Common strategy to prevent the Danube's pollution technological risks with oil and oil products – CLEANDANUBE

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STUDY 1

ON THE DESIRABILITY OF ELABORATING A COMMON STRATEGY, NEW AND ORIGINAL TO PREVENT POLLUTION OF THE DANUBE WITH PETROLEUM PRODUCTS, EVALUATION OF POTENTIAL DEVELOPMENT RESEARCHES IN THE FIELD.

Working team:

Lead partner: National Research & Development Institute for Gas Turbines COMOTI Bucharest, Romania

Puscasu Cristian
Stefanescu Mariana
Voicu Raluca
Axene Ghita
Grigorescu Mihaela
Adam Liviu
Cretu Mihaela
Precob Luminita
Toma Emilian
Teleaba Victoria
Antonescu Marilena

Partner: University of RUSE "ANGEL KANICHEV", Rouse, Bulgaria

Ivanka Mitkova Zheleva
Klimentov Kliment
Nikolaev Ivaylo
Popov Gencho
Russev Piter
Tuzharov Krasimir
Panteleeva Yana Kraleva
Kopchev Peter

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ON THE DESIRABILITY OF ELABORATING
A COMMON STRATEGY, NEW AND ORIGINAL TO PREVENT POLLUTION OF THE DANUBE WITH PETROLEUM PRODUCTS, EVALUATION OF POTENTIAL DEVELOPMENT RESEARCHES IN THE FIELD.

According to the European territorial cooperation objective, which provides support for developing cross-border economic, social and environmental activities, this project aims to develop a **" Common strategy to prevent the Danube's pollution technological risks with oil and oil products"**, to be an effective and coherent response to an environmental problem and lead to a sustainable cross-border development.

The project mainly responds to the primary objective of the Romania-Bulgaria Trans-border Cooperation Program, to "**bring together the people, communities and economies of the Romania-Bulgaria border region to participate in the joint development of a cooperative area, using its human, natural and environmental resources and advantages in a sustainable way**", as well as to the specific objective of "**sustainability of the intrinsic value of the region's natural resources by prudent exploitation and effective environmental protection**. "

The project also aims to a sustainable use of natural and environmental resources and to promote an efficient risk management in trans-border area, considering a common strategy to prevent and combat pollution with oil and petroleum products due to shipping or other industrial activities along the Danube River.

The first project activity consists in realize a detailed study about the contamination of the Danube with petroleum products, based on real values and complex investigations in trans- border area, as we will try to detail further.

This study deals the degree of contamination of the Danube with oil products, based on concrete values and complex investigations in the border area. A special attention was given to the consequences: social, economic and environment. It has been analyzed the potential of research in this area by combining the potency of the scientific communities of the two countries, and the two partners involved in the project.

This material is mainly based on the knowledge and information's exchange in the field chosen in the project, experience exchange between the two scientific communities Romanian and Bulgarian.

We mention that we mainly used in this study statistical data published by the National Institutes of Statistics from both countries, as well as official data provided by the Ministries of Environment and Forests of Romania, Ministry of Water and Environment of Bulgaria, the Romanian Waters National Administration and National Company River Administration of Danube Ports.

1. Introduction

With 70.8% of its surface consisting of oceans and seas and more than half of the planet's land covered by water (in solid or liquid form, standing or flowing), our planet is somewhat improperly called Earth, it is actually rather "Water Planet" (Blue Planet). *[http://www.greenagenda.org/eco-aqua/supraf.htm]*

The Danube River Basin is the second largest in Europe, with a total area of 801,463 km ². It traverses the most countries in Europe and includes territories from 19 countries. From spring (Black Forest Mountains) to the mouth (Black Sea), the Danube has a length of 2778 km. Danube basin ecosystems are very valuable in economic, historical, social and environmental terms, they are however subject to severe and growing pollution from agriculture, industry and cities, as well as navigation.

More than 81 million of people from different cultures and languages considered Danube basin as their origin and they are from centuries linked by widely water branched system of the Danube. All countries on an area of over 2,000 km ² of the Danube basin and European Union are contracting parties of the ICPDR (International Commission for Protection of Danube River)

Table 1. Basic information on the Danube River Basin countries

Country	Code	Coverage in DRB (km²)	Percentage of DRB (%)	Percentage of DRB in country (%)	Population in DRB (Mio.)
Albania	AL	126	< 0.1	0.01	< 0.01
Austria*	AT	80,423	10.0	96.1	7.7
Bosnia and Herzegovina*	BA	36,636	4.6	74.9	2.9
Bulgaria*	BG	47,413	5.9	43.0	3.5
Croatia*	HR	34,965	4.4	62.5	3.1
Czech Republic*	CZ	21,688	2.9	27.5	2.8

Germany*	DE	56,184	7.0	16.8	9.4
Hungary*	HU	93,030	11.6	100.0	10.1
Italy	IT	565	< 0.1	0.2	0.02
Macedonia	MK	109	< 0.1	0.2	< 0.01
Moldova*	MD	12,834	1.6	35.6	1.1
Montenegro*, **	ME	7,075	0.9		
Poland	PL	430	< 0.1	0.1	0.04
Romania*	RO	232,193	29.0	97.4	21.7
Serbia*, **	RS	81,560	10.2		
Slovak Republic*	SK	47,084	5.9	96.0	5.2
Slovenia*	SI	16,422	2.0	81.0	1.7
Switzerland	CH	1,809	0.2	4.3	0.02
Ukraine*	UA	30,520	3.8	5.4	2.7
Total		801,463	100		81.00

Fig. 1 Danube River, from the Black Forest Mountains to the Black Sea

The Danube River, whose course in Romania is 37.7% of its length, is the receiver and emissary to the Black Sea of all discharges from upstream riparian (riverain) countries, affecting water quality from Danube Delta and Black Sea coastal area .

The trans-border area shared by Romania and Bulgaria covers a wide geographical, environmental and cultural range,. In terms of geographic, the area is bordering by Black Sea to east and by Serbia to west, extending mainly along the Danube river, main characteristic of the area, with a length of about 470 km, forming a natural boundary dividing the area into two relatively equal parts, as shown in the following map:

Fig. 2 Danube River, at Romanian-Bulgarian border

2. Navigation on the Danube

Historically the Danube and some of its tributaries have formed important trade routes across Europe. The harnessing of these rivers to facilitate navigation has radically changed their physical and ecological characteristics, while pollution from ships and boats is also a problem. In order to address this problem, the ICPDR is undertaking various activities.

Despite its designation as a major European transport artery, the Danube River has a lesser importance in transports in the region than it would be expected, being used only at a rate of 10-15% in terms of transport capacity. **Waterway transport Axis Rhine / Meuse-Main-Danube** is a major freight route connecting the port of Rotterdam from North Sea to the Black Sea (through Constanta and Bulgarian ports) and river ports located on the two major waterways.

The joint Romanian - Bulgarian Danube Sector has a length of 470.5 km (from km 845.5 - Timok River mouth to 375 km - Calarasi). Between Romania and Bulgaria is an old bilateral agreement, signed in Sofia in 1955, regarding the maintenance and improvement of navigation conditions on the joint Romanian - Bulgarian Danube sector. Under this agreement Romania is responsible for fairway maintenance, including dredging and floating signaling on the river section between km 845.5 and km 610, and Bulgarian authorities are responsible for the sector between km 610 and km 375

Those **15 ports on the Danube** - Romanian and Bulgarian (Orsova, Drobeta-Turnu Severin, Turnu Magurele, Giurgiu, Oltenita, Calarasi, Cernavoda, Vidin, Lom, Oriahovo, Rousse, Svishtov, Somov, Tutrakan and Silistra) are important for transport on the river. Ports administrations are responsible for port infrastructure, especially the piers, but lack of funds led to a significant deterioration of them. 20% of the bays from the Romanian river ports (which are the responsibility of the National Company for Administration of the Danube River Ports of Giurgiu) are more than 60 years old and need

an urgent reconstruction, another 65% of these piers are in bad repair due to lack of funding for maintenance and repairs, and terminal operations are often leased to private companies.

The barge traffic on the Danube is permanent in the navigable period, in condition of above 2.8 m depth of the channel. Continuous dredging and other construction projects are necessary to maintain the navigability of the water.

The main development and modernization programs implemented since 2000 have focused on bank protection works and flood control both on the Danube - Black Sea sector and the White Gate - Midia - Navodari Channel. Romania has implemented some constructions to improve the navigability which were aimed to ensure, by redistribution of water flows, the conditions for safe and efficient navigation, with sufficient depth of water in most of the year, and eliminating navigation blocking on the Danube between Calarasi and Braila (in three critical points: Bala / Caragheorghe, Swan / Epuraşul and Ostrovu / Lupu). Due to its international status, the use of the river is free of charge and taxes are not collected.

The Sectorial Operational Programs (2007-2013) in Romania and Bulgaria, focuses in particular on modernization and development of inland water transport infrastructure along the Danube (**TEN-T priority axis no. 18**), as well as on the construction and modernization of support services for navigation, improved river bed and banks, on development of port reception facilities for ship-generated waste and waste treatment plants.

In Romania, the **National Company Administration of Danube River Ports** -Giurgiu (CN ADPF Co) acts as the port authority in its area of activity, within the port limits ports, roads and shipping infrastructure, established by the Ministry of Transport and Infrastructure. As port authority, the company enforce policies and programs for development of ports infrastructure and waterways, to ensure the functionality of water transport infrastructure, development of shipping auxiliary activities, according to legal regulations in force.

The major ports administered by the NC ADPF Company are: Cernavoda km.300, Calarasi km.370, Oltenita km.430, Giurgiu km.493, Corabia km.630, Bechet km.679, km.794 Calafat, Drobeta Turnu - Severin km .931, Orsova km.955, Moldova Veche km.1046.

The **National Company Administration of Danube River Ports Company** – with headquarter in **Giurgiu** consists of the following functional subunits: branch Drobeta Turnu Severin, Agencies at **Calafat** and **Bechet** and working points subordinate of subunits which function as port authority in their area of jurisdiction.

Fig. 3 Ports on the Romanian-Bulgarian sector of Danube

The main ports in Bulgaria are Vidin, Lom, Oriahovo, Ruse, Svishtov, Somovit, Tutrakan and Silistra.

3. Pollution on the Danube

If we were to give credence to Johann Strauss, Danube is Blue. Only that, especially in the last century, the river has gained alarming shades, and this is not just an aesthetic problem - unfortunately, its pollution may affect not only plant species and endangered wildlife, but also drinking water used by those 80 million people in its catchment area. Danube is supplied with water from the territory of 17 states, by about 120 tributary streams. Unfortunately, these are only one of the main tributaries of the river's pollution.

Most parts of the Danube can be described as moderately polluted, but some areas of the Danube tributaries and the Lower Danube did not hold such status. In some areas, harmful substances from heavy industry and agricultural land pollute rivers and seriously undermines the quality of water.

The nutrients concentrations, including phosphorus and nitrogen in the Danube waters and its larger tributaries are very important in international terms, since they are directly responsible for eutrophication processes in the river and on the Black Sea. There are indications that these concentrations along the Danube River are now substantially higher than natural levels.

The most polluting units are from the management of the waste collection, chemical processing, mining, metallurgy and animal husbandry. The worst example of water pollution: it occurred in 2000, when Tisza river was seriously contaminated with cyanide and heavy metal waste from "Gold" mine in Baia Mare - Romania. Contamination of waste spilled into the Danube and affected biodiversity in the program. The Romanian government has imposed taxes on discharges into water, which seems to

have contributed to reducing pollution. The report "European environment - the third assessment" showed that over 25% of monitoring stations in the area have a water quality poor or very poor.

It has been monitored the overall increases in the next pollutants:

- suspended solids
- organic pollution
- organo-chlorine pesticides
- concentrations of heavy metals (especially cadmium and except manganese , maximum observed in the middle of the Danube)
- concentrations of nitrite and ammonium (however, lower the concentrations of nitrate)
- phosphorus (total phosphorus and phosphate)
- conductivity (caused by dissolved salts)
- alkalinity

The best way to protect and manage the river is a close international cooperation between all countries of the basin, bringing together all interests from upstream and downstream.
Since the adoption of the **EU Water Framework Directive (2000/60/EC)**, all EU countries use a common approach of the river basin management.

To achieve a good water status in water bodies from the Danube Basin until 2015 (and beyond) and to ensure an adequate supply of clean water for future generations, the contracting parties of **DRPC** (**Danube River Protection Convention**) have nominated **ICPDR** (**International Commission for the Protection of the Danube River**) as the coordinating body to develop a comprehensive management plan for the entire Danube basin, using the basic principles of the EU Water Framework Directive. This process involves experts from industry and agriculture, and representatives of environmental and consumer organizations, and local and national authorities. Danube River Basin Management Plan will be updated at every six years in accordance with the law.

