JOINT ACTION PROGRAM

Final Implementation Report

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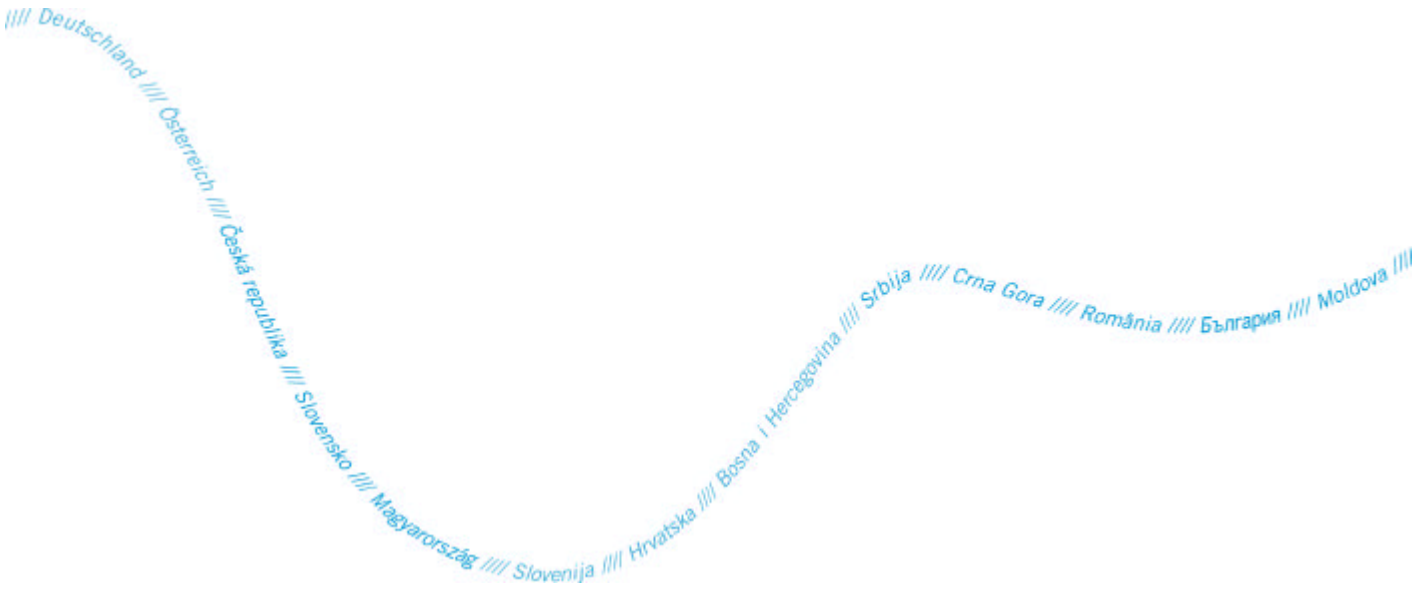

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Mihaela Popovici

ICPDR Secretariat

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1 INTRODUCTION

This Report addresses the status of implementation of the ICPDR Joint Action Programme (JAP), with particular attention to the introduction of policy and legal reforms and implementation of investment projects in the municipal, industrial and agricultural sectors, as well wetlands rehabilitation measures, for pollution control and nutrient reduction in the Danube River Basin.

The JAP 2001-2005 reflects the general strategy for the implementation of the DRPC for the respective period. It deals i.a. with pollution from point and diffuse sources, wetland and floodplain restoration, priority substances, water quality standards, prevention of accidental pollution, floods prevention and control and river basin management. Thus, the report summarizes the achievements that have been realized through the work of the countries under the JAP for the whole period of reporting to JAP implementation - until 31 December 2005. To facilitate a better and more recent reflection of the countries efforts and achievements, in several chapters, the situation and interpretation of results was based on 2006 evidences.

The countries assessment of the projects proposed in 2000 for the JAP is based on the national reports and on the reporting on the investments projects which have been included into the ICPDR database, which provides detailed information for each individual project, as well allows reporting according to the selected parameters and topics. Along the years, many projects were reconsidered, both technically and financially, for different solutions, parameters and updated costs. For these reasons, the country assessment introduces (i) planned projects, with expected pollution reduction and related costs, as being estimated in 2000, then (ii) an assessment by 31 December 2006 according to the countries reporting for the Interim Implementation Report, (iii) a final assessment for the whole period of JAP, and (iv) estimates of proposed measures under implementation, in pipeline, or in preparation in the Danube countries in line with the EU Directives.

The results of the JAP will be used in the development of the Joint Program of Measures, under the Water Framework Directive (WFD).

In assessing the implementation of JAP tasks, the report considers the transfer of EU water related directives (Nitrates Directive, Urban Waste Water Directive, IPPC Directive, Water Framework Directive, etc) into national policies, regulations, and compliance mechanisms. The estimated cost for reforms concerning institutional and legal measures and direct investments that have been carried out to respond to JAP tasks, is also discussed. If the national commitments do not yet include obligations towards EU directives, the assessment of JAP implementation is based on the National Environmental Action Plan of the respective country.

The implementation of investment projects, taking into account **municipal**, **industrial** and **agro-industrial** projects, and measures for **wetland** restoration is analysed.

This final report has been prepared based on the information from the national contributions on the ICPDR Joint Action Program implementation and the results of the ICPDR Expert Groups.

Information provided by the ICPDR DABLAS database, presented in a separate chapter, was only used to create a more comprehensive frame of countries both achievements and efforts towards meeting the EU Directives requirements by 2015. Among future remaining needs, there are several projects under implementation or in pipeline, which are well prepared and do not need any further technical or financial support, but also projects in preparation, which need further technical and financial support.

The Report includes two parts: (i) a thorough revision and assessment of policy objectives, priorities and strategies as well as water related legislation and practices in line with the ICPDR JAP; the identification of main deficiencies and necessary steps to be taken regarding policy, legal and regulatory reform, and finally the estimates on the cost for reforms concerning institutional and legal measures and (ii) direct investments that have been carried out to respond to new water related regulations linked with JAP tasks.

The report has also 4 annexes (investment measures – annex 1, municipal, annex 2, industrial and agro-industrial, and annex 3, wetlands, and summary of country reports- annex 4).

The compiled information provide a clear picture of the results achieved by the individual Danube countries, the policy and legal reforms, the gaps to be filled and the investment projects, which need further technical and financial support. The results may also be used as a baseline for evaluating subsequent progress at the national and regional levels in the process of preparing the River Basin Management Plan under the WFD.

The structure of the Country Report follows the structure of the national reports, which are structured as follows:

(1) Policy objectives
(2) Status of legislation dealing with water management (in force, in progress, main deficiencies)
(3) Main barriers to policy and legal reforms to water-related policy and legal reform and JAP implementation
(4) Proposed actions and measures in relation to JAP
(5) Estimated cost for reforms concerning institutional and legal measures to respond to JAP and new water related regulations.

The Country Reports are also available, and national summaries are attached to this implementation report.

2 MAIN CONCLUSIONS

The report summarizes achievements that have been realized through work of the countries under the ICPDR for the implementation of the Joint Action Program.

The JAP 2001-2005 reflects the general strategy for the implementation of the DRPC for the respective period. It deals i.a. with pollution from point and diffuse sources, wetland and floodplain restoration, priority substances, water quality standards, prevention of accidental pollution, floods prevention and control and river basin management.

The total investment foreseen in the JAP period 2001-2005 to respond to priority needs is estimated to be about 4.404 billion €, with priority projects mainly being:

- Municipal waste water collection and treatment plants: 3.702 billion €
- Industrial waste water treatment: 0.267 billion €
- Agricultural projects and land use: 0.113 billion €
- Rehabilitation of wetlands: 0.323 billion €

Important successes of Danube countries in implementing the JAP include: Trans-national Monitoring Network (TNMN) operational with 79 sampling stations, Analytical Quality Control (AQC) programme to ensure quality and comparability of data, Emissions Inventories updated for point and diffuse sources of pollution, AEWS operational and upgraded, Action Plan for Sustainable Flood Protection in the Danube River Basin developed, Accident prevention system in place, Habitat and species protection areas defined and measures to restore and protect wetlands and floodplains under implementation.

The following conclusions and recommendations are drawn:

- Like all major rivers of Europe, the Danube has historically been significantly altered and affected by a wide variety of ways including water abstraction, industrial processes, agriculture, fishing and transport. The resulted impacts on the Danube water environment have caused diverse and complex relationships, for example by modifying the relationship between soil, water and vegetation through urban development, drainage infrastructure and flood defences or wastewater discharges and the quality of the rivers.
- The highest priority environmental challenge in the region is eutrophication. The problem of eutrophication is now the priority issue for the Black Sea. It is estimated that historically the Danube alone introduced some 60,000 tons of phosphorus and 340,000 tons of inorganic nitrogen into the Black Sea each year. The results in reduction of the water clarity, a raising of the aerobic/anerobic interface, loss of macrophyte growth, reduction in fish spawning sites, increased occurrence of red-tides, loss of biodiversity and, in conjunction with over-fishing, loss and deterioration of commercial fisheries.
- Discharge of untreated municipal wastes into basin waters creates significant problems in the basin. Often sewage treatment is limited to screening before being discharged directly into rivers. Lack of monitoring capacity creates hazardous conditions in recreational waters. With no tertiary treatment nutrient loading from municipal wastes is quite high.

- Problems of flooding in the Danube resulting from climatologically based variations, and loss of flood plain due to urban development and drainage.
- There is also a general decline in biodiversity and a loss of habitat, particularly wetland habitat in the basin. Land use alterations, such as the draining of wetlands and forest clearing, have reduced its naturalness, and pollution by both nutrients -and toxic contaminants have all combined to impair the quality.
- Realization of investment projects in the wetlands sector will not only greatly contribute to reducing nutrient levels in the Danube River Basin but also significantly improve flood protection, biodiversity, groundwater supply, and biomass production (timber, hay, fish, etc.).
- The economies are recovering in many of the basin countries, and agricultural and industrial activities are beginning to become revitalized.
- The ICPDR has been very successful in developing databases, conducting special studies, identifying hot spots and sensitive areas and raising awareness. These activities have facilitated improvements in water management practices in the Danube River Basin. With the majority of the countries now within or working toward the same legislative framework new strategies emerge. It is now possible to develop a more broadly based policy approach in line with the EU Directives. This makes it both more efficient and also cost effective.
- Country commitment to the EU directives is central to its success. The key challenge Danube countries faced in the policy field was to identify the most effective ways of transposing EU environmental directives. Country's choice on how to achieve compliance with EU directives has a significant influence on compliance costs.
- Political support and commitment are already mobilized to facilitate the implementation of investment projects and to enhance the cooperation between participating countries and the financing instruments of the EU, bilateral donors and International Financing Institutions (in particular EBRD, EIB, WB etc).
- EU accession has accelerated the reform process.
- The reporting on the JAP highlights that many investment and actions are happening.
- There has been substantial legislative reform and in particular the implementation of EU community law within the DRB countries.
- Following a challenging and demanding period of transition, most of the DRB countries have in the last years developed a comprehensive hierarchic system of short, medium and long-term environmental policy objectives, strategies and principles which reflect the political context of each country, key country-specific environmental problems and the sector priorities on national and regional levels.
- The key challenge the non-EU countries in the Danube River Basin face in the policy field is to identify the most effective ways of transposing EU environmental directives. Country's choice on how to achieve compliance with EU directives will have a significant influence on compliance costs.
- All Danube countries have provided data on the EU Directives (UWWTD, IPPC, etc) using the same methodology as the Member States.
- The Member States (Austria and Germany) have already implemented the UWWTD and applied the nutrient removal. The other 6 Member States are currently implementing the UWWTD in line with the transition periods agreed with the EC.
- The report is, however, highlighting both the implementation efforts and deficits. This is especially the case for those EU Directives that require substantial administrative reform and financial investments.

