from wastewater treatment plants, and towns that have municipal waste landfills do not comply.
b. **Agriculture**: agrozootechnical farms which do not have adequate storage of manure, units that use pesticides and do not comply with current legislation.
c. **Industry**: raw material deposits, finished products, auxiliary products, noncompliant waste storage, units that produce diffuse pollution incidents, abandoned industrial sites.

Urban pollution sources / agglomerations

Diffuse pollution, upper Crasna catchment area is accentuated because 50.1% of the equivalent inhabitants (agglomerations>2000 s) are connected to centralized sewerage systems and treatment plants.

Improper management of household waste in the villages accounts diffuse pollution. Also, the collection / disposal of sludge from wastewater treatment plant may lead to pollution of water resources.

Development of urban areas require greater attention in terms of household waste collection by building ecological landfills deposits, so that waste can be removed even from areas adjacent watercourses.

Agriculture

Besides point pressures exercised, agricultural activities can lead to diffuse pollution of water resources. Ways by which pollutants (especially nutrients and pesticides, and other pollutants) get into water bodies are different (surface drainage, percolation). Diffuse pollution sources are represented in particular:

• Storage and use of organic and chemical fertilizers;
• Increasing domestic animals;
• Use of pesticides to control pests.

The main diffuse pollution sources are located in the perimeters of settlements in vulnerable areas and potentially vulnerable, identified in according with provisions of 91/676/EC Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources.

Quantities of manure used were about 8, 30 kg nitrogen by hectare of agricultural land and 3.38 kg phosphorus / hectare of agricultural land. Livestock inventory was 82.746 thousand heads, approx. 0.47 heads / hectare farm.

In terms of chemical fertilizers, about 528 hectare of agricultural land is treated with harmful substances, irritable without significant toxicity (4800 kg). To obtain a high effect in terms of water resources protection, risk reduction measures are necessary in handling and storage of fertilizers, and pesticide residues neutralization.

Nutrient emissions from diffuse sources

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

In the case of diffuse pollution sources, water pollutants load estimation is more difficult than for point sources considering different ways in which pollution occurs. Beside the emission point, diffuse pollution can be achieved by sedimentation of particles from atmosphere, surface runoff, flow of drainage networks, soil erosion, leaking underground, leakage from impermeable urban areas.

It is estimated that approximately 34% of total emission due to diffuse agglomerations, agriculture contributing about 316 tons per year, which represents a specific emission of 0.28 kg ha^{-1} agricultural area (Management Plan of Someș Tisa River Basin 2009).

3.4. Significant hydromorphological pressure

Information about the types and size of hydromorphological pressure are required to be known and monitored in order to identify heavily modified water bodies.

The river's hydro-morphology is influenced by the infrastructural developments carried out, leading to degradation in specially prepared areas, erosions of the side and bottom of the minor riverbed, especially in periods of flooding with increased speeds of the water flow. Furthermore, in the dammed, plains areas, significant clogging of the riverbed may be observed, leading to artificially high groundwater levels and, thus, phenomena of high salt contents in the ground. Infrastructural elements separate the river from the floodable meadows, leading to the withdrawal or even disappearance of wetland sections, thus altering pre-existing ecosystems, initially dependent from their connection to the riverbed. Therefore, due to the impoundment of the Someș River downstream from the confluence with Homorodu Nou (Satu Mare county) over a length of 22 km to the border with Hungary and the execution of drainage and irrigation canals on the Crasna and the tributaries of the Someș and the Crasna, the Eced wetland area has significantly dropped in size, from 285.7 km^2, to an area bounded by rivers Someș and Crasna.

In the Someș-Crasna basin, infrastructural developments have been carried out for 22.82% of the entire length of the Someș-Crasna hydrographic network and 63% of the Crasna river has been subjected to such developments (Management Plan of Someș Tisa River Basin 2009).

The environmental consequences of building dams and lakes are multiple. As a result of such works, a flowing water system has been transformed into a relatively stagnant aquatic system, and in the case of lakes with great depths and surfaces, the vertical stratification involves multiple biological consequences, among which the changing structure and functions of the inhabiting populations are probably the most notable.

4. Conclusions

The anthropogenic pollution is primarily responsible for intake pollutants such dangerous substances in resource area, having a permanent character by the discharge of municipal and industrial wastewaters, or accidentally by unexpected spills of toxic industrial or agricultural origin. Also, acute anthropogenic pollution can cause severe shock on aquatic organisms and destruction their habitat, while the chronic anthropogenic pollution, when pollutants dispersion is diffuse, cause changes in trophic structure by slow and progressive disappearance of some species.

Agglomerations, as point and diffuse pressure, cause contamination of surface resources by organic substances and nutrients, establishing "sensitive" character for entire Crasna area, in terms of Directive 91/271/EEC concerning urban waste water. The contribution of specific pollutants from urban agglomerations is significant compared to rural areas, even if they own sewer systems and wastewater treatment plants and the degree of connection of the population is relatively high.

Investment programs in 2013 aimed to promote generally large agglomerations, providing access to sewage collection system for the whole population and proper treatment of wastewaters, and until 2018 for agglomerations under 2000 equivalent inhabitants, deadline for compliance with 2000/60/EC Directive.

Punctual monitoring of wastewaters from urban agglomerations revealed heavy metal load in effluents. Lack of local pre-treatment plant for technology wastewaters and existing urban wastewaters treatment plants only with mechanical and biological steps, determine the presence of these compounds in the resource area that fit into a lower quality, in terms of chemical status.

IPPC and NON IPPC industry brings the main contribution to dangerous substances, List II heavy metals, lead, copper, nickel, chromium, being decisive. Impact of non-priority and priority pollutants, in terms of environmental impact is not distinct; therefore there is a tendency to pay attention to priority pollutants, even if non-priority substances create the greatest damages. Lack of clean technologies or non compliance with Best Available Technologies is the main cause of surface resource contamination by dangerous substances.

Any pressure, punctual or diffuse, chemical or hydromorphological is felt in aquatic environment, by deteriorating environmental conditions and activating factor selection, generating modification of the structures and functions biocenoses. Aquatic organisms can absorb and retain, over time, pollutants from their environment. Their concentration is many times higher than the water, suffering bioaccumulation. These organisms which have accumulated contaminants tend to bioamplifice them by entering in the trophic chain.

"Even if chemicals are often only accumulates in the water or air in concentrations of the order ppm or ppt (parts per million or parts per trillion) they can accumulate in fatty tissues of aquatic organisms exposed, at significant levels of toxicity. Because of this concentration process, tissues and organs can accumulate dangerous substances in concentrations several hundred times higher than those found in ambient, even though in some cases these substances are not detected by standard procedures of analysis" (Huckins et al 2001).

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