The Management Plan of Danube River Basin focuses on key border issues, so-called significant management issues (which may directly or indirectly affect the quality of rivers, lakes and groundwater bodies across borders):

- **Organic pollution**
- **Pollution from nutrients**
- **Pollution with hazardous substances**
- **Hidromorphological alterations**

In addition, the Management Plan include:

- a description of **significant pressures**
- an overview of the **monitoring networks**
- an assessment of **ecological and chemical status**
- a final assessment of **heavily modified water bodies**
- an overview of the **exemptions in accordance with Directive**
- an **economic analysis** of water uses
- a short presentation on the **quantity** of water and **climate change**

- an outline of **public consultation and participation**
- an inventory of **protected areas**

The final version of the Plan is available from the end of 2009 and it was adopted at **ICPDR** Ministerial Meeting in **February 2010.**

Table 2 ICPDR pursues ambitious deadlines under Framework Directive:

2004	Characterisation of river basin: pressures, impacts and economic analysis (Art. 5)
2006	Establishing of monitoring network (art. 8)
2008	Presentation of the draft for river basin management plan (Art. 13)
2009	Completion of river basin management plan, including programs of measures (Art. 13 and 11)
2010	Pricing policies Introducing (art. 9)
2012	Operationalisation of the measures programs (Article 11)
2015	Environmental objectives implementation(Art. 4)
2015-2021	Second management cicle
2021-2027	Third management cicle

The main pressures arising from shipping are:

- Changes in natural river structure
- Changes in water flow, such as connections blocking to the channels separation, tributaries and floodable areas
- Disruption of natural flow patterns through hydro-morphological alterations
- Prevention of fish migration due to the locks
- Engineering works designed to channel cleaning and remove sediments
- Accidental pollution involving oil or hazardous substances
- Pollution by discharging of bilge water, wastewater from washing tanks and leaks from passenger ships
- Sudden introduction of invasive species

From all forms of pollution, the most severe impact on water has **pollution with oil during transportation**, although it represent only 24% of the pollution causes.

50% of all cases represents the shore operations (leakage of rainwater, wastewater discharges, oil processing, refining or port and shipyards activities), 2% of cargo operations, 4% due to natural causes (eruptions), and 13% of cases from the atmosphere (after air combustion).

Analyzing the risk factors of shipping accidents that cause oil pollution, we can highlight the categories:

- risks arising from physical and chemical properties of certain dangerous goods carried, including oil and petroleum products;
- the risks of hidden defects caused by the vessel.
- the risks caused by human mistakes.

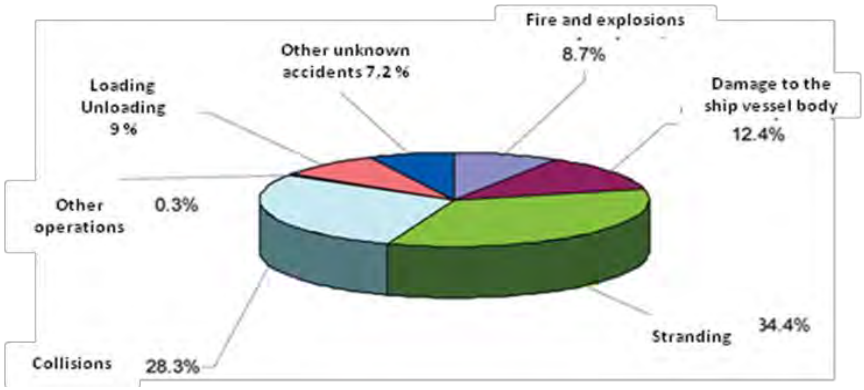

Fig. 4 Causes of pollution from all transport incidents
[Source: ITOPF, 2008, http://www.itopf.com/]

Ships transiting the the Danube River Mouths and Delta pollute water by accidental or willful discharge of wastewater into Danube, by tank cleaning with petrol / diesel and by oil residues discharging.

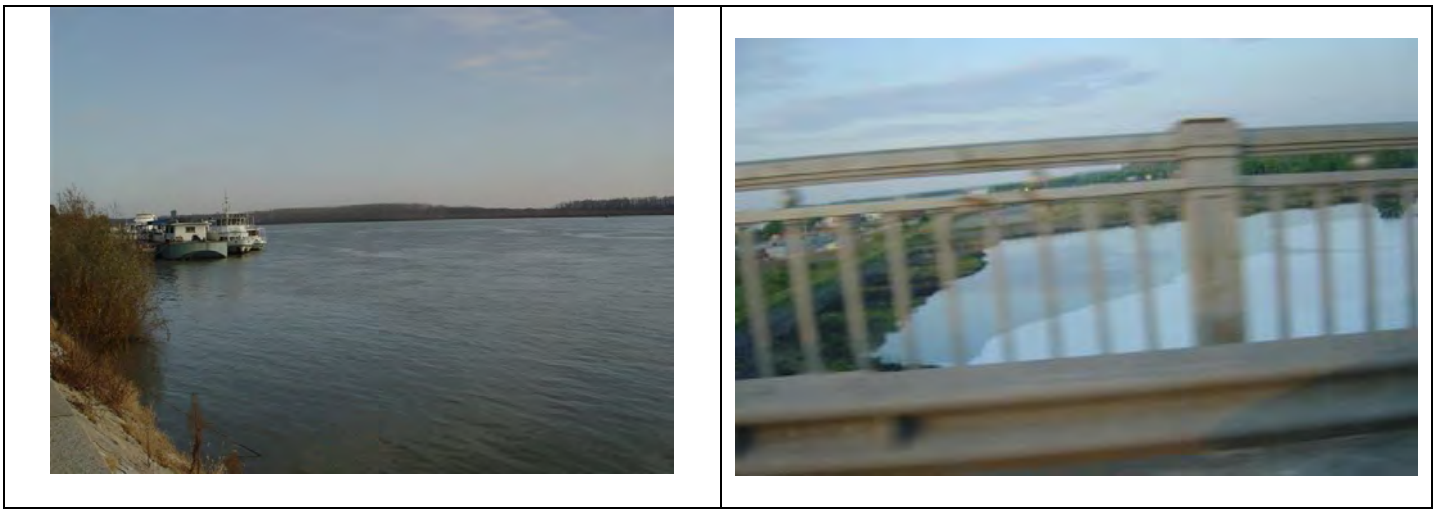

Fig. 5 Transport aspects on the Danube and oil stains on the surface of the river

Oil (**petroleum product**), accidentally discharged in large quantities, may be spread over large areas and affect seriously water quality and aquatic life. Increasing the number of accidents accompanied by major pollution are due to the amount of oil transported, to the characteristics of local navigation (traffic density, hydro-meteorological conditions, water depth, visibility, poor radio communications), to the performed operations in port and bunkering, lack of warning systems.

Studies performed by the Naval Academy "Mircea the Old" and National Research Institute for Marine Geology and Geoecology GEOECOMAR [*Ion Milan, Marian Traian Gomoiu - "Causes and consequences of marine pollution by oil"]* showed that in the **Black Sea basin** are discharged annually approximately **110,000 tons of oil**, which makes pollution effects to be felt in the ecological balance of the entire basin.

Continental sources pollute seriously the Black sea and only the **Danube** flows into the sea a quantity of **53,000 tons annually**, or about **50% of the total annual amount of oil spilled into the sea**. Of the other terrestrial sources, are outlined as follows: 30,000 tons of oil from waste waters; 15,000 t from the **industry**, including **oil industry**, and the remaining 12,000 tons is the contribution of other sources, which includes **naval and maritime transport**. Pollution from oil spills on the Danube as a result of shipping accidents is negligible, this pool being until now far away from major accidents.
The causes of water pollution by oil are analyzed, usually, in relation to the two forms of pollution of oil pollution: operational and accidental.

Operational pollution is caused by unintentionally discharges which occurring in the following situations: during loading and unloading operations of tankers, during bunkering operations (achieving fullness of heavy fuel engines and easy to ship); during the voyage of the vessel , by discharging ballast and bilge water without adequate treatment; during stationing in ports, when are recorded spills at cleaning of petrolium ships for transition to other types of transport, etc.

Accidental pollution is caused by shipping accidents, of which the most significant are: collisions, running aground, the hull rupture caused shipwrecks or leak, fire, explosions, etc.

Transportation of petroleum products on the Danube is less costly compared with rail (4 times) or pipe (2 times) transport. The disadvantage lies in the fact that it is seasonal, because often, in the

winter Danube freeze, this inconvenience leading at problems of storage or use of port facilities for loading unloading cargo.

Transport of crude oil and petroleum products is done with specialized propelled or towed vessels: oil tankers (powered), liquefied gas tankers (LPG or LNG) tankers, barges. The compartments of these tankers require their washing when is necessery to change the destination of compartments from one product to another,, operation that can lead to pollution of the river water. The loading-unloading operations in port are done through a special network of pipes, and during operations may also occur oil leakage from tankers. *[Adrian Marius Pascu - Naval, rail and rutiar transport of hydrocarbons and petroleum products "]*

According to **Romania Strategy for sustainable transport for 2007-2013 and 2020, 2030**), the water transport priorities for 2007-2013 focuses on the modernization/development of water transport infrastructure, ensuring traffic safety, at the same time with the ports consolidation like intermodal logistics centers, serving as support for the progressive realization of a intermodal network for merchandise and the development of shipping services safer and environmentally friendly.

Navigation is therefore a significant pressure for the Danube river, which change the morfology of the riverbad and generate accidental water polution. Thus, during 1983 - 2003, on the Danube, between km 655 - 1075 there were 453 marine accidents, of which 30 have produced significant water pollution, especially with petroleum products.

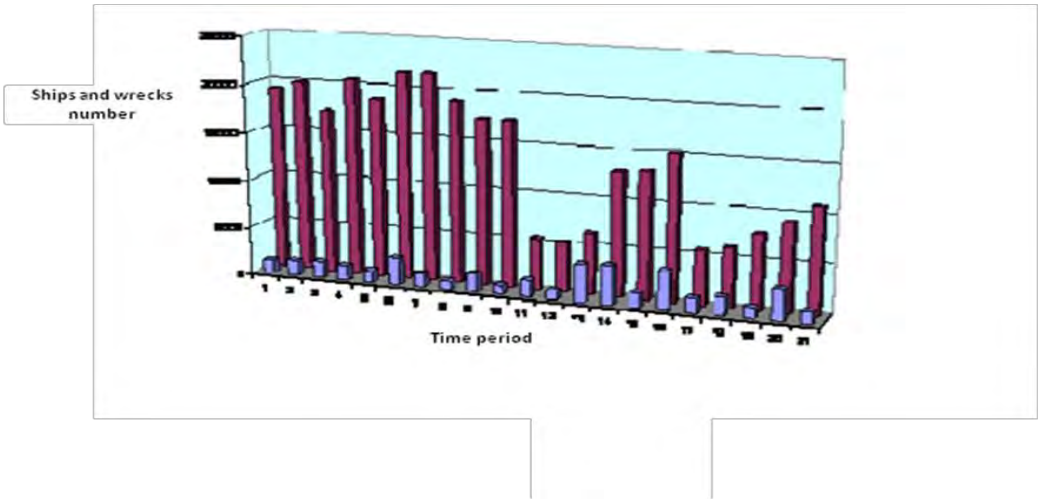

Fig. 6 Comparison Chart of traffic volume and total number of ships wrecks on the Danube between 1075 - 655 km in period 1983 - 2003

Legislation regarding surface water quality in Romania and Bulgaria

As a **clean and safe environment** is a primary requirement for sustainable development of the trans - border area, it must significantly improve the area image as the perfect place to live and invest. Joint Prevention of **natural and technological risks** requires cooperation between existing institutional frameworks to harmonize activities in the field of Danube River protection and pollution prevention for soil, water and air quality, around the trans - border area.

Also, natural resource management, biodiversity and the protection of nature as a whole are major objectives in the national policy of Bulgaria and Romania. Therefore, both countries have adopted a **legislative framework relevant** to the implementation of European Directives. We present below the legal situation of the two countries in the field of water:

Harmonization and implementation of water quality main legislation in Romania

EU Directive/Romanian act	Transposition/Implementation (T/I)
Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy, modified by 2008/32/CE, 2008/105/CE and 2009/31/CE Directives and 2455/2001/CE Decision – **totally transposed**	
OUG no. 12/2007 (MO no. 153/02.03.2007) for modifying and completing certain normative acts that are transposing the communitarian acquis in the field of environmental protection, adopted by Law no. 161/2007 (MO no. 395/12.06.2007)	T
Water Law no. 107/1996 (MO nr. 244/08.10.1996)	T
Law no. 310/2004 (MO no. 584/30.06.2004) for modifying **Water Law no. 107/1996** (MO nr. 244/08.10.1996)	T
Law no. 112/2006 (MO nr. 413/12.05.2006) for modifying and completing **Water Law no. 107/1996**	T
OUG no. 3/2010 (MO no. 114/19.02.2010) for modifying and completion of **Water Law no. 107/1996,** adopted through **Law no. 146/2010** (MO no. 497/19.07.2010)	T
OM no. 913/2001 (unpublished) regarding the approval of the framework plan for water management in river basin	I
HG no. 472/2000 (MO no. 272/15.06.2000) regarding some protection measurements of water resources quality	I
HG. No. 100/2002 (MO no. 130/19.02.2002) for the approval of the quality that must meet surface water used for drinking and the standard regarding the measurement methods, sampling frequency and samples analysis of the surface waters used to produce drinking water. - NTPA-013/2002 - which regulates the quality standards to be met by surface water used for drinking; - NTPA-014/2002 - which regulates the measurement methods, sampling frequency and samples analysis of the surface waters used to produce drinking water.	I
HG no. 567/2006 (MO no. 417/15.05.2006) amending quality norms to be met by surface water used for NTPA - 013, approved by **HG nr. 100/2002**	I
OM no. 161/2006 (MO no. 511/13.06.2006) for approving the standard regarding the surface water classification in order to establish the ecological state of the corps in water	I
Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment, modified by 98/15/EC Directive and Regulation (CE) n0. 1882/2003 – totally transposed	
HG no. 352/2005 (MO no. 398/11.05.2005) amending **HG no. 188/2002** (MO no. 187/20.03.2002) for approving norms regarding discharges of wastewater into the aquatic environment	T
OM no. 1450/2010 (MO no. 670/1.10.2010) for approving the Guidelines of funding Program with respect to protect water resources	integrated water supply