- Further regional cooperation can help close the growing gap between countries that are more and less advanced in specific policy areas.
- In developing the Danube River Basin Management Plan, the ICPDR's role is to encourage all of the Danube countries to adopt and implement IPPC legislation. The majority of the countries have a mandatory obligation to the EU while the remaining countries could be encouraged to adopt legislation requiring the application of BAT as basic measures in the Joint Program of Measures.
- For each of the ICPDR member countries, not involved in EU accession, it is recommended that a targeted three year support program for industrial pollution reduction policy and capacity building be developed. The components should include legislation drafting, institutional development, technical assistance and training among others.
- In the absence of a specific legal requirement industrial installations in the DRB have the opportunity to implement BAT on a voluntary basis. There are additional benefits for those installations, which are in countries that will have legal requirement in the future.
- Many of the municipal sector improvements in these countries are only now starting to be realized. Tertiary treatment (N and P removal) is being applied for a large number of the upgraded and new wastewater treatment plants, but not in all cases. Furthermore, demands for N and P removal for wastewater treatment plants in rural communities, representing approx. 40% of the Danube River Basin, are lower than for urban settlements.
- The majority of the fully financed projects by December 2003 are located in the 4 countries that joined the EU in 2004: Czech Republic, Hungary, Slovak Republic, and Slovenia. A large proportion of project financing for these investments were realised from local/national sources.
- In 2006, 250 projects were reported as finalised, 133 municipal investments, 57 industrial and agro-industrial projects and 57 wetlands measures.
- The total investments cost for the 250 realised measures is 4266 MEUR.
- Bulgaria and Romania lead the region in implementing investments after 2004.
- Foreign direct investment inflows continue to depend heavily on privatisation. Around 90% of inflows were concentrated in Bulgaria, Croatia, Romania and Serbia in 2005.
- There are 593 wastewater treatment plants with N removal and 622 plants with P removal
- There are opportunities for non-EU countries to meet at least the goals of the Danube Declaration
- It is recommended in order to reach the management objectives on quantitative reduction targets as described in the Issue Paper on Nutrient to implement at least P removal in all treatment plants above 10,000 p.e. Further more it is recommended to plan a possible upgrade (technology, space and capacity) of nitrogen removal in all treatment plants more than 10,000 p.e.
- Limited development in the wastewater sector has been achieved in the down-stream, non-EU countries, including Bosnia-Herzegovina, Republic of Serbia, Moldova, and Ukraine.
- The report offers a rich source of data not published before.

3 JOINT ACTION PROGRAM

3.1 Background

Since 1992 the European Community (PHARE and TACIS programs) and the UNDP/GEF (Danube Pollution Reduction Program-1997 to 1999) have supported the efforts of the Danube countries to develop the necessary mechanisms for effective implementation of the DRPC. The Danube Environmental Program Investments 1992 –2000 has included 27 million USD from the EU Phare/Tacis, and 12.4 million USD were provided by the UNDP/GEF.

This support has enabled the elaboration of a regional Strategic Action Plan (SAP) based on national contributions and the development of a Transboundary Analysis Report (TAR) to define causes and effects of transboundary pollution within the DRB and on the Black Sea.

The Strategic Action Plan provides guidance concerning policies and strategies in developing and supporting the implementation measures for pollution reduction and sustainable management of water resources enhancing the enforcement of the DRPC.

According to the Strategic Action Plan, the main problems in the Danube River Basin that affect water quality use are: (i) high loads of nutrients and eutrophication, (ii) contamination with hazardous substances, including oils, (iii) microbiological contamination, (iv) contamination with substances causing heterotrophic growth and oxygen-depletion; and (v) competition for available water.

The SAP outlined regional policies and strategies for pollution reduction and environmental protection in response to the Danube River Protection

The objectives and target of the SAP considered (i) the development of national policies, regulations and actions, (ii) the development of coherent approaches to pollution reduction and transboundary cooperation, (iii) reinforcing of coordination of interventions in relation to sub basin area, (iv) encouraging transboundary cooperation for pollution reduction in Significant Impact Areas.

The Transboundary Analysis Report (TAR) provide a scientific analysis of the root causes of environmental pollution in the DRB, identifying causes and effects of pollution with particular attention to transboundary issues and nutrient transport to the Black Sea. TAR defined priorities for control and management strategies at the regional and national levels. Based on the National Review Reports more than 500 hot spots, in three sectors (municipal, industrial and agricultural) have been identified and ranked.

In the frame of the Danube Pollution Reduction Program 1999 (DPRP), based on the results of the Transboundary Analysis, an investment portfolio has been developed with particular attention to nutrient reduction. All the measures, projects and programs proposed to reduce emissions from both point and non-point sources of pollution will improve water quality, considering a reduction of 50 % in Chemical Oxygen Demand (COD) emissions and 70 % in Biological Oxygen Demand (BOD) emissions and other toxic elements, and thus reduce transboundary effects within the Danube River Basin. Once implemented, these measures would further substantially contribute to reducing nutrient transport (Phosphorus by 27 % and Nitrogen by 14 %) to the Black Sea to further improve, over time, environmental status indicators of Black Sea ecosystems of the western shelf. A total of 421 projects for 5.66 billion USD, primarily addressing hot spots have been identified for municipal, industrial and agricultural projects.

Responding to the DRPC requirements, and based on the DPRP results, the ICPDR developed a **first Joint Action Programme** (JAP) for the years 2001 - 2005, which was adopted at the ICPDR Plenary Session in November 2000. The ICPDR Joint Action Programme 2001-2005 reflects the general strategy for the implementation of the DRPC for the respective period. The general objectives of the ICPDR Joint Action Program 2001-2005 are harmonized with the three main objectives of the Contracting Parties, laid down in

Article 2 of the DRPC:

- shall strive at achieving the goals of a sustainable and equitable water management, ...
- shall make all efforts to control the hazards originating from accidents ...and
- shall endeavour to contribute to reducing the pollution loads of the Black Sea from sources in the catchment area".

The JAP deals i.a. with pollution from point and non-point sources, wetland and floodplain restoration, reduction and control of priority substances, water quality standards, prevention of accidental pollution, floods prevention and control and river basin management. Particular attention is given to both structural/investment and non-structural/policy reforms measures that address nutrient reduction and protection of transboundary waters and ecosystems:

- Coordinating and developing the River Basin Management Plan for the Danube River Basin in implementing the EU Water Framework Directive;
- Maintaining and updating emission inventories and implementing proposed measures for pollution reduction from point sources and non point sources;
- Restoring wetlands and floodplains to improve flood control, to increase nutrient absorption capacities and to rehabilitate habitats and biodiversity;
- Operating and further developing the Transnational Monitoring Network (TNMN) to assess the ecological and chemical quality status of rivers, including establishing respective water quality standards;
- Developing and introducing recommendations on BAT and BEP to assure prevention and/or reduction of hazardous and dangerous substances;
- Operating and upgrading the Accidental Emergency Warning System (AEWS), considering its use also for flood warnings, establishing classified inventories of accidental risk spots and developing preventive measures.

The Joint Action Program 2001 – 2005 is directed to

- the improvement of the water ecological and chemical status,
- the prevention of accidental pollution events and
- the minimization of the impacts of floods.

The implementation of the Joint Action Program will - in addition to the main objectives

- improve the standard of life,
- enhance economic development,
- contribute to the accession process to the European Union,
- restore the biodiversity, and
- strengthen the cooperation amongst the Contracting Parties.

In the frame of the ICPDR Joint Action Programme, 253 committed investment projects and strategic measures have been identified out of which 133 are in the municipal sector and only 57 in the industrial sector. This reflects the situation in most transition countries where industries are not operational or using mostly outdated technologies. Most of these projects, listed generally as “hot spots” or point sources of emission, are representing national priorities and taking equally into account the obligation to mitigate transboundary effects. Particular attention was also given to the identification of sites for wetland restoration, which play an important role not only as natural habitats but also for flood protection and as nutrient sinks.

The total investment foreseen in the JAP period 2001-2005 to respond to priority needs is estimated to be about 4.404 billion €, with 247 priority point source projects mainly being:

- Municipal waste water collection and treatment plants: 3.702 billion €
- Industrial waste water treatment: 0.267 billion €

- Agricultural projects and land use: 0.113 billion €
- Rehabilitation of wetlands: 0.323 billion €

From the total amount of investment of 4.4 billion € for point sources reduction, 3.54 billion € are earmarked as national contributions.

The structure of the identified investment requirements by sector is as follows:

Table 1: Investments per sectors, 2001-2005

	Municipal	Industrial and agro-industrial	Wetlands	Total
No of Projects	133	57	57	247
MEUR	3,829.10	295.50	224.08	4,348.68
(%)-Structure	88%	7%	5%	100

Table 2: Projects and investments per country in the DRB

	DE	AT	CZ	SK	HU	SI	HR	BA	RS	BG	RO	MD	UA	Total
No of Projects	20	9	43	20	28	24	8	12		20	25	31	7	247
MEUR	126	779.3	222	105	749	383	433	176	15.3	125	697	493	54.4	4,348.7
(%)	3	18	5	2	17	9	10	4	1	3	16	11	1	100

The ICPDR is asked to report on the implementation of the Joint Action Program for the period 2001 to 2003 in 2004, and for the period 2001 to 2005, in 2006.

In 2004, the Interim Implementation Report has been prepared. In order to make use in the reporting of the results of the UNDP GEF Danube Regional Project, the ICPDR decided that the final implementation report would be available for approval by the 10th Ordinary Meeting, December 2007.

4 ASSESSMENT OF RESULTS

4.1 Policy Objectives

Danube countries faced substantial challenges in establishing and strengthening the policy and institutional framework required for functioning market-based and democratic societies. Today, progress can be reported with all Danube countries in redesigning policies, programs and regulations, in establishing appropriate incentive structures, redefining partnerships with stakeholders, and strengthening financial sustainability of environmental services. Following a challenging and demanding period of transition, most of the DRB countries have in the last years developed a comprehensive hierarchic system of short, medium and long-term environmental policy objectives, strategies and principles which reflect the political context of each country, key country-specific environmental problems and the sector priorities on national and regional levels.

This is seen as a key challenge the non-EU countries in the Danube River Basin face in the policy field is to identify the most effective ways of transposing EU environmental directives. Country's choice on how to achieve compliance with EU directives will have a significant influence on compliance costs.

In all DRB countries the legal framework for environmental management of water resources and ecosystems consists of a hierarchic system of decrees, laws, directives, ordinances, regulations and standards on different administrative levels. In addition to the WFD, there has been a high level of transposition of the EU Directives into the national legislations of the Danube countries. The Urban Wastewater Treatment and IPPC Directives are considered as the most challenging areas for compliance. This is reflected in the negotiated derogation periods and agreed long transition periods.

All DRB countries currently have a more or less comprehensive system of environmental and water sector-related policies and strategies, which usually reflects:

- the capability of the country to contribute to the solution of transboundary problems;
- the significance and evidence of country-specific environmental problems;
- the significance and evidence of environment-related health hazards;
- the economic development and potential of the country.

Despite the diversity of problems, interests and priorities across the basin, the Danube countries share certain values and principles relating to the environment and the conservation of natural resources.

The key principles for water management and water pollution that have formed the basis for the revision of legal and institutional arrangements adopted by Danube countries include:

- Use of the integrated river basin management approach
- Consider water as a finite and vulnerable resource, a social and economic good
- Implement precautionary principle
- Introduction and use of BAT, BAP and BEP
- Control of pollution at the source and creation of cleaner production centres
- Apply polluter pays principle and the beneficiary pays principle
- Implement principle of shared responsibilities, respectively the principle of subsidiarity
- Use of the market based instruments
- Implement good international practices in managing environmental expenditures

- Strengthen international partnership and transboundary cooperation

Long-term objectives of water policies in the DRB countries mainly focus on:

- Preservation of a sound environment for the future generations;
- Protection of biological diversity;
- Protection of water resources.

The status of water-related policy and programmes in the DRB countries is assessed in general terms in the Table 3.