2006/11/CE Directive *on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community* – ***totally transposed***	
HG no. 351/2005 (MO no. 428/20.05.2005) on the approval of the phasing elimination plan of discharges, emissions and losses of priority hazardous substances	T
HG no. 783/2006 (MO no. 562/29.06.2006) for amending and completing of **HG no. 351/2005** (MO no. 428/20.05.2005) on the approval of the phasing elimination plan of discharges, emissions and losses of priority hazardous substances	T
OUG no. 152/2005 (MO no. 1078/30.11.2005) on prevention and integrated pollution control	T
OM no. 501/2003 (MO no. 591/20.08.2003) regarding approval of the initial inventory of pollution sources of aquatic environment and groundwater	I
OM no. 1177/2002 (unpublished) for approving the methodology of integrated risk assessment in a cross border context	I
OM no. 44/2004 (MO no. 154/23.02.2004) regarding the Regulation approval on of monitoring water quality for priority hazardous substances	I
OM nr. 479/2006 (MO nr. 619/18.07.2006) for approving the methodology and data reporting questionnaires from water sector	I
Council Directive 86/280/EEC on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC, amended by Directives 91/692/CEE and 2008/105/CE (be repealed on 22.12.2012 by Directive 2008/105/CE) Council Directive 88/347/EEC amending Annex II to Directive 86/280/EEC on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC. Council Directive 90/415/EEC amending Annex II to Directive 86/280/EEC on limit values and quality objectives for discharges of certain dangerous substances included in list I of the Annex to Directive 76/464/EEC. Council Directive 82/176/EEC on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry, amended by 91/692/CEE and 2008/105/CE Directive (be repealed on 22.12.2012 by Directive 2008/105/CE) Council Directive 83/513/EEC on limit values and quality objectives for cadmium discharges, amended by 91/692/CEE and 2008/105/CE Directive (be repealed on 22.12.2012 by Directive 2008/105/CE) Council Directive 84/156/EEC on limit values and quality objectives for mercury discharges by sectors other than the chlor-alkali electrolysis industry, amended by 91/692/CEE and 2008/105/CE Directive (be repealed on 22.12.2012 by Directive 2008/105/CE) Council Directive 84/491/EEC on limit values and quality objectives for discharges of hexa-chloro-cyclohexane, amended by 91/692/CEE and 2008/105/CE Directive (be repealed on 22.12.2012 by Directive 2008/105/CE) – ***totally transposed***	
HG no. 210/2007 (MO no. 187/19.03.2007) for modifying and completing certain normative acts that are transposing the communitarian acquis in the field of environmental protection	T
OM no. 31/2006 (MO no. 234 bis/15.03.2006) on approving the Manual for modernization and development of Integrated Water Monitoring System in Romania (SMIAR), which abolishes **OM no. 35/2003**	T/I
OUG no. 152/2005 (MO no. 1078/30.11.2005) on pollution prevention and integrated control	T
HG no. 188/2002 (MO no. 187/20.03.2002) to approve norms regarding waste water discharge in aquatic environment **- NTPA-011-** through this act is regulated the conditions regarding urban waste water collection, treatment and discharge and also the industrial waste water treatment and discharge conditions (G.D. Annex 1). The norm	T

includes an Annex through which is adopted the Action Plan regarding urban waste water collection, treatment and discharge actions. - **NTPA-002/2002** which covers the requirements to be met by waste water discharged into the local sewerage networks and treatment plants directly (Annex 2 of the GD); - **NTPA-001/2002** – which sets limits for pollutant load of industrial and municipal wastewater, discharged into the natural receptors. (Annex 3 of H.G.).	
Directive 2006/44/CE on sweet water quality that need protection or improves to maintain fish life (codified version) – ***totally transposed***	
HG no. 202/2002 (MO no. 196/22.03.2002) to approve the Norms regarding the surface water quality necessitating protection and amelioration with the aim of maintaining the fish life.	T
HG no. 563/2006 (MO no. 406/10.05.2006) on modification and completion of **HG no. 202/2002** (MO no. 196/22.03.2002) to approve the Norms regarding the surface water quality necessitating protection and amelioration with the aim of maintaining the fish life.	T
Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources, amended by Regulation (CE) no. 1882/2003 – ***totally transposed***	
HG no. 964/2000 (MO no. 526/25.10.2000) on approving the Plan of Action for the Protection of waters against nitrates pollution from agricultural sources	T
HG nr. 1360/2005 (MO nr. 1061/28.03.2005) on modification and completion **HG no. 964/2000** (MO no. 526/25.10.2000) on approving the Plan of Action for the Protection of waters against nitrates pollution from agricultural sources	T
OM no. 1072/2003 (MO no. 71/28.01.2004) on approving the organization of the national monitoring support of integrated surveillance, control and decisions to reduce the intake of pollutants from agricultural sources to groundwater and surface water and for approval of the Corresponding surveillance and control program and of the evaluation procedures and instructions of the monitored date of the pollutants from agricultural sources to groundwater and surface water	I
Directive 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC **– *totally transposed***	
HG no. 546/2008 (M.Of. no. 404/29.05.2008) ***concerning the management of bathing water quality***	T
HG no. 459/2002 (M.Of. no. 350/27.05.2002) to approve the quality Norms for water in natural areas arranged for bathings	T/I
HG no. 88/2004 (M.Of. no. 133/13.02.2004) for approval of surveillance, sanitary inspection and control of natural areas used for bathing	I
Directive 2008/56/CE establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) **– *totally transposed***	
OUG no. 71/2010 (MO no. 452/02.07.2010) on strategy establishment marine environment	T

Harmonization and implementation of water quality legislation in Bulgaria

Directive 2000/60/EC establishing a framework for Community action in the field of water policy, amended by Decision No 2455/2001/EC establishing the list of priority substances in the field of water policy

- **Directive 2008/105/EC** of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives **82/176/EEC, 83/513/EEC, 84/491/EEC**, **86/280/EEC** and **amending Directive 2000/60/EC** of the European Parliament and the Council
- **Water Act** (Prom. SG. 67/27 Jul 1999)
- **Regulation nr 13** of 2 April 2007 on characterization of surface water (State Gazette 37/8 Mai 2007)
- **Regulation nr 5** of 23 April 2007 on water monitoring (State Gazette 44/5 June 2007)
- **Regulation nr 1** of 10 October 2007 on the Exploration, Use and Protection of Groundwater (State Gazette 87/30 October 2007)
- **Order nr RD-321** of 7 May 2007 of the Minister of environment and water for determination of priority and priority hazardous substances in the field of water policy (State Gazette 44/5 June 2007)

Directiva 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC

- **Regulation nr 11** of 25 February 2002 on the quality of bathing water (State Gazette No.25/08.03.2002)

Directiva 98/83/EC on the quality of water intended for human consumption, amended by EC Regulation no. 1882/2003

- **Regulation nr 9** of 16 March 2001 on the Quality of Water Intended for Human Consumption (State Gazette No. 30 of 28 May 2001)

Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water, amended by **Directive 79/869/EEC** concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water and **Directive 91/692/EEC** standardizing and rationalizing reports on the implementation of certain Directives relating to the environment, repealed by Directive 2000/60/EC with effect from 22.12.2007

- **Regulation nr 12** of 18 June 2002 on the quality Requirements for Surface Water Intended for Drinking Water Abstraction and Household Supply

Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life (codified version)

- **Regulation nr 4** of 20 October 2000 on the quality of waters supporting fish and shellfish organisms' life (State Gazette No. 88/27.10.2000)

Directive 91/271/EEC concerning urban waste-water treatment, emanded by Directive 98/15/EC with respect to certain requirements established in Annex I thereof (Text with EEA relevance)

- **Law of water** (Prom. SG. 67/27 Jul 1999)
- **Regulation nr 6** of 9 November 2000 on the Limit Values for Admissible Contents of Dangerous and Harmful Substances in the Waste Water Discharged in the Water Bodies Promulgated (Prom. SG. 97/28.11.2000)
- **Regulation nr 7** on the Terms and Procedure for Discharge of Industrial Waste Waters into Settlement Sewer Systems Promulgated (State Gazette No. 98/1.12.2000)
- **Regulation nr 8** of 25 January 2001 on the quality of coastal marine waters (State Gazette No. 10/2.02.2001)
- **Regulation nr 10** on Issuing Permits for Waste Water Discharge into Water Bodies and Setting Individual Emission Limit Values for Point Sources of Pollution (Prom. SG. 66/27.07.2001, effective 27.07.2001)
- Regulation on the order and the way of recovery of sludge from waste water treatment through its use in the agriculture" (State Gazette No. 112/23.12.2004г.)

Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources

- **Regulation nr 2** of 13 September 2007 on the Protection of Waters against Pollution Caused by Nitrates from Agricultural Sources (State Gazette No 27/11.08.2008)

Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances, amended by Directive 91/692/EEC

- **Regulation nr 1** of 7 July 2000 on the Exploration, Use and Protection of Groundwater (State Gazette 87/30.10.2007)

Directive 2006/118/EC of the European parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration

- **Regulation nr 6** of 9 November 2000 on the Limit Values for Admissible Contents of Dangerous and Harmful Substances in the Waste Water Discharged in the Water Bodies Promulgated (State Gazette No. 97/28.11.2000)
- **Regulation nr 7** on the Terms and Procedure for Discharge of Industrial Waste Waters into Settlement Sewer Systems Promulgated (State Gazette No. 98/1.12.2000)

Decision 77/795/EEC establishing a common procedure for the exchange of information on the quality of surface fresh water in the Community, repealed by Directive 2000/60/EC with effect from 22.12.2007

Directive 2007/60/CE
Directive 2008/56/EC of the European Parliament and the Council of 17 June 2008 astablishing a framework for comunity action in the field of marine environmental policy (Marine Strategy Framework Directive)

Water quality – Parameters, Indicators and Limits

Water quality can be defined as a conventional assembly of physical, chemical, biological and bacteriological characteristics, value defined, which permit to the sampler to be included in a defined category having the quality to serve for a certain mission. For water quality stability, from a range of physical, chemical, biological characteristics which can be established through laboratory analysis are using a limited number, considering the important one. The global environment surveillance system requires water quality tracing through three parameter categories:

- basic parameters: temperature, pH, conductivity, dissolved oxygen, colibacils;

- **indicator parameters for persistent pollution**: cadmium, mercury, organic-halogenated and mineral oils;

- **optional parameters**: total organic carbon (COT), oxygen biochemical consumption (CBO), anionic detergents, heavy metals, arsenic, boron, sodium, cyanides, total oils, streptococcus.

According to in force European legislation, transpose in the legislation of the two countries, for characterization of water quality and pollution degree is being used **quality markers**, which are different types:

Organoleptic Indicators	Admissible values	Extraordinarily admissible values
Smell, deg.	2	2
Taste, deg.	2	2

Phisical Indicators	Admissible values	Extraordinarily admissible values
pH	6,5 – 7,4	Max. 8,5
Electrical conductivity , µs/cm	1000	3000
Colour, deg.	15	30
Turbidity, deg. or formazine turbidity units	5	10

Radioactive Indicators	Admissible values	Extraordinarily admissible values
-alpha	0,1	2,3
-beta	0	50

Biological Indicators	Admissible values
volume obtained by net filtering plankton	1 - 10
Animal, vegetal organisms, visible particles	-
Microscopical organic organisms	20
Organusms responsible for phisical or organoleptic properties/100 dm^3	- (only extraordinarily)
Polluting responsible organisms	-
Harmfull organisms for human health	-

Chemical Indicators	Admissible values	Extraordinarily admissible values
Aluminium, (Al^{3+}), mg/dm^3	0,05	0,2
Amonia, (NH_4), mg/dm^3	0	0,5
Nitrits, (NO_2), mg/dm^3	0	0,3
Calcium, (Ca^{2+}) mg/dm^3	100	180
Residual chlorine in water disinfected by chlorination (Cl_2) mg/dm^3 At cunsomer - Residual free chlorine - Total free chlorine Entry in water system - Residual free chlorine - Total free chlorine	 0,10 – 0,25 0,10 – 0,28 0,5 0,55	 - - - -
Chlorides (Cl^-) mg/dm^3	250	400
Phenolic distillate compounds, mg/dm^3	0,001	0,002
Copper (Cu^{2+}), mg/dm^3, max	0,05	0,1
Anionic synthetic detergents, mg/dm^3	0,2	0,5
Total hardness, German deg.	20	30
Fier (Fe^{2+} + Fe^{3+}), mg/dm^3	0,1	0,3
Phosphates (PO_4), mg/dm^3	0,1	0,5
Magnesium (Mg^{2+}), mg/dm^3	50	80
Manganese (Mn^{2+}), mg/dm^3	0,05	0,3
Dissolved oxygen (O_2), mg/dm^3	6	6
Fix waste, mg/dm^3, Min max	 100 800	 30 1200
Oxidable organic compounds, mg/dm^3 -$KMNO_4$ method, as: -CCO_{Mn} (O_2)		

-$KMNO_4$ -$K_2Cr_2O_7$ method, as: -CCOCr (O_2)	2,5 10 3	3,0 12 5
Sulphates, (SO_4^{2-}), mg/dm^3	200	400
Sulfides and hydrogen sulfide, mg/dm^3	0	0,1
Zinc (Zn^{2+}), mg/dm^3,	5	7

Chemical Toxic Indicators	Admissible values
Aromatic amines, mg/dm^3	0
Arsenium (As^{3-}) mg/dm^3	0,05
Azotates(NO_3^-) mg/dm^3	45
Cadmium(Cd^{2+}) mg/dm^3	0,005
Free cyanides (CN^-) mg/dm^3	0,01
Chromium(Cr^{6+}) mg/dm^3	0,05
Fluorine (F) mg/dm^3	1,2
polycyclic aromatic hydrocarbons, µg/ dm^3	0,01
Mercury (Hg^{2+}) mg/dm^3	0,001
Nickel (Ni^{2+}) mg/dm^3	0,1
Pesticides (insecticides, herbicides) µg/ dm^3 -per component -per total components	 0,1 0,5
Lead (Pb^{2+}), mg/dm^3	0,05
Selenium, mg/dm^3	0,01
Natural Uranium, mg/dm^3	0,021

The values are centralized according to in force regulations, the chemical physical markers being particularized by **5 quality classes:**

- **class I** – delimitation for reference natural conditions (for drinking water supply, industrial processes water supply, water supply for animals breeding unities, supplying food industry, irrigation for certain crops, salmonidae develop, public swimming pools

- **class II** – adequate limits of water used for aquatic ecosystems protection for supplying fish breeding activity exception salmonidae, fish breeding and developing in water from plains, industrial processes supply and for town management and recreation purposes.

- **class III, IV, V** – corresponding limits by 2 – 5 times bigger than those of reference objectives, for irrigation systems supply, industry supply for random purposes and other uses unmentioned in class I and II

Limit values for physical-chemical indicators in the main classes

Phisical-chemical indicators		MU	Limit values on classes				
			I	II	III	IV	V
Physical	Temperature	Deg. Celsius	-				
	pH	-	6,5 – 8,5				
Oxygen regime	O_2 disolved	mg/l O_2	7	6	6	4	<4
	CBO_5	mg/l O_2	3	5	10	25	>25
	CCO-Mn	mg/l O_2	5	10	20	50	<50
	CCO-Cr	mg/l O_2	10	25	50	125	>125
Nutrients	Amonium N-NH_4	mgN/l	0,2	0,3	0,6	>1,5	
	Nitrits N-NO	mgN/l	0,01	0,06	0,12	0,3	>0,3
	Nitrates N-NO_3	mgN/l	1	3	6	15	>15
	Nitrogen total N	mgN/l	1,5	4	8	20	>20
	Ortophophats P-PO_4	mgP/l	0,05	0,1	0,2	0,5	>0,5
	Phosphat total P	mgP/l	0,1	0,2	0,4	1	>1
	Clorophila a	>µg/l	0,05	0,1	0,2	0,5	>0,5
Ions, salinity	Filterable residue	mg/l	fond	500	1000	1300	>1300
	Sodium Na^+	mg/l	fond	50	100	200	>300
	Calcium Ca^{2+}	mg/l	75	150	200	300	>300
	Magnezium Mg^{2+}	mg/l	fond	25	50	100	>100
	Iron total	mg/l	fond	0,1	0,3	1,0	>1,0
	Manganesse total	mg/l	fond	0,005	0,1	0,3	>0,3
	Chlorines Cl^-	mg/l	fond	100	250	300	>300
	Suphats SO_4^{2-}	mg/l	80	150	250	300	>300
Metals: -disolved fraction	Zinc Zn^{2+}	µg/l	fond	5	10	25	>25
	$Copper^+$	µg/l	fond	2	4	8	>8
	Chromium total	µg/l	fond	2	4	10	>10
	Lead Pb^{2+}	µg/l	fond	1	2	5	>10
	Cadmiu Cd^{2+}	µg/l	fond	0,1	0,2	0,5	>0,5
	Mercury Hg^{2+}	µg/l	fond	0,1	0,15	0,3	>0,3
	Nickel Ni^{2+}	µg/l	fond	1,0	2,0	5,0	>5,0
- total concentration	Arsenium As^{2+}	µg/l	fond	1,0	2,0	5,0	>5,0
	Zinc Zn^{2+}	µg/l	fond	100	200	500	>500
	$Copper^+$	µg/l	fond	20	40	100	>100
	Chromium total	µg/l	fond	50	100	250	>250
	Plumb Pb^{2+}	µg/l	fond	5	10	25	>25
	Cadmium Cd^{2+}	µg/l	fond	1	2	5	>5
	Mercury Hg^{2+}	µg/l	fond	0,1	0,2	0,5	>0,5
	Nickel Ni^{2+}	µg/l	fond	50	100	250	>250
	Arsenium As^{2+}	µg/l	fond	5	10	25	>25
Toxic organic compounds	Phenols	µg/l	fond	1	20	50	>50
	Active anionic detergents	µg/l	fond	500	750	1000	>1000
	Petrolium hidrocarbons	µg/l	fond	100	200	500	>500
	PAH	µg/l	-	-	-	-	-
	PCB	µg/l	-	-	-	-	-
	Lindane	µg/l	0,005	0,1	0,2	0,5	>0,5
	Pp DDT	µg/l	0,001	0,01	0,02	0,05	>0,05
	Atrazine	µg/l	0,002	0,1	0,2	0,5	>0,5
	Triclormethan	µg/l	0,02	0,6	1,2	1,8	>1,8
	Tetraclormethan	µg/l	0,02	1	2	5	>5
	Triclorethan	µg/l	0,02	1	2	5	>5
	Tetraclorethan	µg/l	0,02	1	2	5	>5
	AOX	µg/l	10	50	100	250	>250

Phisical-chemical determinations on sediments		
Componente	**MU**	**Concentration limit**
Arsenium	mg/kg	17
Cadmium	mg/kg	3,5
Chromium	mg/kg	90
Copper	mg/kg	200
Lead	mg/kg	90
Mercury	mg/kg	0,5
Zinc	mg/kg	300
Benzpyrene	mg/kg	750
Lindane	mg/kg	1,4
PCB	mg/kg	280

Biological Indicators					
Indicator	Values on classes				
	I	II	III	IV	V
saprobic index MXB	<1,8	1,8 -2,3	2,31 - 2,7	2,71 - 3,2	>3,2

Micro-biological Indicators					
Indicator	Valori pe clase				
	I	II	III	IV	V
Coliforms total	500	10000	-	-	-
Coliformi excremental	100	2000	-	-	-

According to art. 13 of **Water Frame Directive**, the member states develop a management plan for every hydrographic district, and if they are located in other international district, they must assure the coordination for developing a single management plan. Romania, as Bulgaria, being located in Danube basin, contributes to **Management Plan of Danube Hydrographic District**

Current situation regarding water quality of Danube river

On ICPDR level AEWS system was set up according to demands from 16 Article of Cooperation Convention for Danube river protection and Sustainable Usage.

For anthropogenic impact above Danube river were used data provided by **Transnational Monitoring Network, National Monitoring Networks**, as well as data from expeditionary campaigns (ex. Joint Danube Survey 2002).

Transnational Monitoring Network on Danube basin level (TNMN) has been operating since 1996, as a part of obligation package which revert to every member country of Convention for Danube river protection, on which Romania is member. Implementation, after year 2000 of Water Frame Directive (2000/60/CE, DCA) imposed TNMN reorganize on Danube district level, according to new legislative demands, process ended in 2007.

Transnational Monitoring program started in 1985, in the frame of Bucharest Proclamation, being extended afterwards through Danube Environment Program from 1992-1996. In 1996, the Danube Environment Program was transferred to Danube river Protection Proclamation, being official launched as TNMN in 1996. The monitoring system operation of water quality from hydrographic Danube basin in transboundary context through the network created between Danube countries – TNMN, was done according to obligations of Convention concerning Danube river protection, 8 Article. Starting with year 2000, along with coming into force of Frame Water Directive, TNMN network had been reorganized according to the new demands of the directive, process ended in 2007.

According to the new procedure regarding primary data generation for TNMN network, starting with year 2006, the main generator of primary data from Romania has been Romanian Water National Administration - through its two Reference Laboratories (Jiu Water Division, respectively Dobrogea Water Division – Seaside). The primary monitoring data for TNMN network are monthly generated.

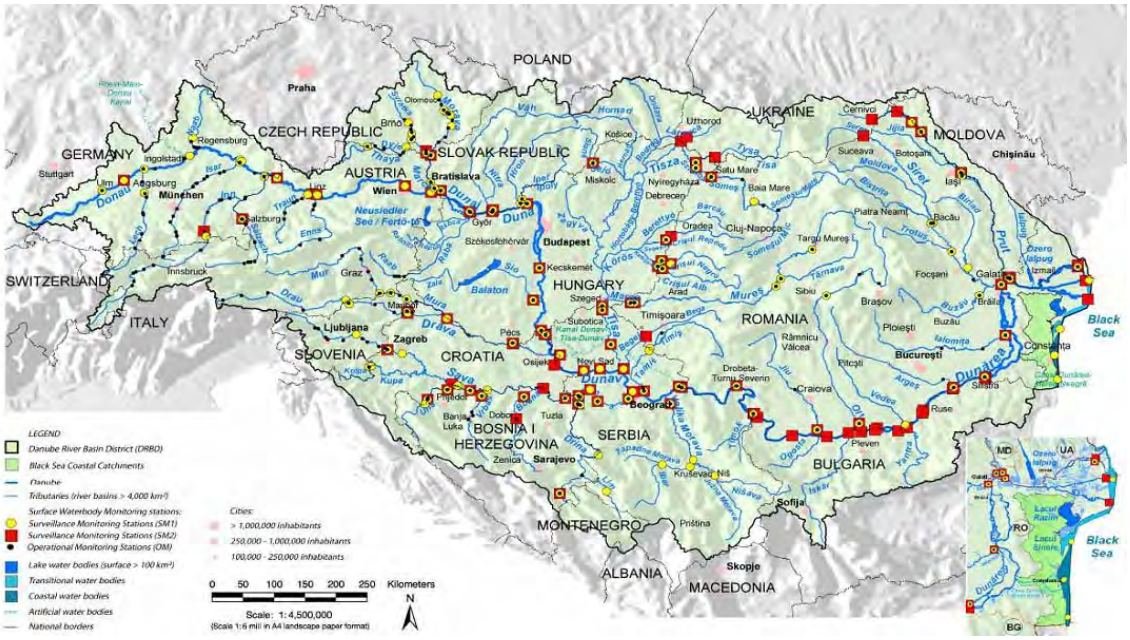

Fig. 7 Primary monitoring points in TNMN

From analysis made in the frame of **Management plan of Danube hydrographic basin,** resulted two of majors effects of human activities impact above water resources from our country which have important economical and social implications:

- **Water quality degradation.**
- **Floral Biodiversity and aquatic fauna reducing** as a result of water pollution.

Presently, 43,7% from water corps of Danube hydrographic basin risk not to achieve the environment goals according to Frame Directive 2000/60;

The quality of water resources is influenced, also, by accidental pollutions. Information regarding accidental pollutions with boundary impact is being sent through Accident Emergency Warning System – AEWS.

These applications imposed by Danube Committee to reduce accidental pollution conduct to some regulations:

- **Financial Warranty** "Certificate of Financial Disponibility" for ships which transport pollutant substances on Danube, which will facilitate the recovery of cleaning operational costs, based on "the pollutant pays" principle;
- **Fluvial ships equipment**, to separate bilge waters with centrifugal separators and using the residues in the ship's burner which will lead to reducing 1000 time polluted water and removing the danger of accidental spillway;
- The existence on board of fluvial ships of a **recording, manipulation and reporting log books (Oil Record Book)** like the log books existent on maritime ships, according to Marpol Convention 73/78

The water quality from Romania is tracked according to structure and methodological principles of Integrated **Water Monitoring System from Romania (SMIAR)**, restructured according to European Directive demands.

Romanian national water monitoring system has two types of monitoring, according to demands from Law 210/2004 which modify and completes of Water Law 197/1996 which took up Frame directive 60/2000/CEE stipulations in water field and others UE Directives. Thus is realized a **surveillance monitoring** having the role to assess all corps from water from hydrographic basin and a **operational monitoring** (as a part of surveillance monitoring) for water corps which risk not to fulfill the water protection goals

The **Management plans of Hydrographic Basins from Romania – 2007**, made by Environment Minister and Water Management and Romanian National Water Administration establishes rules for pressure identification, including impact assessment criteria. Were taking into consideration:

- **Organic substances pollution**
- **Nutrients pollution**
- **Pollution with main substances/main dangerous**
- **Hydro morphologic alteration.**

Next we will review physical-chemical quality markers, selected to reflect the main pressures prior identified on basin level: organic load, nutrients and main substances..

Danube river water quality near the Romania-Bulgaria border on the low sector of the Danube is influenced by significant pressures, such as:

- Pressure from pollution sources from Danube basin upstream Bazias. From the total charge of azote and phosphorus found in Danube waters in Reni area, 82% of the azote and 70% of the phosphorus come from upstream Bazias;
- Pressure from Danube affluents located downstream Bazias, especially on rivers: Jantra, Lom, Arges and Prut;
- Punctual pollution sources located on Danube shore

Danube river water quality was monitored in **2007** in 30 sections, on the river and on Tulcea, Chilia, Sulina and Sf. Gheorghe branches. **From 1075 km monitored, 280 km were included in class I, 787 km in class II and 8 km in class III**. As far as hazardous substances are concerned, Cu and Se were found in all sections, wile Cr, Pb and Cd were rarely found.

Biologically speaking, from 1075 km monitored, **153 km were in critical situation** and needed remedy actions. These 153 km were in Chiciu-Cernavoda section – 72 km and Giurgeni – Siret junction – 81 km.

The set of indicators selected to evaluate quality included organic charge (by CBO_5 and CCO-Cr), dissolved forms of nutrients N and P based ($N\text{-}NH_4$, NNO_3, $P\text{-}PO_4$ and P Total), heavy metals (Cd and Pb) and organic micro pollutants (Atrazine). Data quality was ensured by specific procedures of the involved laboratories, as well as by their annual participation in the international intercomparation scheme QualcoDanube AQC Programme, organized by International Commission for the Protection of the Danube River (ICPDR), through Environmental Protection and Water Management Research Institute (VITUKI, Budapest, Hungary).