Table 3: Overview of water-related policy, programmes and National Environmental Action Plans in the DRB countries

Country	Explicitly formulated policy objectives for water management and pollution control	Programmes especially dealing with water management and pollution control	Programmes especially dealing with WFD implementation
DE	Complete system of policy objectives completely in line with the requirements of the relevant EU Directives	Action Programs Environmental Statute Book	Strategy for WFD implementation
AT	Complete system of policy objectives completely in line with the requirements of the relevant EU Directives Austrian Water Protection Policy Water Right Act	Action Programme to control diffuse pollution Austrian Programme of Environmental Friendly Agriculture	Strategy for WFD implementation
CZ	Complete system of policy objectives	Program for adequate implementation of municipal WWTPs	The State Environmental Policy 2004 – 2010 Resolution 339, 2004
SK	Complete system of policy objectives in the Strategy for National Environmental Action Program, 1993; National Strategy for Sustainable Development, 2000 and Water Management policy	National Environmental Action Program Codex of Good Agricultural Practices State Water Protection Plan Action Plan for the protection of biological and landscape diversity	Strategy for WFD implementation Inter sectoral Strategic Group Coordinating office Working Groups
HU	Complete system of policy objectives	National Environmental Program National Urban Waste Water Collection and Treatment Program National Municipal Sewage Canalisation and Treatment Programme National agro-environmental protection program Other programmes (lake, oxbow lake, low land, etc.)	Strategy for WFD implementation
SI	Complete system of policy objectives	National Environmental Action Plan, 1999 New Environmental Action Plan in preparation Operative program for wastewater collection and treatment	Strategy for WFD implementation
HR	Satisfactory system of policy objectives in the current legislation: National Strategy for Environmental Protection, 2002 State Water Protection Plan, 1999	State Water Protection Plan Strategy and Action Plan Water Management Strategy, pending for adoption	Strategy for WFD implementation

Country	Explicitly formulated policy objectives for water management and pollution control	Programmes especially dealing with water management and pollution control	Programmes especially dealing with WFD implementation
	Environmental protection Plan Nature Protection Act, 1999 Water Act, 1995 Water Management Financing Act, 1995 Law on Environmental protection, 1994		
BA	Limited number of policy objectives Water Law, 2006	EU CARDS Program USAID, WB, GEF programmes National Environmental Action Plan, 2003	Harmonisation with EU legislation Activities concerning bilateral agreements with Croatia
CS	Insufficient system of policy objectives and focussed programs	EU and GEF programs	Harmonisation with EU legislation
BG	Satisfactory system of policy objectives	Environmental Strategy to implement ISPA objectives Program for UWWT Directive implementation National Strategy for Management and development of the water sector until 2015 Programme for construction of municipal WWTPs	Strategy for WFD implementation
RO	Complete system of policy objectives	National Environmental Action Plan Strategy for environmental protection Strategy for water resources management Series of nutrient-related programmes to be carried out during the forthcoming period Action program for reduction of pollution due to dangerous substances	Strategy for WFD implementation
MD	Reduced policy objectives. National Strategy for sustainable development, 2000Concept of the Environmental Policy, 2001	National Water resources management Strategy, 2003 Water Supply and Sewage program, 2002 National Action Plan on Health and Environment, 2001	Strategy for WFD implementation
UA	Approved legal and regulatory system of policy objectives within the frame of the update version of the Sustainable Development Strategy National Conception of Sustainable Development Law on Environmental Protection, 2004	State Program for WFD harmonisation, 2004 State Program of Development of Water Industry Governmental Action Plan 2005 Drinking water of Ukraine program for 2006-2012	Water Code of Ukraine harmonized with EU Directives (expecting approval)

4.2 Status of Legislation Dealing with Water Management

Countries in the basin have increasingly recognized that developing and implementing regulation (at the national, regional and local level) is a precondition for effectively responding to a range of key challenges.

Further assistance and efforts are still needed in the non-EU countries to build institutional capacity at central and local government level to address the broad challenges of legal reforms.

The water legislation was amended, or is under revision, according to the EU Directives in most of the countries. The water sector-related policies and strategies reflect:

- country's commitment to respond to EU requirements and international agreements obligations
- the need to incorporate general principles for sustainable development, environmental, economic and social concerns into the national development strategies
- capability of the country to contribute to the solution of transboundary problems
- the significance and evidence of country-specific environmental problems.

A fundamental objective of regulatory reforms in the Danube countries is to foster high quality regulation that will improve the efficiency of national economies and environmental actions, and will eliminate the substantial compliance costs generated by low quality regulations. By helping countries to revise their legal and institutional arrangement, the ICPDR has contributed to long-term economic prosperity and increased opportunities for investments to reduce pollution and protect natural resources.

The following section summarizes the policy and legislation achievements in the countries (Table 4).

In general terms, the DRB countries can be categorized and characterized as follows: **Germany** and **Austria** have substantially reformed their regulatory regimes to assure the functioning of their democracies and market-based economies, with all legislation in compliance with the "highest environmental standards". Significant efforts are also required for EU member states for reaching an acceptable level of implementation.

The **German** water management and protection policy is in compliance with EU water policy, aiming at achieving of good water status for all waters by 2015. With the elimination of biological and chemical pollutions from municipal and industrial sources the most important conditions for further continuous improvements of the water ecology are already met. Main priorities have been given to the over-fertilization of waters and structural changes as a result of river development.

The responsibilities for preparation and implementation of the Flood Action Plans belong to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Bavarian State Ministry of the Environment, Public Health and Consumer Protection, and the Ministry of the Environment and Traffic Baden-Württemberg.

The core of water legislation in **Austria** is the Water Right Act, which was revised in 2003 to accommodate the EU Directives principles. Austria developed Ordinance defining water quality objectives for rivers as well as for lakes and an Ordinance for the management of the Austrian Water Data Register. Primary goal of water policy is to ensure sustainable water management through a prudent human interference into waters. Main principles are: (i) minimizing impacts on water quantity and quality via a stringent system of permits and control, (ii) protection of population and its living place and goods against floods, and (iii) public awareness on the value of water and for it rational use. The WFD implementation is regarded as an important supporting tool to achieve the primary goal of water policy in Austria. In response to the disastrous floods 2002 activities for the protection against floods are intensified taking into account developments on the international level. Federal Ministry of Agriculture & Forestry Environment and Water Management is the competent authorities responsible for preparation and implementation of the Flood Action Plans.

The experience of the new Member States having joined EU in May 2004 is an important information for other Danube countries.

In March 2004, the **Czech** Ministry of Environment prepared the updated State Environmental Policy for 2004 – 2010. Measures implemented based on the State Environmental policy in the Czech Republic in the field of water protection considered the principle of protection of the quality and quantity of water in the

whole system of river basins and hydro-geological regions, which is in accordance with EC approach. Considerable attention is paid to wetland ecosystems, to rehabilitation of aquatic biotopes, to effective and sustainable protection of surface and ground water bodies, to harmful contaminants, to integrated water protection and management. Through river basin management plans, measures to protect wetlands and floodplains shall be implemented. The use of wetlands and water resources should be sustainable in view of economic pressures and global changes, and this includes principles referring to landscape and environmentally sound agricultural practice, wetland and floodplain uniqueness, restoration, remediation and rehabilitation of damaged wetlands areas. Both the Ministry of Environment and Ministry of Agriculture are the competent authorities responsible for preparation and implementation of the Flood Action Plans.

Slovenia has developed appropriate legislative tools that outline the objectives and strategies for environmental regulation and water management. The lately approved Environmental Protection Act (May 2004) primarily focuses on pollution from point sources and is consistent with EU environmental requirements. The 1999 National Environmental Action Programme (NEAP) established a more balanced relationship between the environment and economic sectors and introduced a system of economic incentives to encourage manufacturers and consumers to use resources in a more "environmentally successful" manner. The Water Act considers the whole water policy such as protection of water, water use, management of water and protection of water depending ecosystems. The Ministry of Environment Spatial Planning and Energy is the competent authorities responsible for preparation and implementation of the Flood Action Plans. To make the implementation process of extensive environmental regulation easier, Slovenia have demanded transitional period with exact time and scope determination. Three of these transitional periods for fully implementation of legislation demand with programs of measures for Water quality sector, Industrial Pollution Control sector and Packaging treatment were assured.

The National Environmental Programme of **Hungary** includes substantial provisions and measures for the conservation and management of surface and groundwater resources. Some of the key targets and approved policy directions are: regulation development to encourage sustainable and economical water use; improvement of water quality for the main water bodies (Danube and Tisza Rivers, Lake Balaton); gradual increase (to a level of 65%) of the number of settlements with sewers; at least biological treatment of wastewater from sewers; nitrate and phosphorous load reductions for highly protected and sensitive waters. By 2003 the Hungarian legislation on water quality protection was fully harmonized with the EU regulations, including the appropriate institutional set-up. The Ministry of Environment and Water and the National Directorate for Environment, Nature and Water are the competent authorities responsible for preparation and implementation of the Flood Action Plans.

The implementation of the **Slovak** water management and protection policy is in compliance with EU water policy, i.e the WFD, aiming at achieving of good water status for all waters by 2015. The legislative tools for achieving policy objectives have been prepared. All EC directives have been transposed into the national law system. The transposition was finished in 2004 through an updated version of the Water Act (no. 364/2004). Main priority in relevant sectors (urban wastewater, industrial wastewater, land use, wetlands) is the implementation of EC directives' requirements (urban and industrial wastewater during the transition periods), namely reduction of nutrients and priority substances and creation of effective water management that will be able to promote sustainable water use based on long - term protection of available resources. The Ministry of Environment is the competent authority responsible for preparation and implementation of the Flood Action Plans.

Water legislation in **Moldova** addresses, among other things, the ownership of water resources, the legal nature and stability of water rights, the effective and beneficial use of water, the transferability of water rights, and the need to acknowledge and respect existing uses and customary entitlements when changing water legislation. Water law also seeks to prevent the transfer of negative externalities, restrict monopolies, and reduce transaction costs. In addition, water law sets out duties and functions of water/environment management agencies and water service providers. Legislation provides the basis for government action in

the regulatory and operational areas and establishes the context for action by non-governmental entities and individuals.

The need to implement a unified policy on the environment and the use of natural resources, which integrates environmental requirements into the process of national economic reform, along with the political desire for European integration, has resulted in the review of the existing environmental legislation in Moldova. The current priorities for water management include the strengthening of institutional and management capability through improvement of economic mechanisms for environmental protection and the use of natural resources, setting internal environmental performance targets and controls, self-monitoring, review of current legislation in line with European Union legislation, and the adjustment or elaboration on a case-by-case basis of implementation mechanisms. The Ministry of Ecology and Natural Resources is the competent authority responsible for preparation and implementation of the Flood Action Plans.

Bosnia and Herzegovina is faced with major challenges in the environmental and water management area. Among specific objectives for environment is the development of an environmental framework in Bosnia and Herzegovina based on the Acquis. The most important issues in the environment sector will be identified in the Environmental Action Plan, which is being developed with World Bank support. The EU is supporting a Water Institutional Strengthening Programme, which is complemented by two Memoranda of Understanding (2000, 2004) between both Entities and the EC. The responsibility for preparation and implementation of the Flood Action Plans is with Federal Ministry of Agriculture, Water Management and Forestry Environment and the Ministry of Agriculture, Forestry Environment and Water Management. The New Water Law entered into force after its publication in the „Offical Gazzete Federation BiH“ – (28.11.2006), and its implementation started from the first day of the operation of Agencies for watershed (max. 6 month after the Law endorsement). The Water Law is aligned with the Water Framework Directive and other EU water legislation (Urban Waste Water Directive, Drinking Water Directive, Nitrates Directive).

Since the WFD was adopted, numerous and diverse activities were initiated in **Serbia** to further implement the Directive. The water management is faced with serious tasks that require, above all: (i) the creation of a system of efficient financing for water management, (ii) the reorganization of water management sector, and (iii) the revision of water legislation and related regulations, in compliance with requirements of European legislation. In the Republic of Serbia, the responsibility for preparation and implementation of the Flood Action Plans is with the Ministry of Agriculture, Forestry and Water Management and the Directorate for Water.

The adoption in 1999 of the Strategy for the Integrated Water Management marked the beginning of the reforms in the water sector in **Bulgaria** in line with the WFD and assumed obligations under international instruments. Several other programs such as Environmental Strategy to implement the ISPA objectives, the Program for the UWWT Directive implementation or the National Strategy for Management and Development of the Water Sector until 2015 complete the picture of on going efforts in Bulgaria towards complying with EU legislation. The last amendment of the Water Act was in 2006, in line with the EC requirements. The Ministry of Environment and Water is responsible for preparation and implementation of the Flood Action Plans.

In **Romania,** as part of the accession process on the environmental protection, Ministry of Environment and Sustainable Development (MESD) had harmonized the national legislation to EU law and specific directives, including those related to water. In order to reach the goals of the specific directives and mainly the Water Framework Directive (WFD) Romania is in full process of implementation. The MESD carries out national water strategy and policy in the water resources quantitative and qualitative management field. The implementation of the national water strategy and policy, quantitative and qualitative water management, as well as the operation of the water management structures is carried out by the National Administration “Apele Romane” (ANAR). This Administration has 11 regional branches organized according to river basins of Romania.

Croatia received a candidate status for EU membership in June 2004, by means of which the Government of Croatia indicated its commitment to the process of adoption of the existing EU legislation.