Evaluation of Danube River water quality on the Romanian part, on sections part of the monitoring program, was performed based on in force regulations requirements.

The results compared to the limits established by Order 161/2006 are included in the following tables:

:

Values for quality indicators and TNMN sections

Indicator	CBO5	CCO-Cr	N-NH4	N-NO3	P-PO4	P Total	Cd	Pb	Atrazin
Stație	($mg.l^{-1}O_2$)	($mg.l^{-1}O_2$)	($mg.l^{-1}N$)	($mg.l^{-1}N$)	($mg.l^{-1}P$)	($mg.l^{-1}P$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)
Bazias	4.4	12.6	0.52	2.10	0.14	0.18	5.50	24.0	0.20
Pristol	4.2	13.2	0.45	1.94	0.13	0.17	4.32	22.0	0.16
Am. Arges	3.8	12.8	0.30	2.31	0.12	0.23	2.67	25.0	0.22
Arges	8.2	20.1	3.96	4.20	0.24	0.40	3.16	41.5	0.22
Chiciu	4.3	37.0	0.82	2.56	0.08	0.18	2.71	26.7	0.15
Siret	6.6	57.7	1.64	3.00	0.11	0.29	4.03	41.0	0.16
Prut	5.4	53.6	1.21	3.09	0.10	0.22	3.94	33.2	0.16
Reni	3.4	35.0	0.67	2.65	0.08	0.17	2.99	24.0	0.15
Chilia	3.7	34.7	0.61	2.52	0.08	0.15	2.49	25.0	0.18
Sulina	3.8	36.0	0.80	2.45	0.09	0.16	3.73	25.0	0.17
Sf. Gheorghe	3.7	35.6	0.68	2.39	0.09	0.17	2.39	26.0	0.20

Results of the ecologic statuses established by Order 161/2006

Indicator	CBO5	CCO-Cr	N-NH4	N-NO3	P-PO4	P Total	Cd	Pb	Atrazin
Bazias	II	II	II	II	II	II	V	III	< SC
Pristol	II	II	II	II	II	II	IV	III	< SC
Am. Arges	II	II	I	II	II	II	IV	IV	< SC
Arges	IV	II	V	III	III	III	IV	IV	< SC
Chiciu	II	III	III	II	I	II	IV	IV	< SC
Siret	III	IV	IV	III	II	II	IV	IV	< SC
Prut	III	IV	IV	III	II	II	IV	IV	< SC
Reni	II	III	II	II	I	II	IV	III	< SC
Chilia	II	III	II	II	I	II	IV	III	< SC
Sulina	II	III	III	II	I	II	IV	IV	< SC
Sf. Gheorghe	II	III	II	II	I	II	IV	IV	< SC

To comment these results we may state the following:

- in the first part of Danube main stream, between Bazias and upstream Arges, the organic charge indicators and nutrients indicate a very good and good quality status (I and II). For Cd and Pb heavy metals the status is moderate, weak and poor (III, IV and V).

- the second part of the stream, between Chiciu section and sections located on three main branches of the delta, is characterized by very good, good and moderate status for organic charge and nutrients (I, II and III), as well as by weak and poor state for Cd and Pb.

- Siret and Prut affluents indicate good state (II) for phosphorus based nutrients, moderate and weak state (III and IV) for azote based nutrients and for organic charge. This is not the case for Arges, as there are weak and poor quality statuses (IV and V) for parameters indicating high pollution from not cleaned used water exhaustion (CBO5 and N-NH4).

- for all considered stations, the Atrazine level was situated bellow the maximum limit established through Order 161 quality standard

We may summarize that on river main stream there is a decrease tendency – from upstream to downstream – of concentration for CBO5 and N-NH4, P-PO4 and Cd indicators, while N-NO3, P total and Pb and Atrazine are almost constant or slightly ascending. From investigated affluents, Siret and Prut show slightly higher levels of concentration than the Danube and Arges, through very high concentrations, reflects the high pollution degree from exhaustion of not cleaned or insufficiently cleaned used water exhaustion, as confirmed by the results of the investigation monitoring program results performed by ICPDR, Joint Danube Surveys 1 and 2 (Technical Reports, 2002 and 2008).

For Danube main stream we asses, generally, for organic charge, nutrients and Atrazine indicators that the requested quality objective is reached – good quality status. Cd and Pb heavy metals determine, however, a status of weak and poor quality.

Siret and Prut affluents, depending on the considered indicator, have a moderate or weak state, while Arges best status is moderated (except for CCO-Cr indicator).

In **Country environment Report (Romania) for 2009**, Danube River status, in 2009, was considered based on processing information from 28 control sections located on the Danube, as well as on Tulcea, Chilia, Sulina and Sf. Gheorghe branches.

Considering quality evolution along rivers, by relation to the regulated quality categories, the results of surveillance of basin water quality reveals the following situation: in relation to the total length investigated of **1075 km** in 2009, 1061 km **(98.7%)** were included in class **II** and 14 km **(1.3%)** were included in class **III**. In relation with evaluation of indicators as **prioritary/prioritary dangerous** substances, Danube water quality was **improper**, in relation to **Cu** and **Cr** indicators in about 80% of sections where these substances were monitored.

As far as **organic** micro pollutants prioritary/prioritary dangerous substances are concerned there was about **28%** increase from monitored sections for hexachlorbenzene and DDT.

In 2009 the **biologic** analysis of Danube River on Romanian territory was monitored on 1459 km, in 40 monitoring sections, from which 1075 km in 22 monitoring Danube River sections and 18 sections representing 384 km in Desnatui sub-basin.

The biologic analysis of waters from Desnatui sub-basin show damages on the following rivers: Camana 5 km, Desnatui 115 km,Topolnita 44 km, Plesuva 12 km, Blahnita 56 km, Crihala 10 km, Drincea 79 km, Balasan 51 km and Ciutura 12 km. From 384 monitored kilometers, 176 km (**45,83 %)** were I-st class quality – very good ecologic status, 109 km (**28,39 %)** were II-nd class quality –good ecologic status, 97 km (**25,39 %)** were III-rd class quality – moderate ecologic status, 2 km **(0,52%)** were included in IV-th class quality – poor ecologic status.
Biologically speaking, in 2009, in Desnatui sub-basin 99 km did not fit in I and II class quality.
The critical areas that need improvement of water quality from ecologic point of view are the following:

III class quality - moderate ecologic status: 97 km

- Topolnita River section interflow with Danube: 1 km;
- Plesuva River section interflow with Topolnita: 3 km;
- Blahnita River interflow with Danube: 2 km;
- Drincea River Podul Grosului section – interflow with Danube: 66 km;
- Balasan River upstream Bailesti - interflow with Danube: 25 km;

IV class quality - poor ecologic status: 2 km

- Crihala River section upstream Topolnita river interflow: 2 km.

In Danube hydrological basin were also monitored Jijila (14 km) which was included in III-rd class quality – moderate ecologic status and Topolog rivers (50 km) which was included in II-nd class quality –good ecologic status. Both monitored rivers have together 64 km and they belong to 14 eco-region (rivers located at 400-500 m altitude).

Danube River is monitored on Romanian territory on 1075 km from which: 646 km monitored by Jiu basin Management and 429 km by Dobrogea-Litoral basin Management in 27 monitoring sections.

Biological analysis included Danube river water, on 1075 monitored km, in II-nd class quality – good ecologic status.

In the latest **Country environment Report (Romania)** for **2009** the water quality status may be seen in hydrographical basins and in Danube:

DISTRIBUTION OF MONITORING SECTIONS ON CLASSES OF QUALITY ACCORDING TO THE OVERALL SITUATION IN 2009:

No.	Hydrografic basin	Sector length km	Repartition on quality classes									
			I		II		III		IV		V	
			no.	%	no.	%	no.	%	no.	%	no.	%
1	Tisa	24	12	50	7	29,2	4	16,7	-	-	1	4,2
2	Somes	66	13	19,7	31	47	11	16,7	5	7,6	6	9,1
3	Crisuri	90	50	55,6	25	27,8	11	12,2	3	3,3	1	1,1
4	Mures-Aranca	79	17	21,5	44	55,7	9	11,4	5	6,3	4	5,1
5	Bega-Timis	43	15	34,9	15	34,9	10	23,3	3	7	-	-
6	Nera-Cerna	12	6	50	6	50	-	-	-	-	-	-
7	Jiu	53	21	39,6	23	43,4	6	11,3	2	3,8	1	1,9
8	Olt	127	49	38,6	18	14,2	7	5,5	5	3,9		
9	Vedea	17	-	-	9	52,9	4	23,5	1	5,9	3	17,6
10	Arges	79	1	1,3	56	70,9	13	16,5	6	7,6	3	3,8
11	Ialomita	45	18	40	13	28,9	11	24,4	2	4,4	1	2,2
12	Siret	122	39	32	43	35,2	26	21,3	5	4,1	9	7,4
13	Prut	33	2	6,1	11	33,3	11	33,3	8	24,2	1	3
14	**Dunare**	**28**	**1**	**3,6**	**26**	**92,9**	**1**	**3,6**	**-**	**-**	**-**	**-**
TOTAL		*818*	*244*	*29,8*	*357*	*43,6*	*135*	*16,5*	*47*	*5,7*	*35*	*4,3*

SUMARY OF RIVER LENGTHS CUMULATED ON QUALITY CLASSES, ACCORDING TO THE GLOBAL EVALUATED SITUATION IN 2009:

No.	Hydrografic basin	Total length km	Lengths repartition on quality classes									
			I		II		III		IV		V	
			km	%	km	%	km	%	km	%	km	%
1	Tisa	548	238	43,4	224	40,9	77	14,1	-	-	9	1,6
2	Somes	1818	284	15,6	970	53,4	365	20,1	122	6,7	77	4,2
3	Crisuri	1910	993	52	638	33,4	198	10,4	81	4,2	-	-
4	Mures-Aranca	2690	737	27,4	1361	50,6	333	12,4	186	6,9	73	2,7
5	Bega-Timis	1471	503	34,2	595	40,4	303	20,6	70	4,8	-	-
6	Nera-Cerna	390	183	46,9	207	53,1	-	-	-	-	-	-
7	Jiu	1588	949	59,8	438	27,6	125	7,9	73	4,6	3	0,2
8	Olt	3465	1146	33,1	1761	50,8	291	8,4	155	4,5	112	3,2
9	Vedea	1103	-	-	623	56,5	207	18,8	157	14,2	116	10,5
10	Arges	2681	14	0,6	1708	63,7	641	23,9	256	9,5	62	2,3
11	Ialomita	1460	277	19	379	26	571	39,1	75	5,1	158	10,8
12	Siret	4209	1372	32,6	1603	38,1	817	19,4	134	3,2	283	6,7
13	Prut	1608	88	5,5	767	47,7	545	33,9	197	12,3	11	0,7
14	Litoral	331	-	-	6	1,8	228	68,8	90	27,1	7	2,3
14	**Dunare**	**1075**	**-**	**-**	**1061**	**98,7**	**14**	**1,3**	**-**	**-**	**-**	**-**
TOTAL		*26347*	*6784*	*25,7*	*12341*	*46,8*	*4715*	*17,9*	*1596*	*6,1*	*911*	*3,5*

From global quality point of view, in 2009, from the total length of monitored rivers (26347 km), 6784 km were included in I-st class quality (25,75 %), 12341 km in II-nd class quality (46,84 %), 4715 km in III-rd class quality (17,9 %), 1596 km in IV-th class quality (6,06 %) and 911 km in V-th class quality (3,46 %). The next figure illustrates the evolution of monitored river sectors in quality classes during 2004-2009, in accordance with data published on National Institute of Statistics web-site. There may be noticed a decrease in river sectors included in Iv-th and V-th class quality.

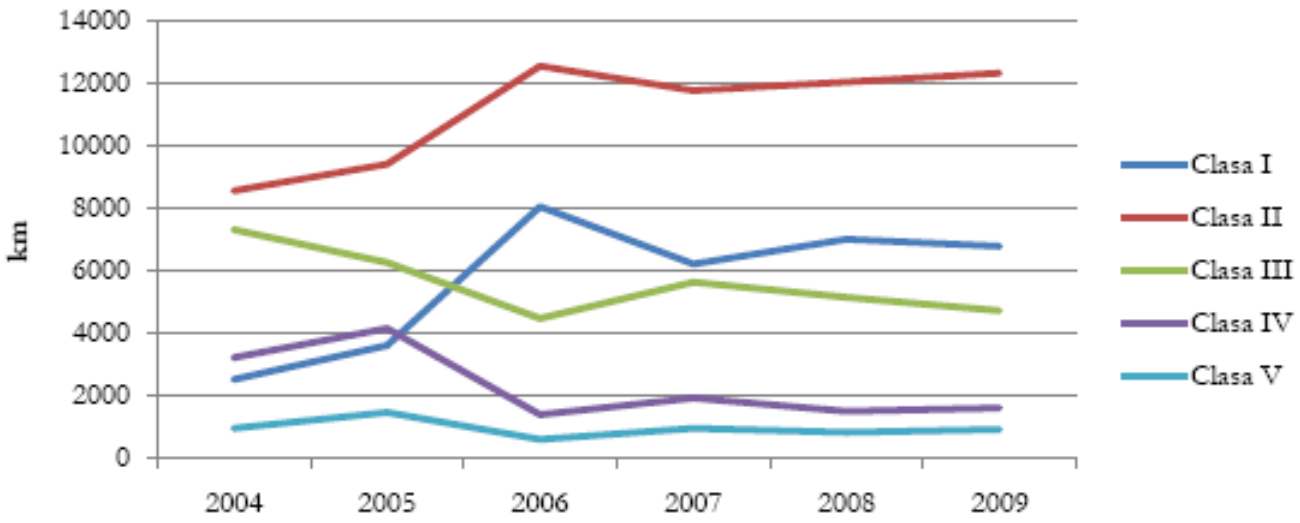

Fig. 8 Evolution of rivers sectors framing on quality classes during 2004 - 2009
Source: INS (based on data supplied by the National Administration "Romanian Waters")

THE OVERALL SITUATION OF THE RIVER LENGTHS IN ROMANIA IN 2009, ON QUALITY CLASSES, ACCORDING TO THEIR ECOLOGICAL STATE:

No.	Hydrografic basin	Total length	Very good		Good		Moderate		Poor		Very poor	
			Km	%	Km	%	Km	%	Km	%	Km	%
	Tisa	548	148	27	359	65,51	12	2,19	20	3,65	9	1,64
	Somes	1818	281	15,46	1170	64,36	356	19,59	-	-	11	0,6
	Crisuri	1662	160	9,63	918	55,26	669	35,14	-	-	-	-
	Mures-Aranca	2690	888	33,01	1632	60,67	49	1,82	44	1,64	77	2,86
	Bega-Timis-Caras	1471	109	7,41	1112	75,59	228	15,5	22	1,5	-	-
	Nera-Cerna	390	52	13,33	338	86,67	-	-	-	-	-	-
	Jiu	1492	1112	74,53	370	28,81	1	0,06	6	0,4	3	0,2
	Olt	3125	1340	42,28	1223	39,14	430	14,05	74	2,37	49	1,56
	Vedea-Calmatui	1103	-	-	400	32,26	571	51,77	132	11,97	-	-
	Arges	2643	280	10,59	1420	53,73	536	20,28	128	4,84	279	10,56
	Ialomita + Calmatui	1612	261	16,19	568	35,24	668	41,44	115	7,13	-	-
	Siret	4129	1233	29,86	2450,5	59,35	401,5	9,72	44	1,07	-	-
	Prut	1608	-	-	1282	79,7	311	19,3	-	-	15	0,9
	Dunare + Jijia + opolog	**1075 64**	**- -**	**- -**	**1075 14**	**100 21,87**	**- 50**	**- 100**	**- -**	**- -**	**- -**	**- -**
	Desnatui	384	176	45,83	109	28,39	97	25,26	2	0,52	-	-
	Litoral	324	-	-	124	38,27	200	61,73	-	-	-	-
Total General		*26223*	*6040*	*23,03*	*14564,5*	*55,55*	*4588,5*	*17,49*	*587*	*2,24*	*443*	*1,69*

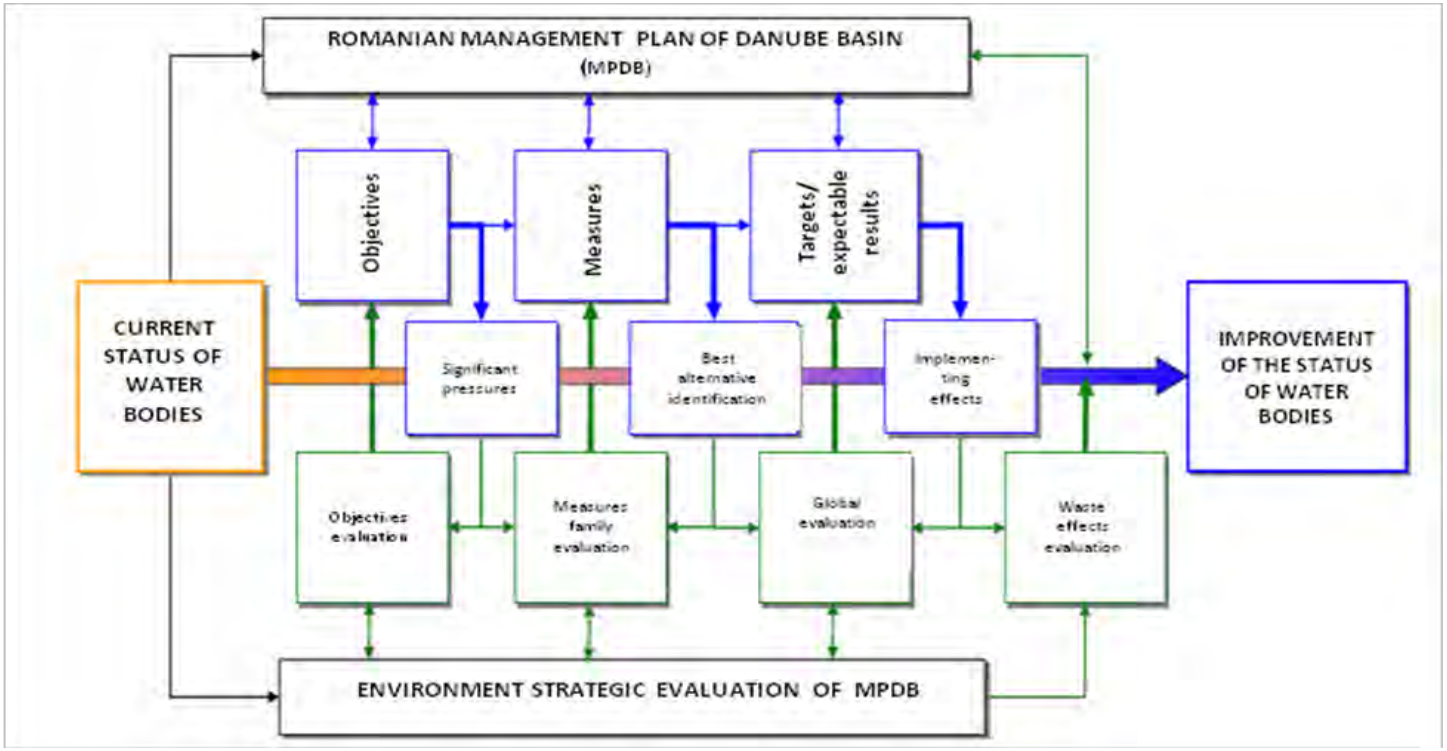

Fig. 9 Conceptual framework for environmental assessing of PNMBD

[MINISTRY OF ENVIRONMENT AND FORESTS

- GENERAL DIRECTORATE of WATER MANAGEMENT - 2010*]*

In **Romania 73 accidental pollution incidents** were registered in **2009**, **31 with oil products, 17 with organic substances,** most due to used waters, 11 with inorganic products and 5 other types of pollution.

Accidental pollution with oil products (42.5%) were caused by oil products pipes breaks for fuel theft or due to their ageing as well as exhaustion of bilge water. They also affected 11% of Danube River. The following table describes them:

No.	Date of pollution event	Water Directorate	Zone/ Km at which Danube river was affected	Pollutant	Nature of pollution	Sanction imposed	Observations / Measures
1	15.01.2009, hour 10.00	WD Jiu	648	unidentyfied	**Petrolium products**	-	SGA Dolj acted with absorbent material. Pollution has been halted on the same day, 14.00
2	16.02.2009, hour 10.00	WD Arges Deva	590 - 595	DONAU-CHEM Ltd	Amonia, after blocking pumps	pecuniary penalty 35.000 lei	Water quality was monitored by taking samples from discharge water and from four sections the Danube, downstream. There have been not affected water uses.
3	23.02.2009, hour 14.00	WD Jiu	954	unidentyfied	**Petrolium product**	-	SGA Mehedinti acted with biodegradable substances ans pollution was stopped on 02/24/2009
4	26.02.2009, hour 09.00	WD Banat	1061-1064	unidentyfied (ship in transit)	**Petrolium product**	-	It was spread absorbent biodegradable substance
5	03.04.2009, ora 08.00	WD Seaside Constanta	30	unidentyfied	**Petrolium product**	-	There have been scattered 140 kg dry absorbent by Water Agencies of SH Cernavoda. It was monitored water downstream over a length of 15 km. Whereas petroleum spot came on

							the Danube - Black Sea about 500 m, it was kept under observation. At around 11.00 there were no traces of oil
6	26.06.2009, hour 07.00	WD Prut		Ship Nefterudozov 12 M russian flag	Diesel, an iridescent surface of 1000 sqm	Notice	Intervention with 3 floating dams and absorbent material type spill-sorb and Oil Depol Flest
7	28.06.2009, hour 06.00	WD Seaside Constanta	Port Constanta Dana 85	unidentyfied	Rainwater infested with petroleum products	-	An anti-pollutant dam was installed by SC CONSAL . The ship “Depol 9” has performed cleaning operations
8	19.08.2009 hour 07.55	WD Prut	Galati Danele 18 -19	SUPERQUATRO Grup Ltd Galati	**Leaked petroleum product, during refloating works of the ship wreck Transylvania**		Polluter has acted to combat and remove the effects of pollution by floating dams and applying absorbent material. SGA Galati has provide qualified personnel. Pollution has been stopped in 27.08. 20.00
9	25.08.2009, hour 15.00	WD Prut	Zona SC DAMEN SA Port Bazinul Nou Galati	unidentyfied	Hydrocarbons, burned oil	-	It has been blocked the damaged pipe. Intervention with floating dam and absorbent material. Pollution has been stopped in 27.08.2009, 20.45 hours
10.	17.10.2009, hour 17.30	WD Prut	Galati	APA CANAL Company Galati	Untreated urban wastewater	-	The riddles related outlets in the Danube were closed, wastewater has been collected in retention basin. It has been checked and corrected sewers

Description of accidental pollution cases on the Danube River, Romania

II. First Case:

Pollution start: **19.08.2009, hour 07.55**

Polluants: **Leaked petroleum product during the Transylvania wreck ship refloating works**.

Location: **Danube, hm 1491-1492,** on a surface of aproximately 500mp**.**

Polution sourse/cause: The ship anchored in berths 18-19 on the Danube / cutting operations and refloating "Transylvania" wreck ship, performed by SC SUPERQUATRO GROUP SRL Galati

Actions carried out and measures taken to avoid or reduce damage:
S.C. Superquatro Group LLC Galati stopped the cutting and refloating of the wreck ship in the engine area (engine room), which represents the pollution source and the refloating operations restarted with the prow of the wreck ship, in compliance with the measures set out by the competent authority
In the work area there were constantly maintained absorbent dams to combat, in order to avoid potential incidents.
S.G.A. Galati regularly monitored the area and intervened with qualified personnel and specific means if the situation required.
The competent authorities have ordered SC SUPERQUATRO GROUP SRL Galati - the polluting unit, permanent measures for all the activity period, for rapid intervention in case of accidental pollution:
- continuous monitoring of the area where the refloating work was carried out;
- permanent communication with the competent institutions, on the existing situation in the area and in case of other incidents;
- Permanent possession of means and materials necessary for intervention in case of accidental pollution;
- prepare and send the Prevention and Control Plan for Accidental Pollution to the empowered authorities, and to act in accordance with this;
- Storage of the absorbent material soaked with oil in a special place and transmit it to the CN Galati S.A APDM for it disposal.
S.G.A. Galati warned the downstream water uses that may be affected by accidental pollution; constantly monitored and organized the actions performed by SC SUPERQUATRO GROUP SRL Galati, in order to stop the pollution and remove its effects.
Pollution was stopped on 27.08.2009, at 20:30, There were no downstream water users affected and aquatic flora and fauna either.

III. Second Case:

Pollution start: **25.08.2009, hour 15:00**

Pollutants: **Hidrocarbons / used oil**

Location: Danube, km 1474, in the SC SN DAMEN SA Galati and SC Bazinul Nou Harbour SA

Galati area
Pollution source / cause: unidentified / changes made by operators in the drainage network structure

Actions carried out and measures taken to avoid or reduce damage:
SGA Galaţi and GNM Galaţi operative teams organized and monitored the actions taken by SC S.N. Damen S.A. Galati and SC Bazinul Nou Harbour SA, to combat and eliminate the effects of the accidental pollution
In order to identify the polluter, SGA Galaţi and GNM Galaţi, the operational teams have carried out the following actions:
- the adjacent source of pollution area (pipeline) was inspected
- the sewage systems of the economical agents were checked, and other potential pollution sources
SGA Galati intervened with absorbent material type Spill Sorb.
S.C. S. N. Damen S.A. Galati installed a floating dam and spread absorbent material type MIXSORB, in order to limit water pollution;
SC Bazinul Nou Harbour SA, Galati intervened in order to eliminate the cause that produced the pollution, armoring the pipeline thought which the HC containing water had leaked, by installing a wooden stopper and caisson it with concrete.
Prior to this action, different operation were taken to prevent any HC leakage in Danube, as follows:
- a pit for collecting the mixture of water and HC leaking from the pipeline was done in the vicinity of the pipe;
- successive dams of soil, sawdust, twigs and absorbent material, ware made in order to retain the pollutant and to halt the flow of water-HC mixture in Danube;
- transfuse the mixture of water and HC from the pit in four metal drums, in order to eliminated by a specialized company.
Competent authorities have ordered S.C. S.N. DAMEN S.A. Galaţi and S.C. Port Bazinul Nou S.A. Galaţi the following measures:
1. Constant surveillance along Danube shore in the area of S.C. S.N. DAMEN S.A. Galaţi, S.C. Port Bazinul Nou S.A. Galaţi. and the area of armored pipeline;
2. Removal, by licensed companies, of the dangerous waste and petroleum residues resulting from the incident
3. Shore sanitation and greening in the area of intervention
4. Permanent possession of means and materials necessary for intervention in case of accidental pollution;
5. Action in accordance with the own Prevention and Control Plan for Accidental Pollution
6. Permanent communication with the competent institutions, on the existing situation in the area and in case of other incidents;
Pollution was stopped on 27.08.2009, at 21:00, There were no downstream water users affected and aquatic flora and fauna either.