Croatia as well as the remaining non-accession countries in the Danube basin is experiencing the historic opportunity of European integration, which is the most important driver of reforms but brings great challenges at the same time. In Croatia, the current basic environmental and water legislation and regulations (such as the Water Act, Water Management Financing Act, State Water Protection Plan) were revised to meet the EU directives requirements within the frame of two CARDS projects, which started at the end of 2004. The Ministry of Agriculture, Forestry and Water Management, Water Management Directorate is responsible for preparation and implementation of the Flood Action Plans.

The legal framework for water management in Croatia for the period 2001 - 2005 consists of the Constitution of the Republic of Croatia, the Water Act ("Official Gazette" No. 107/95, 150/05), which includes 42 sub legal acts envisaged by the main act, the Water Management Financing Act ("Official Gazette" Nos. 107/95, 19/96, 88/98 and 150/05), the Law on Environmental Protection ("Official Gazette" Nos. 82/94 and 128/99), the Nature Protection Act ("Official Gazette" Nos. 30/94, 72/94 and 107/03) and other relevant regulations.

Ukraine has updated in 2004 the legal and regulatory system in the field of water management. the environmental policy act (the Principal Direction, 1998). The update version of the Sustainable Development Strategy, however, has been recently submitted for approval by the Parliament. The Program of the Development of Water Economy is in force but still specific legislation on water management is missing. The current Governmental Action Plan is a comprehensive document, which integrates economic, social and environmental concerns. Efforts are currently undertaken to finalize in 2005 the revision of the Protocol on the Protection of the Black Sea Marine Environment against Pollution from Land-Based Sources, in line with WFD principles. The Water Code of Ukraine harmonized with EU Directives is submitted as well for approval. The Ministry for Environmental protection of Ukraine and the Ukrainian State Committee of Water Management are responsible for preparation and implementation of the Flood Action Plans.

Table 4: Overview of water related legislation in the DRB countries` and proposed measure

Country	Main existing legal provisions for water management and pollution control	Proposed measures regarding water management and pollution control
DE	Fully appropriate legislation The Water Resources Policy Act, Fertilizer Act, Fertilizer Ordinance, etc.	Implementation and ordinances for enforcement
AT	Fully appropriate legislation Water act, and Acts on the adoption of EU Directives UUWT, IPPC, etc.	Implementation and ordinances for enforcement
CZ	Complete set of legislation, such as: State Environmental Policy 2004-2010, 2004 Act on Environmental Protection, 1992 Water Act, 2001 Water Supply and Sewerage Systems Act, 2001 Act on Agriculture, etc.	Remaining Directives to be implemented Enforcement of legislation Ownership transfer in agricultural sector Clarification of competencies among all parties
SK	Appropriate legislation fully harmonized with EU Water Act, 2004- Natura Protection Act, 2003 Environmental Protection Act, 1999 GD No 491/2002 Coll. MO 249/2003 Act No on IPPC No 245/2003 Coll.	Implementation of updated legislation Finalize harmonization of legislation under the competencies of local authorities Increase share of population connected to sewage and wastewater treatment plants Increase water quality for drinking water Implement Program of measures against flooding
HU	Appropriate legislation fully harmonized with EU	Improve the institutional structures and clarify

Country	Main existing legal provisions for water management and pollution control	Proposed measures regarding water management and pollution control
	directives Act LIII of 1995 on the General Rules of the Protection of the Environment Act LVII of 1995 on Water Management Act LXXXIX of 2003 on the Environmental Load Charges Nature Protection Act, 1996 Government Decree No. 221/2004. (VII. 21.) on certain rules of river basin management Government Decree No. 220/2004. (VII. 21.) on the rules of the protection of the quality of surface waters Government Decree No. 219/2004. (VII. 21.) on the protection of groundwater Government Decree No. 49/2001 (IV.3.) and Government Decree No. 27/2006 (II.7.) on the protection of waters against pollution caused by nitrates from agricultural sources Government Decree No. 314/2005 (XII. 25.) on the rules of the Environmental Impact Assessment and the Integrated Permitting Procedure for the Use of the Environment	responsibilities Implement the adopted legislation Ministerial decree on the observation and monitoring of ground waters Ministerial decree on the observation and monitoring of surface waters
SI	Environmental Law, 2004; Water Act, 2002; Nature Conservation Act, 2002; IPPC; UWWT	Regulations for enforcement and compliance National Environmental Action Plan 2005 – 2012 Programme for the reduction of hazards due to accidents of greater extent involving dangerous substances
HR	Law on Environmental protection, 1999; Nature Protection Act; Water Act; Water Management Financing Act; Water Management Strategy	Compliance and enforcement plans Water quality standards by water classes; Standards on hazardous substances; Effluent standards: maximum allowed concentration of hazardous substances
BA	Water Act, 2006	New Environmental Law, expected 2005 Regulation on dangerous and harmful substances in waters, expected 2007 Establishment and Development of Water Information System
CS	Legislation not fully satisfactory. Law on water and Law on water management financing under preparation Law on Environmental Protection, 1991 (Serbia) and 1996 (Montenegrin)	Harmonization with EU water and environmental legislation Involvement in transboundary cooperation within the frame of international conventions
BG	Explicit policy objectives and appropriate legislation in place Environmental protection Act Water Act, 2000, amended 2006 Regulation on the Exploration, Use and Protection of Groundwater, 2000 Regulation on the Protection of Waters against Pollution Caused by Nitrates from Agricultural	Implementation rules for complying with EU legislation National Program for Priority Construction of Urban Wastewater Treatment Plants Regulation concerning the type and size of sanitary protected areas Regulations concerning monitoring and quality of drinking water

Country	Main existing legal provisions for water management and pollution control	Proposed measures regarding water management and pollution control
	Sources, 2000 Regulation on the Limit Values for Admissible Contents of Dangerous and Harmful Substances in the Waste Water Discharged in the Water Bodies, 2000 Regulation on the conditions and procedures for issuing of permits for Integrated Pollution Prevention and Control for the construction of new and the operation of existing industrial installations and equipment, 2003	
RO	Explicit policy objectives and appropriate legislation in place Environmental Protection Law Water Protection Law Environmental protection strategy Law 645/2002 on IPPC Law 462/2001 on regime of natural protected areas and conservation of habitats Drinking Water Law 458/2002 Law 5/1991 wetlands and floodplain restoration National Action Programme for Environmental Protection	Implementation rules for complying with EU legislation Ministerial Order concerning the National Water Monitoring System Governmental Decision concerning the type and size of the sanitary protected areas Ministerial Order concerning the public participation in the water management decision making Water Management Framework Schemes
MD	Law on Biological Security Law on Environmental Protection Law on Ecological Expert Evaluation and Environmental Impact Assessment Law on payment for environmental pollution Water Code Ecological Funds	Revision of system of standards, including water quality standards, emission standards, and effluent standards Strengthening capacity building Restructuring institutional arrangements
UA	The specific legislation on water management is under revision The Law on the State Program of Protection and Rehabilitation of the Environment of the Black and Azov Seas The Law on the State Program of the Development of Water Industry The Law on Fish, other Alive Water Resources and Food Products from Them The Law on Drinking Water and Drinking Water Supply	Water Code, harmonized with EU Directives expecting approval

4.3 Main Barriers to Policy and Legal Reforms in implementing JAP

Regulatory challenges facing Danube Countries have been significant. Progress is significant in the Member States, but also the governments of the non-EU countries are gradually adopting modern regulatory and policies instruments to improve the quality of the regulatory environment and management practices to send a clear signal to the foreign and national financing institutions on their needs for investments and on their commitment to respond to the EU reporting requirements.

Enforcement and compliance were considered as the main barriers to the effective implementation of the ICPDR JAP. The difference between high regulatory standards and compliance capacity of the regulated bodies, without having designed flexible compliance schedules prevent authorities from effectively enforcing their regulatory instruments. Lack of a unifying concept on policies instruments choice and implementation across various levels of government still exist in some countries (e.g Moldova, Ukraine, Serbia) where decentralization and democratisation of structures is just happening. In some countries, problems with decentralization are associated with absence of subsidiarity principle approach (clarifying of competencies by all authorities – in government, in regions, districts and municipalities).

Additionally, costs for fulfilment of EU directives requirements will increase of water services prices. Implementation of Directive 76/464/EEC on water pollution by discharges of certain dangerous requires education of state water administration concerning new permits for discharging of wastewaters. Sometimes, weak enforcement in the non-EU countries of the Danube basin is associated with ineffective penalties system or with inconsistencies between the current structure/content of the laws, and the conflicts and overlapped provisions in various other laws.

Other barriers impeding the implementation are linked to the insufficient capacity building, lack of access to water and environmental relevant information, absence of public participation mechanisms in the environmental decision-making process. High investment needs, sometimes more demanding national legislation than that at the EU, administrative burdens, and insufficient co-operation between governmental institutions can complete the barriers picture.

Based on the information provided by the national contributions, the main barriers to policy and legal reform during the JAP implementation, can be categorized as outlined below.

(1) Historical issues

- Outdated legal and administrative structures
- Inappropriate business structures / methods
- Inappropriate industrial and agricultural structures and practices
- Unsolved ownership situation - public and private sectors
- Insufficient awareness of population (wastage of water, etc)

(2) Economic issues

- Deteriorated economic capacities
- Decreased industrial and agricultural production
- Decreased livestock farming
- Inadequate status of privatisation
- Inappropriate public infrastructure (waste water collection systems, WWTP)

(3) Financial issues

- Lack of domestic public funds for environmental issues
- Lack of international funds at favourable terms
- Lack of adequate funding mechanisms
- Lack of adequate funding tools (incentives, charges)

(4) Institutional / administrative issues

- Inadequate personnel capability and qualification
- Inadequate technical equipment
- Inadequate structure of administration
- Inadequate allocation of responsibilities (gaps, overlaps, not defined)

- Lack of adequate vertical and horizontal coordination
- Lack of adequate cooperation within public administration
- Lack of adequate cooperation between public administration and private sector
- Lack of adequate tools for enforcement of legislation
- Lack of private sector participation (investment, management)

(5) Participatory issues

- Lack of public awareness (regarding environmental issues)
- Lack of adequate awareness of decision makers (regarding environmental issues)
- Lack of public interest in solving environmental deficiencies / problems
- Lack of organizational capability (inadequate representation of NGOs)
- Lack of private sector participation (investment, management)

(6) Natural / environmental issues

- Degradation of ecosystem
- Loss of adequate biodiversity
- Inadequately high concentration of nutrients in agricultural areas
- Uncontrolled flood risk
- Inadequate utilization of water resources
- Uncontrolled discharge of waste water (in the past / ongoing)
- Insufficient monitoring capacities
- Inadequate agricultural practices (in the past / ongoing)
- Inadequate utilization of fertilizers, pesticides, etc. (in the past / ongoing).

4.4 Actions and measures in response to JAP

In most of the Danube countries, numerous laws and regulations were adopted a long time ago. Therefore they have been amended during the previous years of transition and fundamentally revised in line with the EU requirements. In others, the relevant legislation is currently in the phase of substantial reform and modernization. In the non-EU countries, due to the complexity of this task it can be anticipated that the completion of this ongoing reform process will take a bit more time before the relevant legislation will reach an acceptable level of compliance with international requirements.

The current essential deficits and problems in the non-EU countries of the DRB can be summarized as follows:

- the environmental and water-related legislation is still based to a certain extent on historical structures, with various changes, adjustments and modifications that have led to inconsistencies;
- the practical applicability and effectiveness of the recent established new environmental and water - related legislation is not yet been proven;
- the impossibility to enforce the relatively sophisticated systems of environmental and water-related legislation, due to critical social and economic issues.

In response to these common deficiencies, the needs for improvement regarding the water sector-related legislation in these countries can be summarized as follows:

- restructuring and adjustment of relevant legislation to the requirements of modern environment-oriented market economy;
- streamlining, simplification and elimination of inconsistent components, basically resulting from ad-hoc changes during the previous transition period;
- ensuring utmost compatibility of interacting legislation on the various administrative levels;

- specification of efficient implementing regulations and enforcement mechanisms; elimination of all kinds of unjustified exemptions;
- further harmonization of national legislation with EU regulations and standards.

4.5 Estimated cost for reforms concerning institutional and legal measures to respond to JAP and EU water related regulations

All DRB countries considered the harmonization of national environment and water-related legislation with the EU legislation as the most essential prerequisite for long-term sustainable water management in their countries.

The 6 (4 + 2) new Danube Member States have fully transposed their regulatory frameworks in line with EU environmental requirements, but realising actual compliance will require significant time and financial resources. Among the Danube River Basin countries, the total environmental costs range from 2,723 MEUR for Slovenia to 10,000 MEUR for Hungary and the Czech Republic. For Bulgaria and Romania, it requires even more to achieve compliance: 11,000 MEUR and 17,000 MEUR, respectively.

Table 5: Estimated total environmental costs to meet EU standards

Country	Population	Total environmental costs to meet EU standards (MEUR)
Bulgaria	8.2 million	11,000
Czech Republic	10.4 million	10,000
Hungary	10 million	10,000
Romania	22.4 million	17,700
Slovakia	5.4 million	4,005
Slovenia	1.99 million	2,723

The Urban Wastewater Treatment Directive is expected to be the most expensive water quality requirement to implement, accounting for 8% (Slovenia) to over 45% (Romania) of the total estimated environmental compliance investment. The new Member states have been granted transitional periods for implementing the UWWT, as much as 13 years beyond the 2005 deadline stipulated in the Directive.

Shorter transition periods were reached for complying with the IPPC Directive, the most significant challenge facing the industrial sector. Industrial restructuring has been underway in the region for several years, but meeting the IPPC Directive requirements by the 2007 deadline is a major challenge for many Danube enterprises. Estimated costs complying with the IPPC Directive among the Danube River Basin countries ranges from 50 MEUR for Slovenia to 3,725 MEUR in the Czech Republic:

In the agricultural sector, the Nitrates Directive is the most relevant EU environmental legislation. Agricultural nitrate pollution is generally much lower in lower Danube countries than in intensely farmed portions of western EU countries, primarily because the lower Danube countries agricultural sector is still recovering from the break-up of former communal farms. However, many intensive animal husbandry operations throughout these countries are faced with significant financial burdens for improving manure storage and handling facilities.

The new member states did not receive transition periods for nature conservation compliance. The Birds and Habitats directives are usually not considered as investment-heavy legislation, but balancing conservation efforts with infrastructure improvements is paramount. For example, many transportation projects in the region threaten potential Natura 2000 sites. There is an agreed need to accelerate the process of identifying areas to be protected.

Since the beginning of accession negotiations, the EU has stressed that at least 90% of the cost of environmental compliance must be borne from countries' own sources, representing 23% of GDP for many years to come.

The high cost of achieving EU environmental compliance is a formidable challenge for the new member states,

Bulgaria and **Romania**, and few other Danube countries that have negotiated Stabilisation and Association Agreements (SAAs) with the EU to bring their countries closer to EU standards.

In **Hungary**, sewage and wastewater treatment projects valuing 1,2 billion EURO are under the realisation. New sewer network and sewage treatment infrastructure were built for almost 1.9 million citizens.

The total investment costs required achieving the National Implementation Program of Urban Wastewater Collection and Treatment until 2015 is about 3,3 billion EURO.

The reforms should concern institutional and legal measures. For **Czech Republic**, for the water sector, it will be required for 5 years period 1,130 – 1,500 MEUR, and for 10 years period 2,260 – 3,000 MEUR. Values related to the direct investments within the Morava River, which have to be carried out, to respond to new water related regulations are estimated to reach a total amount of 200 – 250 MEUR for period of 5 years. Cost assessment for implementation of the WFD is about 10 MEUR for years 2003 – 2015, of which for years 2004 – 2006 is estimated for an amount of 2.6 MEUR. State budget is the main source of finance. In the 1992–2002 period, the State Environmental Fund of the Czech Republic spent 1.1 billion € and supported the various environmental and water related investments, of which construction or reconstruction of 1,115 waste water treatment plants and sewer systems and 1,295 projects to decrease the burden on nature and the landscape.

For some countries (**Moldova, Croatia, B&H and Serbia**), the time frame for the approximation of national legislation to EU legislation is determined by the currently not fully satisfactory status of water sector legislation and the economic capability and potential of the particular country. For these countries the approximation process has to be considered as a medium to long-term task.

Moldova is further committed to implement the WFD and the ICPDR JAP. A detailed revision of needs in terms of legislation to respond to WFD is not yet done. The needed investment for JAP implementation is: 296.7 MEUR for municipal wastewater treatment plants, including sewerage systems, 111.2 MEUR for industrial wastewater treatment plants, and 85.0 MEUR for restoring and protecting the wetlands.

For **Bosnia and Herzegovina**, the financial allocation for 2002-2004 is 25,6 MEUR. From **Slovene** EcoFund 0,211 MEUR were spent on wastewater treatment and 1,875 MEUR for wastewater collection systems as part of the NEAP priorities only in 2002.

Romania is the recipient of funding from the EU-ISPA Programme that provides support for the transport and environment sectors, with an annual allocation of 208-270 MEUR for the period 2000-06. Under the terms of the EU accession agreement, Romania is obliged to comply with the Drinking Water Directive by 2015 and with the Urban Waste Water Treatment Directive by 2018. The estimated total investment costs for achieving full compliance with EU legislation in this sector is around Euro 19 billion, of which investments totalling to around Euro 12 billion will be required during the period 2007 – 2013. The estimated total investment costs comprise: ~ Euro 5.6 billion for improving drinking water systems; ~ Euro 9.5 billion for wastewater collection and treatment (Euro 5.7 billion for wastewater treatment and Euro 3.8 billion for sewerage systems), and ~ Euro 3.1 billion for tackling pollution caused by nitrates. Around Euro 12 billion (or ~ 63% of the total estimated investment cost) is projected to be invested during the period 2007 – 2013, of which Euro 5.4 billion is expected to be financed from EU funds.
The two first Danube EU member countries **Germany** and **Austria** have significantly achieved high standards of emission reduction and water pollution control. Concerning the projects indicated in the ICPDR JAP, investments of 234 MEUR for Germany and 264 MEUR for Austria were foreseen for the period from 2001 to 2005.

In 1997 and 1998 **Germany** invested more then 2.88 billion € for pollution reduction measures to respond to EU Water Directives and in particular the Nitrate Directive. Current investment in the water sector in the German part of the Danube River Basin is at the level of about 1.8 billion € per year of which 1.5 billion € is spent for communal wastewater treatment facilities (including 3rd stage for nutrient removal).

An additional amount of 1.4 billion Euro were spent to achieve the proposed project of the JAP, in the period 2001 to 2005. With these investment **Germany** responds to EU Water Directives and in particular the Urban Waste Water Directive.

From 1993 to 1999 **Austria** invested about 936 MEUR per year for municipal wastewater treatment including nutrient removal facilities.

All investments to enlarge wastewater purification plant capacities in the 2000- 2005 reporting period in **Austria** have amounted to approximately 851 MEUR, 545 MEUR for treatment plants > 15,000 p.e., and 306 MEUR for treatment plants < 15,000 p.e.

Altogether a total of 4,195 MEUR had been invested in measures for wastewater collection and treatment, a sum, which corresponds to an average investment sum of 840 MEUR p/a.

As minimising floods impacts is one of the main tasks of the JAP, estimates of the financial resources for implementation of the Action Programme for Sustainable Flood Protection in the Danube River Basin show the following sources:

- National budgets and other national sources
- Stakeholders contribution
- EU funds, including new cohesion funds

Relevant projects on flood action planning and implementation could financially be supported from programmes and funds of European Union, such as: Common Agriculture Policy, European Regional Development Fund, INTERREG IIIB CADSES, Special Action Programme for Agriculture and Rural Development (SAPARD), LIFE, PHARE Cross Border Co-operation (CBC), or TACIS. The European Commission has made a proposal for European Regional Development Fund 2007-2013 (COM (2004) 495 final) and has proposed to simplify the funding of external assistance (COM (2004) 626 final).

Table 6 shows a schedule for the envisaged approximation of the national legislation to the EU legislation (regarding selected EU Directives which are directly or indirectly related to the JAP tasks).

Table 6: Planned Schedule for Approximation of National Legislation to EU Legislation

Country	2000/60 EC Water Framework Directive	EC 91/271/EC on urban waste water treatment, amended as 98/15/EC 1998	EC 91/676/EC Nitrates Directive on the protection of waters against pollution caused by nitrates from agricultural sources	EC 80/68/EC on the protection of ground water	96/61/EC IPPC Directive on integrated Pollution Prevention and Control	EC 98/83/EC on the quality of water for human consumption and household needs	EC 76/464/EC on dangerous substances	EC 73/404/EC on biodegradability of detergents	EC 78/659/EC on the quality of fresh water needing protection or improvement in order to support fish life
DE	2005	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance
AT	2005	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance	Full compliance
CZ	2005	2010	2006	2007	2007	01.01.2003	2008	2003	
SK	2005	2010	2008	2005	2007	2008	2006	2000	2004
HU	2005	2010	2008	2005	2007	2008	30.09.05		
SI	2005	2008	2008	2007	2007	2008	30.09.05		
HR	2007	--	--	--		--	--	--	--
BA	--	--	--	--		--	--	--	--
CS	--	--	--	--		--	--	--	--
BG	2005	2015			2012				
RO	2005	2018	2014		2015	2022	2015		2010
MD	--	--	--	--		--	--	--	--
UA	--	2010	2003	2003			2005		

5 TASKS OF THE JOINT ACTION PROGRAM

The general objectives of the Joint Action Programme of the ICPDR are in line with the three main objectives defined in Article 2 of the DRPC: *"The Contracting Parties shall strive at achieving the goals of a sustainable and equitable water management, ...shall make all efforts to control the hazards originating from accidents ...and shall endeavour to contribute to reducing the pollution loads of the Black Sea from sources in the catchment area".*

There are 14 main tasks specified in the JAP (Table 7).

Table 7: Table 7 Joint Action Program tasks

Nr.	Tasks	Measures
1	Reduction of Pollution from Point Sources - Municipal Discharges - Industrial Discharges - Agricultural Discharges	Emission inventories Recommendations on BAT in priority sectors Investments
2	Reduction of Pollution from Non-Point Sources	Emission inventories Program of measures Investments
3	Wetland and floodplain restoration	Investments
4	Continuing the basin-wide co-operation in the field of monitoring	TNMN
5	Improving the scope of the TNMN, in order to get it in line with the EC Water Frame Directive and to enable its timely operation	TNMN Analytical Quality Control (AQC)
6	List of Priority Substances	List of priority substances Monitoring priority substances Recommendations on BAT and BEP to reduce priority substances
7	Water Quality Standards	Water Quality Standards Reporting
8	Prevention of accidental pollution events and maintenance of the accidental emergency warning system	Inventory of accident risk spots al pollution exist, till the end of 2001 Development of Recommendations for risk reduction of accidental pollution at the identified sites, till 2002 Maintaining and improving the existing AEW system, and considering its use also for related purposes (e.g. flood wamings)
9	Reduction of pollution from inland navigation	Cooperation
10	Product controls	Accomplishing of a voluntary agreement by the Detergent Industry either towards ICPDR or to the Danube Basin States, in order to put only phosphate-free detergents for household and industrial use to the market

Nr.	Tasks	Measures
		in the Danube Basin, till the end of 2002
11	Minimising the impacts of floods	Action Programmes for sustainable Flood Prevention for selected parts of the Basin
12	Water Balance	Harmonised methodology for establishing domestic water balances for DRB
13	River Basin Management	RBMP for Danube river basin
14	Reporting on the Implementation of the Joint Action Programme for the Danube River Basin	Final Implementation Interim Reporting 2004 Final Implementation Reporting 2006

5.1 Reduction of Pollution from Point Sources

5.1.1 Issues in need of special attention

Like all major rivers of Europe, the Danube has historically been significantly altered and affected by a wide variety of ways including water abstraction, industrial processes, agriculture, fishing and transport. The resulted impacts on the Danube water environment have caused diverse and complex relationships, for example by modifying the relationship between soil, water and vegetation through urban development, drainage infrastructure and flood defences or wastewater discharges and the quality of the rivers.

The problems of the Danube developed slowly over time and are the cumulative impact of a number of actions.

According to the assessment for the preparation of the Joint Action Program, the main problems in the Danube River Basin that affect water quality use were: (i) high loads of nutrients and eutrophication, (ii) contamination with hazardous substances, including oils, (iii) microbiological contamination, (iv) contamination with substances causing heterotrophic growth and oxygen-depletion; and (v) competition for available water.