Fig. 10 Aspects from interventions

Bulgaria, practically, made its first steps in the implementation of the Water Framework Directive with the adoption and enforcement of the Water Act from January 2000. The present report indicates the first results of the real steps of the implementation of the provisions of the Directive, as well as the first obtained results, on the basis of the available data, having been at that stage either harmonized or twinned to the requirements of the Directive.

In Bulgaria, the water management is carried out and guided by the Ministry of Environment and Water, since this is the responsible institution at national level for the implementation of the Water Framework Directive in the Republic of Bulgaria.
Following the principle of river basin management in the country stipulated in the Water Act**, four river basin districts** have been established in the country. They are as follows:

- **Danube River Basin District** with headquarters in the town of **Pleven**;
- **Black Sea River Basin District** with headquarters in the city of **Varna**;

- **East Aegean Sea River Basin District** with headquarters in the city of **Plovdiv**, and
- **West Aegean Sea River Basin District** with headquarters in the town of **Blagoevgrad**.

Fig. 11 River Basin Districts in Bulgaria

After the establishment of the Basin Directorates in 2002, they became the competent water management authorities and started their activities and got actively involved in the performance of tasks regarding the implementation of the Water Framework Directive.

The Danube River Basin District covers 45 % of the territory of Bulgaria and the predominant part of Northern Bulgaria. An exception is the River Iskar, which originates in the Rila mountain and gets water from the mountains of Vitosha, Plana, Lozenska Planina, Lyulin, the southern slopes of the Balkan, between the Petrohan and Vitinya passes, crosses the Balkanthrough the Iskar gorge and has tributaries from the northern slopes of the Balkan. The network of Nishava River with its tributaries is located to the south of the Balkan's ridge.

The Danube River Basin District includes two main morphological and structural units: the Danube plain, characterized by lowland and hilly-plateau relief and the northern slopes of the Balkan mountain chain which is divided into two parts: Pre-Balkan and Main Balkan Chain.

The main mountain chain has an average altitude of 900 m, and the Pre-Balkan - 384 m.

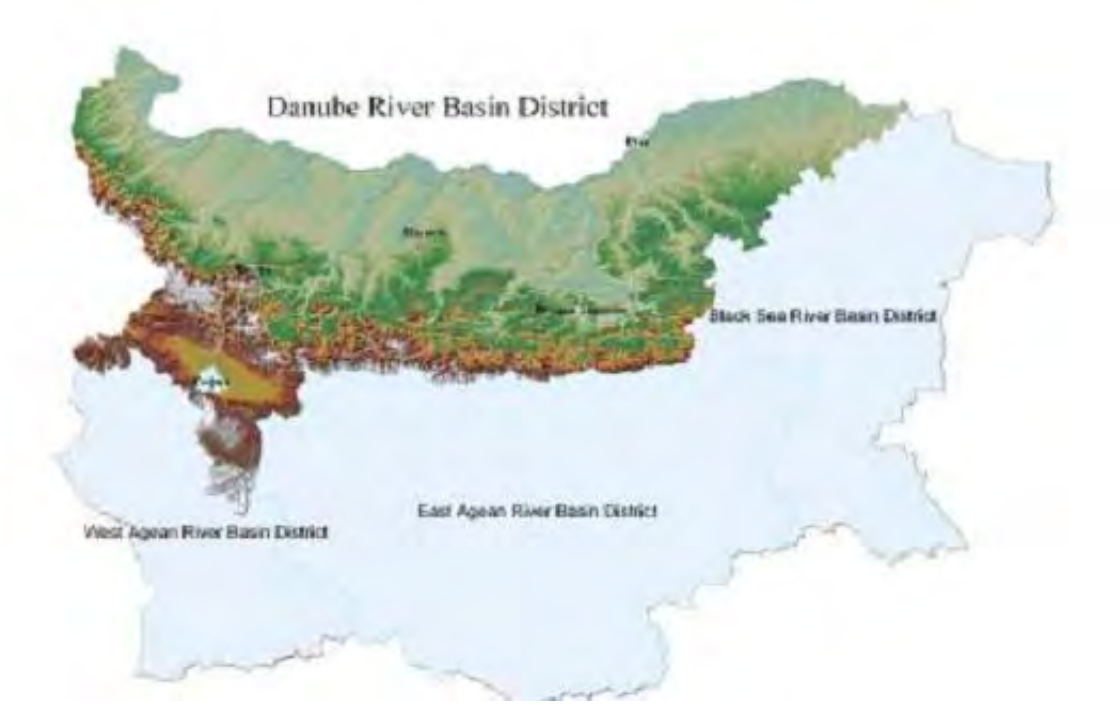

Fig. 12 Danube River Basin District (DRBD) with center the town of Pleven

The main environmental impacts occurring in the DRBD in Bulgaria as a result of significant pressures are:

- **Organic enrichment**
- **Nitrogen enrichment**
- **Elevated level of dangerous substances – Cr, Pb, Fe**
- **Water abstractions from surface water;**
- **Water Flow Regulations and Morphological Alterations**.

The main activities for characterization of surface water bodies are still in process; and forthcoming as regards groundwater. A great amount of data is either missing or insufficient for making a good assessment. Therefore, expert judgments were often used in the final decision making which need further complements and investigations.

The surface water bodies have been classified into the following categories:

Classification of water courses categories in Bulgaria

N	River Basin District	water bodies		
		not at risk number (percentage)	at risk number (percentage)	possibly at risk number (percentage)
1	Danube	51 (32%)	49 (30%)	61 (38%)
2	Black Sea	26 (16%)	26 (16%)	106 (67%)
3	East Aegean	107 (35%)	54(18%)	145 (47%)
4	West Aegean	79 (63%)	23 (18%)	24 (19%)

Source: MoEW, National Report on Implementation of Art. 8 of the WFD, 2007

Although Bulgaria has not designated coastal waters to the Danube River Basin District coordination was carried out with Romanian competent authorities regarding coastal water types and coastal water bodies at the boundaries of the DRBD and the Bulgarian Black Sea River District. Bulgarian and Romanian competent authorities have jointly identified two transboundary ground water bodies, following the criteria described in Chapter 5 of the Danube Basin Analysis (WFD Roof Report 2004)– Part A.

Joint Bulgarian-Romanian activities on the implementation of the WFD within the framework of the ICPDR have clearly revealed the need to update the legal basis for cooperation between the two countries in the area of water management. An Agreement between the Ministry of Environment and Water of the Republic of Bulgaria and the Ministry of Environment and Water Management of Romania on Cooperation in the Field of Water Management was signed on 12 November 2004 in Bucharest. This document envisages the establishment of a Joint Commission on Water Management as a bilateral body for the implementation of the agreement.

In Bulgaria , 35 groundwater monitoring points in the region of the Danube Basin have been proposed.

The analysis of anthropogenic impact and pressure was conducted by taking into consideration the pressure exercised and respectively the impact by:

Point Sources:

- Urban sewerage of residential areas having more than 2000 equivalent inhabitants discharging without the required purification;
- Discharge from urban waste water treatment plant – urban waste water treatment plants (such plants were constructed for more than 10 000 equivalent inhabitants);
- Discharge of industrial waste water from industrial sites (industries contained in the list of IPPC Directive and some more important which are not listed).

Diffuse Sources:

- Residential areas having more than 2000 equivalent inhabitants without urban sewerage;
- Landfills of residential areas with more than 2000 equivalent inhabitants;
- Industrial diffuse pollution points – discharge of waste water into absorbing wells and backwaters, presence of industrial waste landfills.

Morphological alterations

- Water abstractions – quantity of abstracted water and purpose of water abstraction by economic sectors

Risk assessment of water bodies was conducted on the basis of an expert judgment using five-level scale for the concentration of physical and chemical elements as well as the value of the biotic index BI in the water body, adopted on national level (refer to item IV).

The risk assessment was carried out by using the data obtained through the analysis of samples taken from the monitoring points of the National Environmental Monitoring System – NAEMS, as well as by taking into consideration the particularities ofanthropogenic impact and pressure for diffuse and point pollution sources and morphological alterations.

The following programmes and development forecasts were considered:

- Implementing programme related to Directive 91/271/EEC on urban (municipal) waste water treatment plants (transposed by Regulation N 6 of 2000);
- Implementing programme for harmonization with Directive 96/61/EC – IPPC on integrated pollution prevention and control (transposed by the Environmental Protection Act and Regulation on the complex permits, adopted by Decree N 62 of 2003);
- Demographic forecast;
- Industry development forecast;
- Agriculture development forecast;
- Tourism development forecast.

The following recommendations were made in reference to the exploratory surface water monitoring:

- NEMS – additional water monitoring places should be included along the river course of: the Iskar River, Ogosta River and the rivers westwards from Ogosta, Vit River, Osam River, Yantra River and Russenski Lom River.
- Monitoring on surface drinking water (by river course) pursuant to Regulation N12 on the quality requirements to surface water intended for drinking water supply (SG n 63/28.06.2002).
- Monitoring of water for natural fish communities (trout and carp) by river course, according to the provisions of Regulation N 4 on the quality of fish and shellfish water. (SG N 88/ 27.10.2000).
- NASEM Hydrobiological monitoring – by river course.

So we can say that the main activities for characterization of surface water bodies are still in process in Bulgaria; and forthcoming as regards groundwater. A great amount of data is either missing or insufficient for making a good assessment. Therefore, expert judgements were often used in the final decision making which need further complements and investigations [*Sector "Water Quality" http://www.moew.government.bg*].

Polution impact and strategies against polution

A simple pollution impact classification can be:

- Economical;
- Ecological;
- Social;
- Political.

The economical impact it refers to negative effects induced to economic activities. These activities can be industrial, tourist, industrial and sport fishing and never the least shipping himself.

If we refer to ecological impact, the pollution effects depend on several factors such as:

- spilled volume,
- pollutant type and characteristics,
- hydro-meteorological and weather conditions in the moment of the accidents / incidents,
- shoreline, area and river bed topography,
- the pollutant-sediment relationship and their mixing degree, etc.

The most serious repercussions are ultimately on the increased water toxicity degree, mainly due to the water soluble fractions toxicity: alkenes, benzene and naphthalene, the lethal dose for 96 hours of exposure being between 0.5 - 10 mg / l.

The main cause that can generate immediate lethal effects is the hydrogen sulphide from 0.0001% (concentration that is detectable by smell and irritates the respiratory tract) to only 0.1%, (concentration that causes immediate loss of consciousness and brain damage, death occurring in about 3-5 minutes of continuous exposure, birds and fish from aquatic environment are exposed in such way). Also, negative effects can occur on the human body, both on health and even to community image

Finally, if the pollution damages exceed the country border, the political effects of pollution must not be neglected; claims and damages between the two or more states involved can appear. The political impact is more pronounced if those countries are not member of international organizations and conventions, who can offer assistance and protection in case of pollution.

Through Romania - Bulgaria cross border Program - Priority Axis 2 - Natural resources and environment sustainable use and protection, border area effective risk management promotion - 2.2 - **Infrastructure and common services development to prevent natural and technological disasters, including joint emergency services intervention**, has created the economic frame regarding to Romanian – Bulgarian jointly activities achievement for closeness, awareness, learning and putting into practice of a prevention and greening system for oil waste that can infest Danube waters.

The activities included in Priority axis no. 2 are reducing pollution and stopping waste discharges into water by common actions. Together with national policies, integrating environmental and key areas intervention objectives, the present project will contribute implementing this directive.

The main request for border area sustainable development is to have a clean and safe environment and in this key area intervention is intended to significantly improve the area image as a good place to live and invest.

The achievement of another program objective (closeness between the population from two Danube sides and strengthening cultural ties between them) will be by common bilingual studies on disaster control, information on mutual concern matters exchange, experience and knowledge on border area effective pollution prevention risk management exchange.
Thus, by small proportions joint activities, the community awareness on cleaning Danube water is achieved.

Existing prevention/fighting border area strategies are targeting three large action categories: awareness, promotion and technical solutions. They are:

- international cooperation improvement that would allow to have a system to collect and exchange information on border water quality trend in order to determine the lowest cost of pollution control measures;
- market based tools promotion which will take into account the environmental issues
- pollutants discharged into water, air and soil fees application
- taxes reductions for those who are using technologies with low environmental impact
- facilitate the access to funding sources for environmental protection activities
- providing technical and logistical means to intervening in case of rivers contamination
- national and regional environmental programs implementation (environmental Danube protection national program) with international assistance
- develop the capacity to control of the environmental authorities
- water treatment plants development in the border area for industrial waste water and urban sewage
- safe waste disposal systems development
- upgrading the national water quality monitoring network
- training and education programs to increase the capacity of making decisions about environmental protection establishment
- effective actions to combat pollution promotion

Risk Management

The risk management has two important components: risk assessment and vulnerability assessment.

Environment degradation represents a disaster risk factor and, also, a reason for community vulnerability increasing to venture.

From environment point of view, the main activities which contribute to disaster prevention (more exactly to vulnerabilities and risks decreasing), realized together with environment ONG, public administration and communities, are the following:

- **rational using of natural resources** (for direct common human consumption, and also for industry);
- **reducing extreme human intervention above environment** (through activities like: deforestation, river banking, polluting industrial activities, green areas from cities extinction etc);
- **decreasing the number of polluting agents and the quantity of polluting agents** which human activities release in environment (wastages, toxic substances from industry, gas emissions with green house effect etc).

The risk management aims to connect all elements and actors from disaster management system and development of disasters decreasing elements based on prevention and intervention strategies, acknowledge transfer and mutual exchange, education and decision making techniques.