The highest priority environmental challenge in the region is eutrophication. The problem of eutrophication is the priority issue for the Black Sea. It is estimated that historically the Danube alone introduced some 60,000 tons of phosphorus and 340,000 tons of inorganic nitrogen into the Black Sea each year. The results in reduction of the water clarity, a raising of the aerobic/anerobic interface, loss of macrophyte growth, reduction in fish spawning sites, increased occurrence of red-tides, loss of biodiversity and, in conjunction with over-fishing, loss and deterioration of commercial fisheries.

Discharge of untreated municipal wastes into basin waters creates significant problems in the basin. Often sewage treatment is limited to screening before being discharged directly into rivers. Lack of monitoring capacity creates hazardous conditions in recreational waters. With no tertiary treatment nutrient loading from municipal wastes is quite high.

Out of the 83 million living in the Danube River Basin about 57% is living in urban areas. The share of population connected to public water supply varies from 29% in Moldova to 98% in Germany. The share of population branched to public sewer system varies from 14% in Moldova to 91% in Germany.

Also, as sewage collection expands and more and more municipal wastewater treatment plants come on line, there is a compelling risk that N and P emissions will increase. The four EU member states (CZ, HU, SI, SK) were committed to take stock of their water and wastewater infrastructure systems, in order to comply with relevant EU water directives, as accession discussions advanced. Many of the municipal sector improvements in the last EU member States (BG and RO) are only now starting to be realized. Tertiary treatment (N and P removal) is being applied for a large number of the upgraded and new wastewater treatment plants, but not in all cases. Furthermore, demands for N and P removal for wastewater treatment

plants in rural communities, representing approx. 40% of the Danube River Basin, are lower than for urban settlements.
On top of these pressures, sewerage coverage in the eastern and south-eastern Danube River Basin countries today averages less than 60%, so municipal discharges will certainly proliferate as these countries further develop in the coming years.

The most significant problems with regard to the situation of wastewater treatment on municipal level in lower Danube countries are:

- Missing wastewater collection and treatment facilities,
- Generally poor condition of the facilities,
- Outdated and unreliable treatment technology,
- Insufficient maintenance of technical schemes,
- Insufficient financial resources for building, reconstruction and extension.

The degree of industrial development and the importance and amount of the pollution caused by the industrial sector varies within every single country. Practically all industrial branches are represented: chemical, electrical, engineering works, metallurgical and galvanic, textile, sugar, papermaking and pulp-mills, wood-making industry, etc. Still, in some cases industrial wastewater is discharged without any or with insufficient treatment into the public sewer network. This causes problems at the wastewater treatment plants so that their purification capacity is not sufficient or completely obstructed.

On the agricultural point sources of pollution, the pig and cattle farms are identified as point sources. These hot spots are in general relatively easy to eliminate by the treatment of the liquid manure.

Significant water pollution problems persist throughout a large part of the basin despite effective implementation of EU and national policies in most of the Danube countries and the substantial economic and social benefits of reducing water pollution.

The analysis of economic disparities which have been considered in the 2000 assessment of the JAP still shows in 2006 a clear trend of a west – east decline of the GDP from the upstream countries like Germany and Austria, with about 35,000 EUR per capita and year (2006), to the downstream countries of which Moldova accounts for less than 1,000 EUR per capita and year (Figure 1). This analysis is necessary to understand the efforts undertaken and the challenges that still do exist in achieving common regional and global goals (Figure 2).

Figure 1: Overview GDP per capita (PPP) in $ in 2006 in the DRB countries

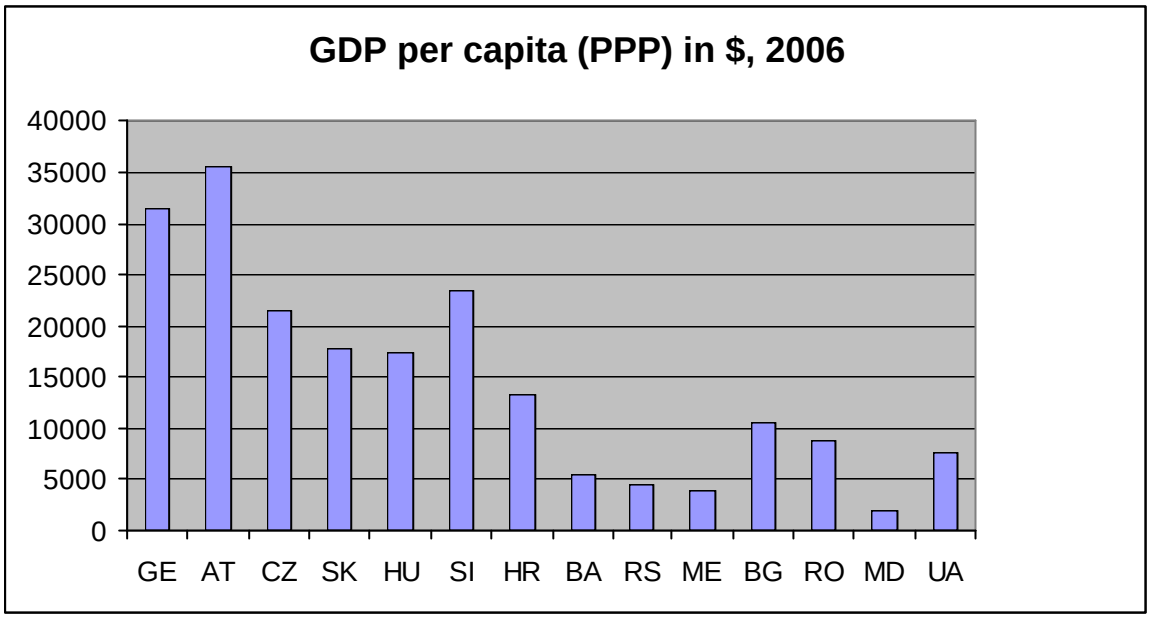
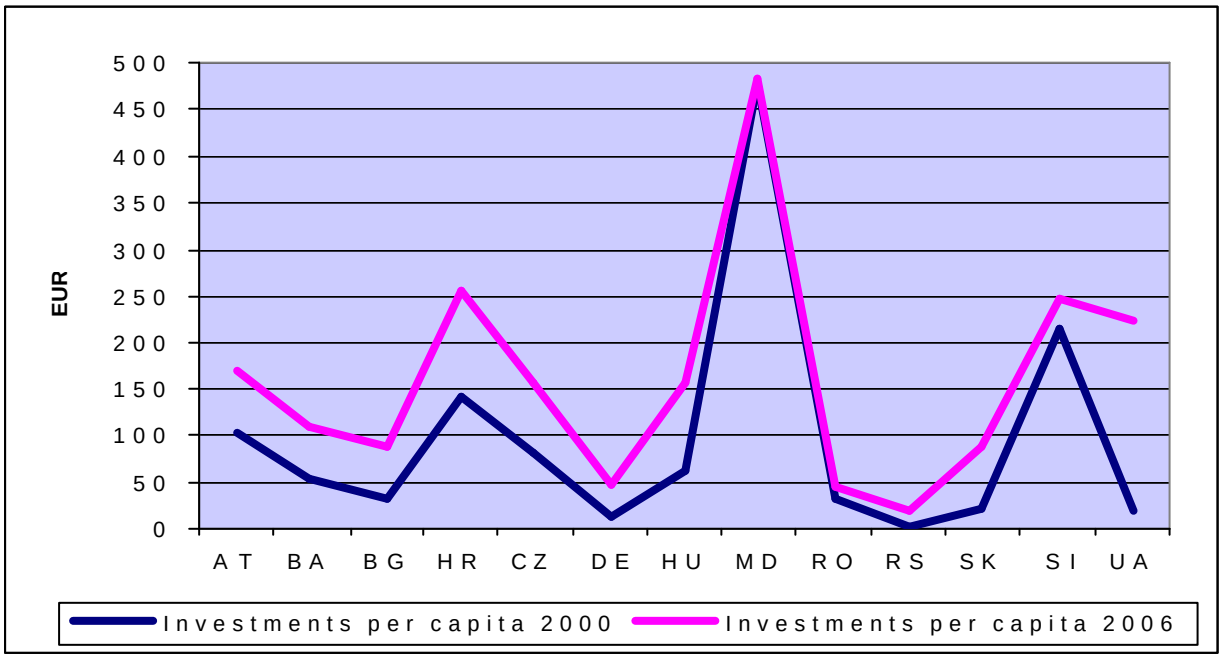


Figure 2: Comparison of planned and achieved specific investments in the DRB countries



5.1.2 Reporting on pollution sources

The ICPDR has prepared inventories for point source emissions for the reference years 1997, 2000, 2002 and 2004 (Table 8). The inventories of 2004 served as basis of pressures assessment for the Danube Analysis – Roof report, Art. 5 reports. The most recent concluded inventory is done for the reference year 2005.

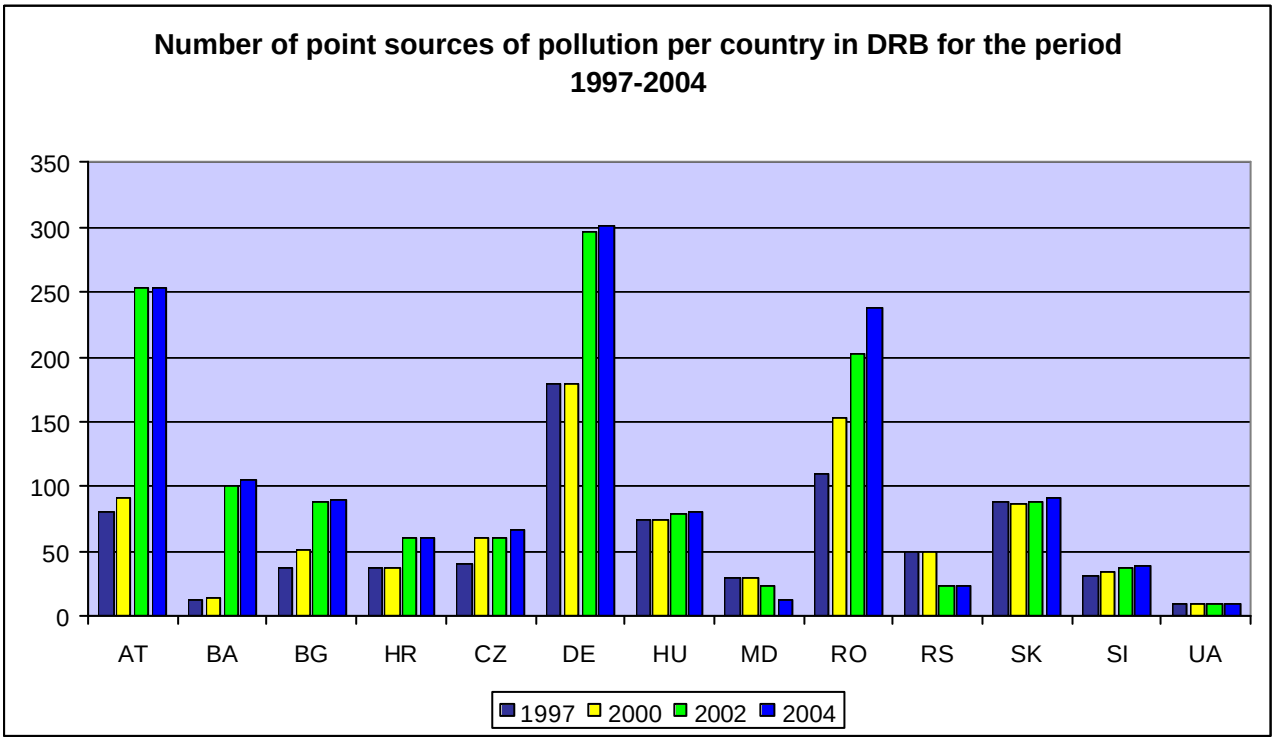
These include municipal, industrial and agro-industrial point sources. The inventory for the reference year 2004 includes 1371 sources of pollution, of which 992 municipal. The most recent inventory, reference year 2005 counts 1621 municipal point sources of pollution.

Table 8: Discharges, per sectors and country, in the DRB, reported 2000-2004

Overview Emission Inventories Danube River Basin														
Municipal, industrial and agricultural point sources														
Country	AT	BA	BG	HR	CZ	DE	HU	MD	RO	RS	SK	SI	UA	**Total**
2000	92	15	51	38	60	180	74	29	153	50	87	34	9	**872**
2002	253	101	89	60	61	297	79	24	202	23	89	38	10	**1326**
2004	253	106	90	60	66	301	80	13	238	23	92	39	10	**1371**

Figure 1 presents an overview of reporting on point sources of pollution for the period 1997 – 2004. Germany, Austria and Romania report the largest number of point sources in the basin. The number of reported point sources is low in Ukraine, Moldova, Serbia and Slovenia. The large difference between the reported sources of pollution is due to the magnitude of the country's share in the basin.

Figure 3: Overview DRB countries reporting on point sources of pollution 1997 - 2004



5.1.3 Results of JAP measures to reduce pollution

According to the article 3.2.1. of the Joint Action Program, "Contracting Parties have agreed to implement the proposed measures, under the assumption that the financial resources are available during the implementation period of the JAP, i.e. till 2005".

Within the frame of Joint Action Program, both structural/investment and legal/policy reforms projects that address pollution reduction were introduced for the period 2001 – 2005. According to the JAP, the total investment required for the 247 priority planned point source projects for DRB countries amounts to about 4,348.8 MEUR.

The interim implementation report on JAP measures indicated that ~ 50% of the reduction has been achieved by projects completed by 2003. This means that remaining ~50% of the expected pollution reduction should have been achieved through projects completed until 2005.

Annexes 1 to 3 of the JAP Final Implementation Report, 2006, list the planned and achieved measures for the reduction of pollution load from municipal, industrial, agro-industrial and wetlands projects.

The analysis of the investments projects reported by the countries for the period 2000 - 2005 shows that not all commitments have been respected and for each sector, the total number for all countries, of achieved projects is 250 (Table 9), which is more than the planned figure of 247 projects (Table 10). The increase is due to additional industrial and agro-industrial projects achieved by 2006 (Figure 5).

Table 9: Sector overview of investment projects achieved in 2006.

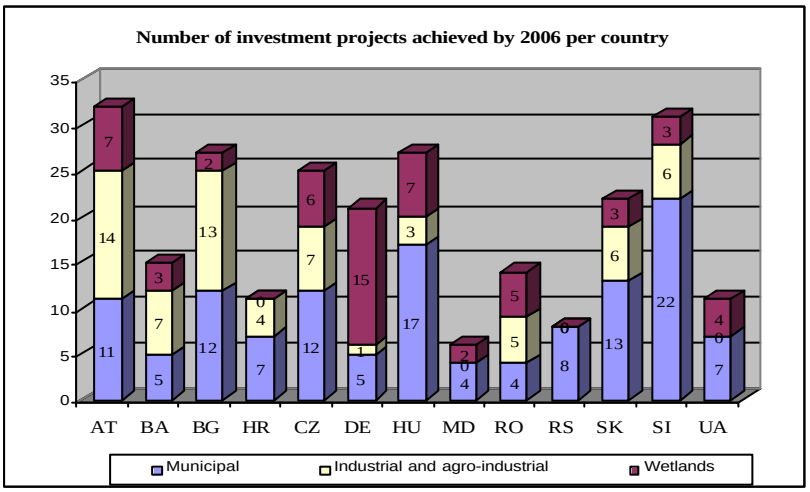
Investments per sector for projects realized by 2006 in DRB				
	Municipal	**Industrial and Ago-industrial**	**Wetlands**	**Total**
No of Projects	127	66	57	250
MEUR	3,716	328	221	4,265
(%) - Structure	87%	8%	5%	100

Table 10: Comparison of planned and achieved projects, by sector

Comparison 2000 - 2006 investments projects				
JAP 2006 - Sector Overview: Number of Investment Projects achieved by 2006				
Country	**Municipal**	**Industrial and agro-industrial**	**Wetlands**	**Total**
AT	11	14	7	32
BA	5	7	3	15
BG	12	13	2	27
HR	7	4	-	11
CZ	12	7	6	25
DE	5	1	15	21
HU	17	3	7	27
MD	4	0	2	6

RO	4	5	5	14
RS	8	-	-	8
SK	13	6	3	22
SI	22	6	3	31
UA	7	-	4	11
Total achieved reported 2006	**127**	**66**	**57**	**250**
Total planned 2000	**133**	**57**	**57**	**247**

Figure 4: Overview of achieved investments, per sector and country

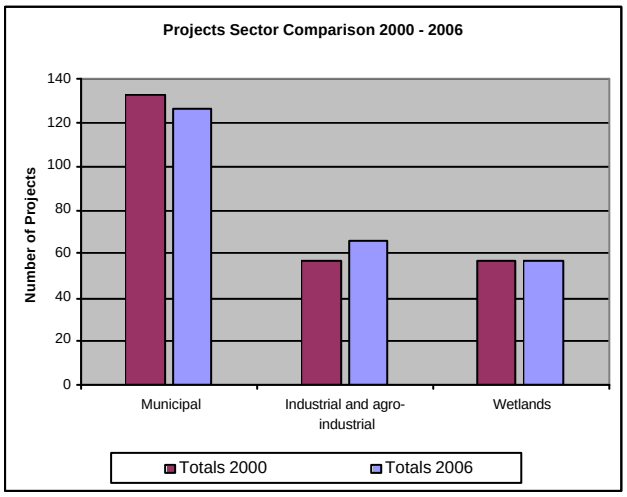


The results of reports on the investments projects (Annex 1-3) are presented in the Figure 4.

The largest number of municipal projects has been realised by Hungary and Slovenia. Germany achieved the largest number of wetlands rehabilitation measures, while Austria leads with the largest number of industrial and agro-industrial measures.

The results show that some countries (Austria, Slovakia and Slovenia) have completely or even exceeded the 2000 commitments; some have fulfilled all commitments within one sector.

Figure 5: Sector overview of projects 2000 – 2006

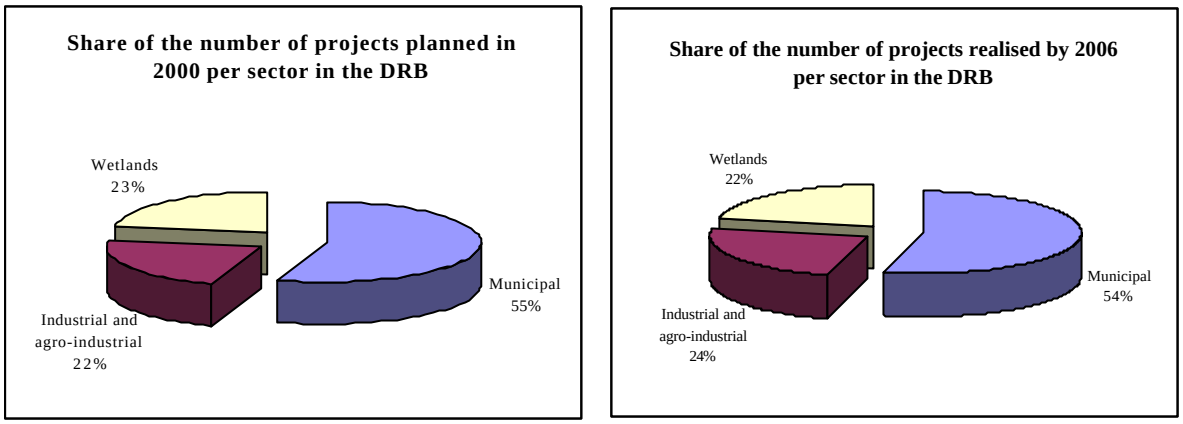


Such examples include: (i) for municipal measures: Austria, Czech Republic, Germany, Slovakia, Slovenia, Ukraine, Serbia, Hungary, (ii) for industrial and agro-industrial measures: Austria, Bulgaria, Croatia, Slovakia and Slovenia, and (iii) for wetlands measures: Austria, Bosnia and Herzegovina, Germany, Hungary and Ukraine.

In some countries the 2000 commitments were not accomplished for individual sector. The largest difference is reported in Moldova and Romania (municipal, industrial and agro-industrial measures) and in Czech Republic for wetlands rehabilitation measures.

The comparison of planned and achieved investments shows almost the same weight of various sectors in the countries prioritisation of investments in the basin (Figure 6).

Figure 6: Planned and achieved projects distribution in the DRB



The reported results on total investments in response to the measures of the JAP indicates 4,265 MEUR, which represents 0,98% of the planned amount to be spent estimated in 2000 (4,348.8 MEUR).

Table 11: Comparison of planned and achieved projects in 2000 and 2006, per country

Project Realisation (all sectors combined)				
Country	**Projects Proposed in 2000**		**Projects Completed by 2006**	
	No. of Projects	**Investment MEUR**	**No. of Projects**	**Investment MEUR**
AT	9	**779.3**	32	**495.82**
BA	12	**176.4**	15	**187.0**
BG	20	**125.4**	27	**216.0**
HR	8	**433.5**	11	**354.0**
CZ	43	**221.8**	25	**210.0**
DE	20	**126**	21	**295.6**
HU	28	**739.6**	27	**1,111.10**
MD	31	**492.9**	6	**6.0**
RO	25	**696.5**	14	**250.0**
RS		**15.355**	8	**155.266**
SK	20	**105.1**	22	**327.0**
SI	24	**382.5**	31	**55.0**
UA	7	**54.4**	11	**605**
Total:	**247**	**4,348.755**	**250**	**4,265.449**

Table 12 provides the distribution of projects and related investments per country, in 2006.

Table 12: Distribution of investments and projects, per country

	DE	AT	CZ	SK	HU	SI	HR	BA	RS	BG	RO	MD	UA	Total
No of Projects	21	32	25	22	27	31	11	15	8	27	14	6	11	250
MEUR	296	496	210	327	1111	55	354	187	155	216	250	6	605	4,265
(%)	7%	12%	5%	8%	26%	1%	8%	4%	4%	5%	6%	0.14%	14%	100

The same comparison of 2000 and 2006 planned and achieved investments, but distributed per sectors is presented in the Table 13.

Table 13: Overview of achieved total investments, per sector and country as compared with the planned JAP

Sector Overview: Total Investments (MEUR)				
Country	**Municipal**	**Industrial and agro-industrial**	**Wetlands**	**Total**
AT	353.2	120.30	22.32	**495.82**
BA	145.2	29.40	11.90	**186.5**
BG	171.9	39.70	4.00	**215.6**
HR	349.4	4.50		**353.9**
CZ	199.6	3.00	7.00	**209.6**
DE	160	0.60	135.00	**295.6**
HU	1,061.40	41.60	8.10	**1,111.10**
MD	0.063	0.00	5.90	**5.963**
RO	214.6	33.20	1.90	**249.7**
RS	112.966	36.20	6.10	**155.266**
SK	303.4	19.70	3.50	**326.6**
SI	39.7	-	15.10	**54.8**
UA	605	-	-	**605**
Total achieved 2006	**3,716**	**328.20**	**220.82**	**4,265**
Total planned 2000	**3829.1**	**295.5**	**224.20**	**4,348.8**

The planned and achieved distribution of investments made in response of the JAP measures, per country, is presented in the Figure 7.