The risk management process is iterative, and is demonstrated by the feed-back loops from the following picture

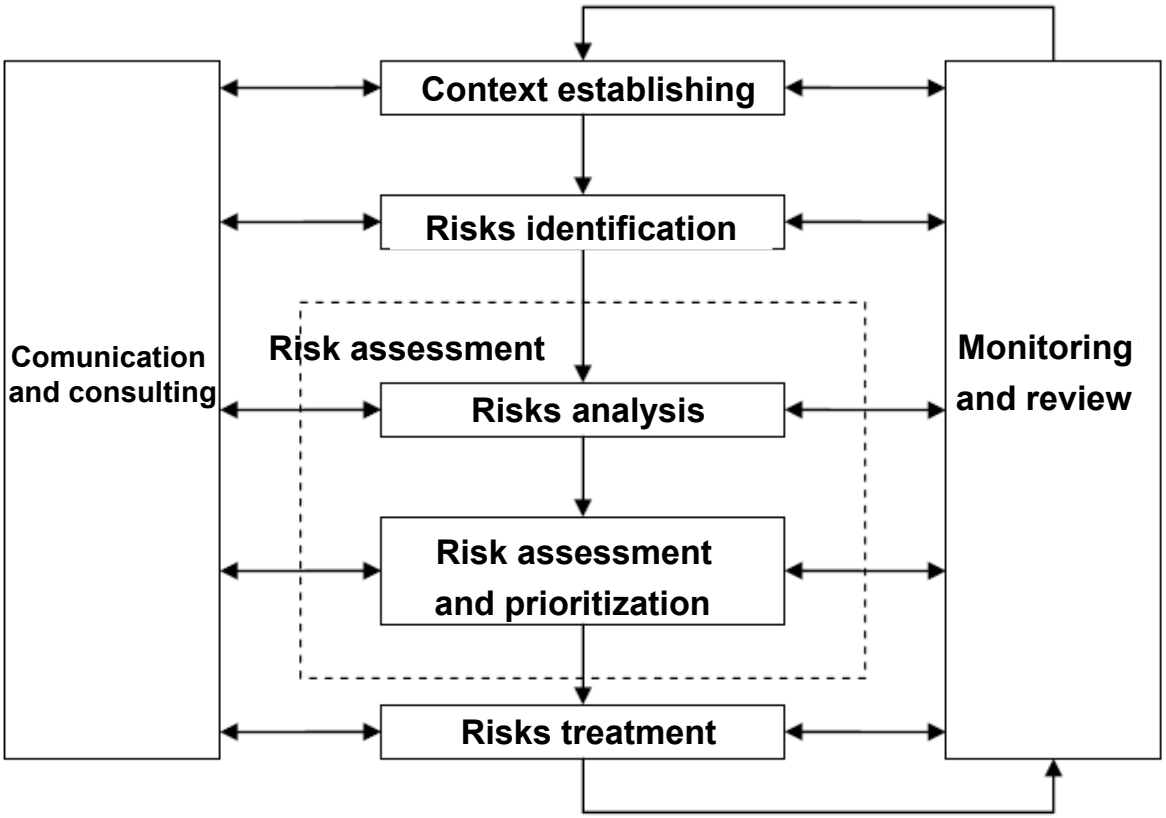

Fig. 13 Model for the process of risk management

It can be repeated with the condition of introducing of some additional criteria or risks, resulting a continuous improved process.

The phases of risk management generic process are:

- **context establishing**: strategic, organizational and management context assessment of risks, and determination of analysis structure and of basic criteria according to the risks will be assessed; affected/interested sides identification and communication and consulting policies definition;
- **risks identification**: identification, as a base of subsequent analysis, of what can happen, inclusive dangers and associate consequences;
- **risks analysis**: risks analysis, in probability and gravity terms; control possibilities and control measures effect above consequences gravity; happening probability and the gravity can be combined for risk level assessment;
- **risks assessment and hierarchy**: comparing appraised risk levels with established criteria; next, risks can be gradated for priorities identification; identified risks with low

priority can be accepted without being treated, constitute just monitoring and revision subject;

- **risks treatment**: developing and management plan implementation, which must include considerations regarding financial and other natures resources, and also action terms;
- **communication and consultation**: consultation and communication with affected/interested parts, internal and external, in every stage of risk management process;
- **monitoring and revision**: monitoring and risks revision, inclusive system management performances assessment and modifications which can affect it. Whereas are presented and independent activities, in practice the stage enumerated before are in a close interaction [2]. For example, when risks were identified the context and criteria must be revised, and some aspects of analysis must be reconsidered

Environment risk results from interaction between human activities and environment. Ecological management risk, which treats risks problems generated by past, present and future human activities above the fauna and ecosystems, represent just one component of environment risk management. So that we consider:

Environment risk. This type of risk admits the fact that the activities of an organization can generate some environment changes. Environment risk can refer to:

- flora and fauna;
- people health and welfare;
- people social and cultural welfare;
- water, air and soil resources;
- energy and clime.

The purpose of each study in particular must be clearly defined.

The risk for organization from environment's problem point of view. This category includes the risk of legislation and existent and future criteria inconformity. Also, in these category are included the company's business loss because of inadequate management, decreasing the company's reputation, litigation costs and assuring difficulties to maintain the development possibility of operational and development activities.

The problems regarding the labor health and security and management risks in emergency situations can be significant from environment point of view. Many laws, standards, methodological guides and studies are established to this sort of problems, but they are not precisely approached in this paper.

Environment management risk provide a formal set of processes which fundament decision embracement regarding the environment and sustain the decision organism to minimize the incertitude level.

Environment management risk significant differs from other types of risks management, because has particular characteristics which reflect environment complexity.

The large number of ecosystems and organisms, the way they interact between them or with other related systems generate a high complexity degree and a significant incertitude level.

In most situations, the decisions refer to long period of time and are based on multiple suppositions regarding potential impact, such as, for example, the effect above next generations. Due to the difficulty to generate precise suppositions, the decisions are frequently taken in conditions of scientific incertitude above possible consequences.

The factors which influence environment management risk include:

- **absence of data** or a small volume of data existence;
- **the necessity for supposition's** formulation;
- **the natural variability;**
- **concepts, techniques and new methods** use, which come from not enough developed scientific fields and which represent the object of frequently disputes and controversies regarding the actions that must be done;
- **long periods of time** (e.g., even though it has to consider future generations, ecologic changes may happen slowly, due to time difference between causes and effects);
- local, regional, national, international, global **potential effects over the environment and economic welfare** and eventuality of irreversible consequences;
- **lack of direct and obvious connection between certain causes and effects on the environment.**

The essential elements for interventions in case of hydrocarbon pollution are:

- existence of a **legal national operations coordination and management authority**
- existence of **specialized trained personnel**
- existence of **specialized and reliable equipments**

The main objectives of the intervention are:

- **protection** of the shore and limitation, as much as possible, of pollution of sensitive areas (economic, touristic areas, reservations)
- **recovery** of the pollutant, as much as possible
- **rehabilitation** of the polluted areas, as much as possible, in order to restore the initial ecologic status.

Use of intervention methods is conditioned by several elements which affect the success of intervention operations:

- **hydrometeorology** during intervention (wind, big waves, floods, temperatures, etc)
- **processes** on the spilled pollutant
- **pollutant type and quantity**
- **impact type and type of polluted area**
- **human and material resources** available at the moment of intervention

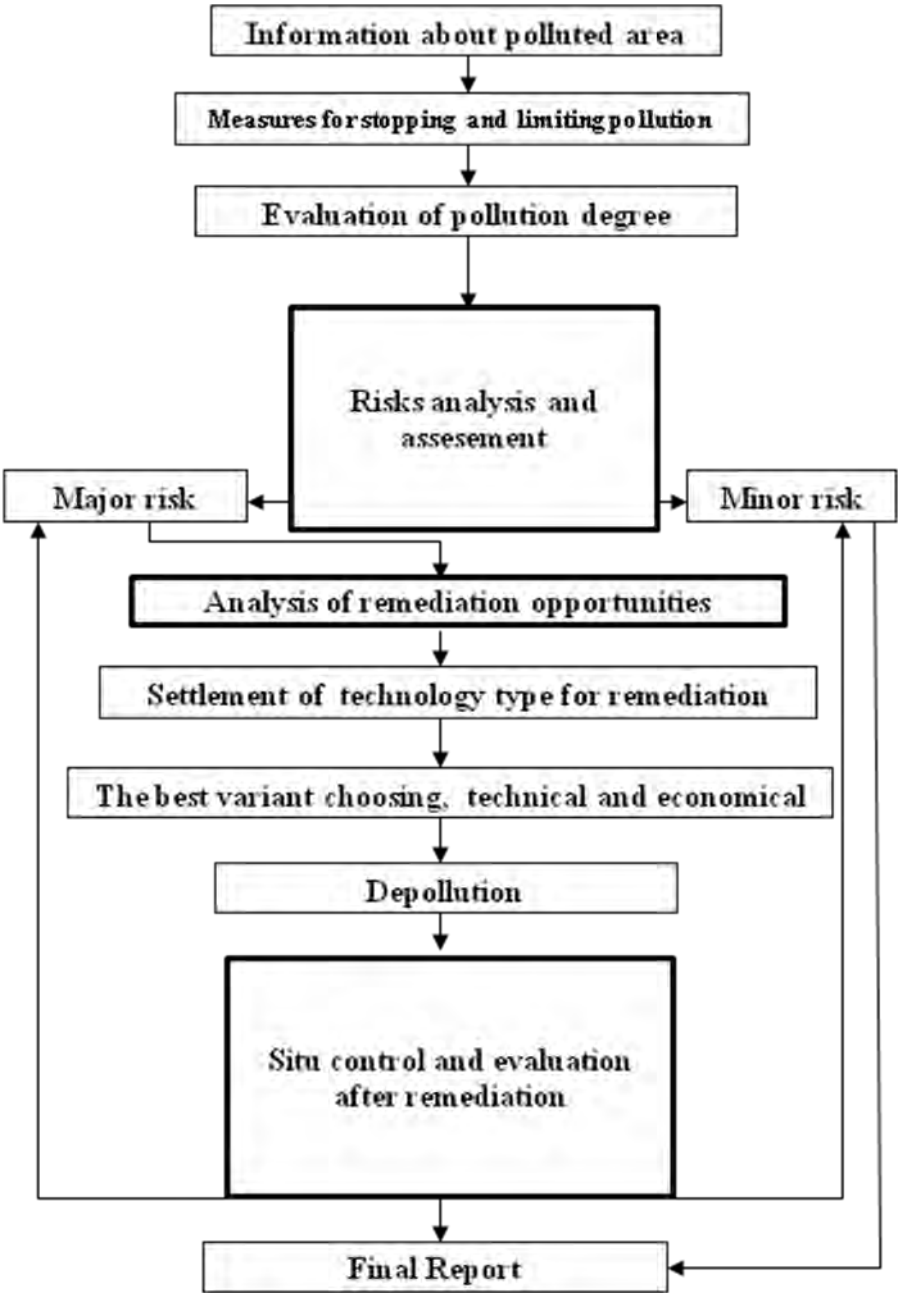

Fig. 14 The proposed model

The strategy proposed through this project aims to a **new, rapid and useful intervention method to remove oil products pollution** and the method was developed by specialists of the project partners, based on their high professional performance.

Promoting a very efficient joint strategy, based on development of new scientific ideas, leads not only to joining Romanian and Bulgarian economies, but also to achieving **sustainable development** of the common interest area.

Efficient environment protection by advanced processing, up to completely ecologic compounds (water and hardware) and reuse of oil in the industrial circuit (without further special treatments) leads to sustainability of the inside value of the natural resources of the region, in accordance with no. 3 specific objective of the Program.

The project has two main objectives:

- to elaborate a prevention **strategy** against technological risks of polluting the Danube with oil and oil products, by using a **jointly coordinated management system**, ensuring efficient **protection and use of the natural values** of the area, which perfectly matches Objective 1 of Priority Axis no. 2.

- to primarily protect the **natural environment of the area**, which leads to protection of the **people and the companies** which perform their activities in this area and whose operational results are influenced by **quality of the environment** as well as of the existing local infrastructure, by achieving a fast and efficient response to **prevent and timely remove the possibly catastrophic of men caused crisis or technological accidents**, which perfectly matches Objective 3 of Priority Axis no. 2.

Intervention methods currently used in case of oil pollution on the Danube

Currently in Romania, NC APDF Company Giurgiu performs environmental protection activities:

- Taking over the household waste and garbage from ships
- Taking waste and sewage from ships
- Intervention in case of oil pollution by dividing the port waters

To accomplish these activities it were used as sources EU funding and own sources. An example is the investment project "Greening the Danube and transport facilities, included in the PHARE CBC 2000 between Romania and Bulgaria.

De-pollution Unit from Giurgiu port Complex is composed by:

- **Greening port berth arranged on the left bank of the Danube Km 493 Giurgiu**
- **Motor ship "Ecostar 1",** which colect oil , petroleum products waste or garbage from the ships, as well as for rapid intervention in case of accidental oil pollution
- **Technical anti-polluting ship without propulsion "ND 2282"** , designed to collect waste oil and hydrocarbons from ships, wastewater, garbage and to response to accidental oil pollution

It has special plants (instalations) for reception and separation of oily water mixture, processing and wastewater treatment.

Fig. 15 Aspects on environmental protection activities on the Danube - Giurgiu

What our project aims (the **novelty**) is an entirely different technology (**centrifugation**), that will complement and improve the existing ones , in order **to minimize the effects of pollution**, the **response time** and the **intervention time** in case of pollution, as well as to increase in the same time the **capability and efficiency of the separation process** for those three phases.