Figure 7: Comparison of planned and achieved investments in the DRB

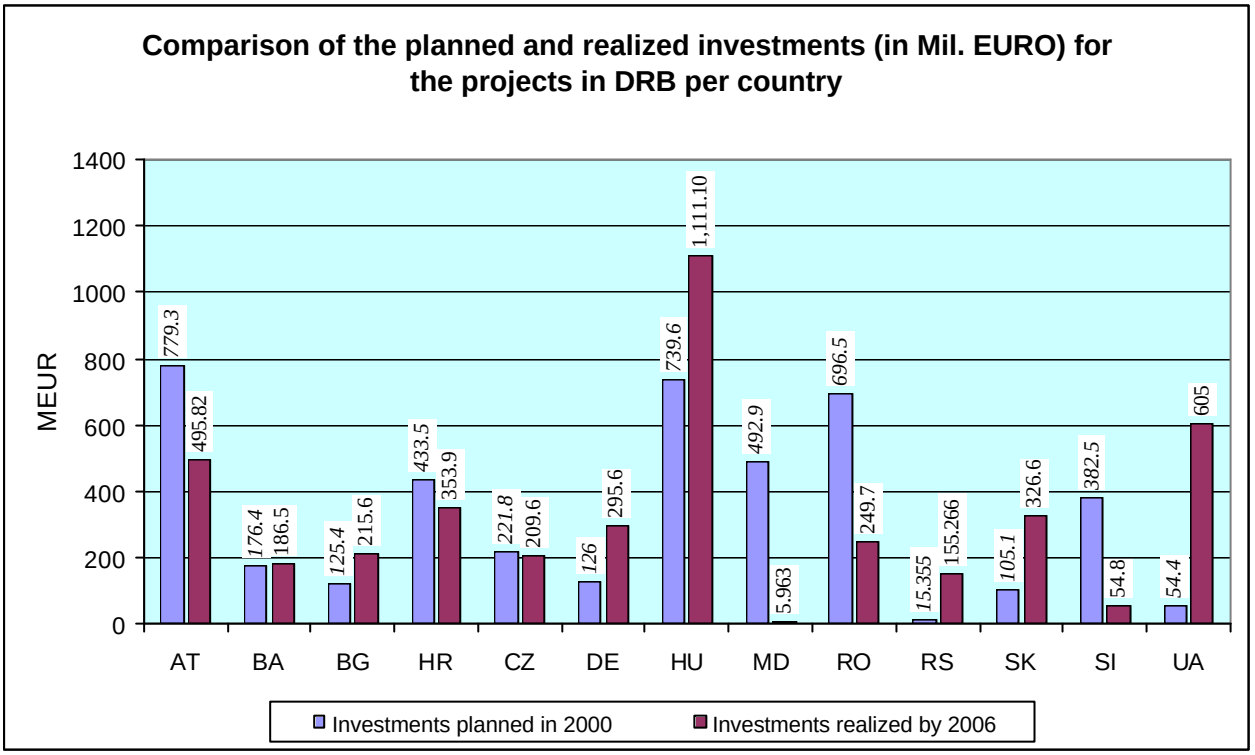
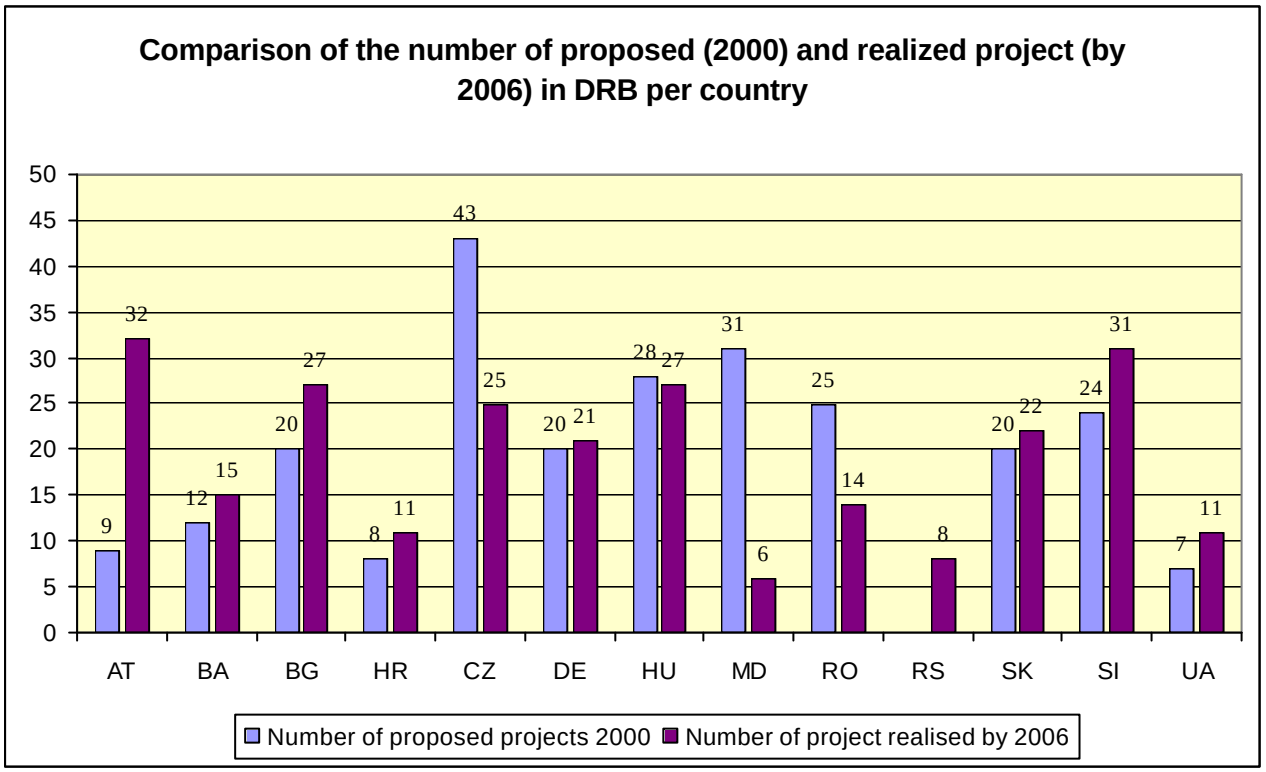


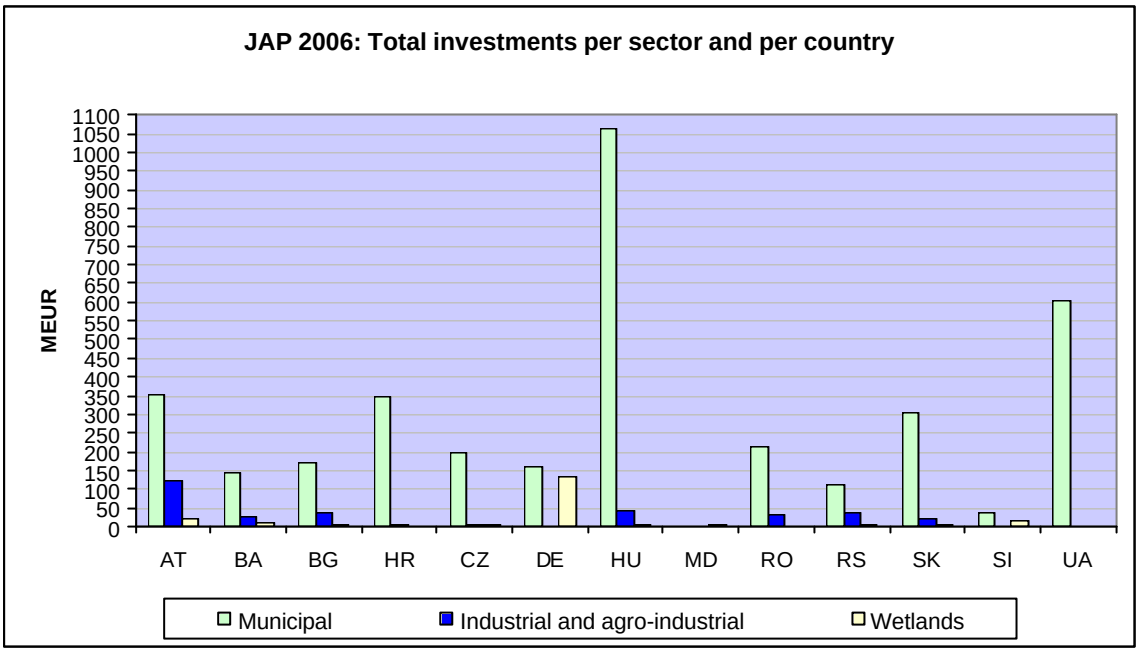
Figure 8 shows that in most of the countries the number of realised projects exceeds the planned one: Croatia, Austria and Ukraine having the largest difference in terms of achieved against planned measures.

Figure 8: Overview of planned and realised projects per country in the DRB



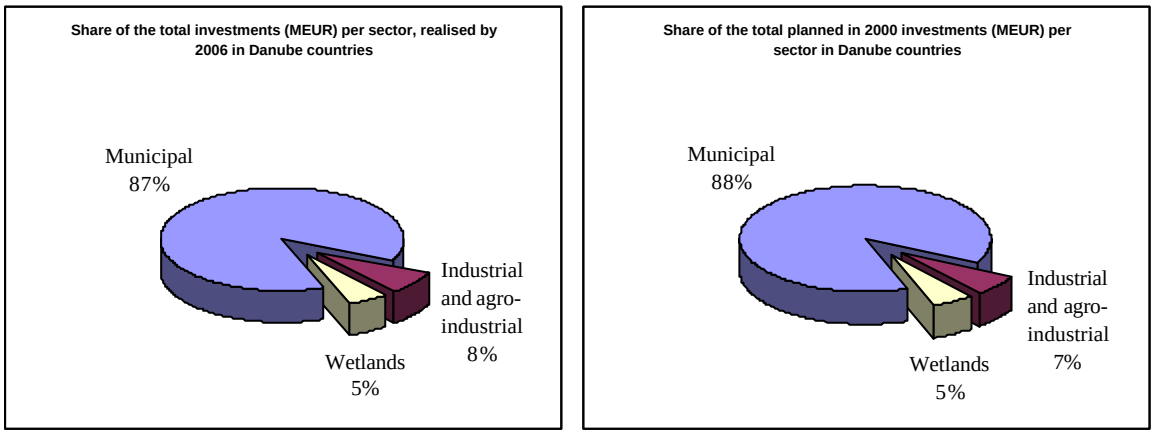
The distribution per country in the basin of the financial efforts on the JAP implementation is shown in the Figure 9. The largest number of measures has been taken in the municipal sector. Hungary invested the largest amount of funds in municipal projects, Germany in wetlands restoration and floodplain measures and Austria in the industrial and agro-industrial investments.

Figure 9: Total achieved investments of the JAP, distributed per sectors and country



The comparison of planned and achieved share of investments per sectors indicates similar weights for each of the analysed sector (Figure 10).

Figure 10: Share of total planned and achieved investments per sectors in the DRB



A comparison of the significant point source emissions assessed through screening of emission inventories illustrates that only few point sources are responsible for about half of the point discharges into the Danube River system. From this it can be concluded that reduction of emissions (organic substances and nutrients) from these sources would lead to a remarkable reduction of the total point source pollution.

Table 14 includes specific point source discharges of COD, BOD, total nitrogen and phosphorus from municipal wastewater treatments (WWTPs), direct industrial discharges, and agricultural point discharges in the sub-catchments of the Danube, representing results obtained in 2004 using MONERIS for reference year 2000.

Table 14: Point sources of pollution, reference year 2000

Sub-catchment	CODs	BODs	Ns inv	Ps inv	Ns calc	Ps calc
	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)

Sub-catchment	CODs	BODs	Ns inv	Ps inv	Ns calc	Ps calc
	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)	g/(Inh·d)
01 Upper Danube	9.5	1.2	3.5	0.2	3.8	0.3
02 Inn	20.2	3.9	3.9	0.4	3.6	0.5
03 Austrian Danube	11.8	1.4	2.8	0.2	3.4	0.3
04 Morava	10.8	1.8	3.5	0.4	4.9	0.5
05 Vah-Hron	26.0	9.1	7.1	0.6	4.2	0.4
06 Pannonian Central Danube	35.8	18.8	5.3	0.6	6.7	1.0
07 Drava-Mura	44.2	12.5	5.2	0.8	4.1	0.7
08 Sava	52.3	28.6	4.0	1.0	4.8	1.2
09 Tisza	14.4	8.3	2.7	0.5	3.5	0.5
10 Banat-Eastern Serbia	17.8	68.5	12.4	2.7	10.4	2.4
11 Velika Morava	n.a.	24.9	3.3	1.1	3.3	1.1
12 Mizia-Dobrudzha	64.6	30.2	6.4	1.6	6.7	1.5
13 Muntenia	17.3	10.0	4.1	0.7	4.5	0.9
14 Prut-Siret	15.1	5.9	2.1	0.2	2.4	0.3
15 Delta-Liman	15.6	8.4	4.3	0.5	3.7	0.6
Total DRBD	**23.9**	**14.0**	**4.2**	**0.7**	**4.5**	**0.8**

Figure 11 shows the difference in the state of the specific nutrient point source discharges within the Danube countries. For nitrogen it is shown that the lowest point N discharges are in Germany with 4 g/(Inh.·d) per connected inhabitant followed by Austria, Ukraine and Moldova. It is likely that the low N discharges for the latter two countries are due to inconsistent data for the population connected to waste water treatment plants, or to low nitrogen discharges from the point sources in the inventory.

The level of N elimination in the WWTPs of Ukraine and Moldava is much lower than in Germany and Austria. For some countries the specific N discharges are higher than the assumed N emission per inhabitant of 12 g/(Inh.·d). This is due to the present low level of nitrogen removal in most of the WWTPs of these countries and the additional fact that the point source database includes industrial discharges emitted into the river indirectly (via sewer system) and directly (industrial point sources).

Figure 11: Inhabitant specific N discharges from point sources in the Danube countries for the period 1998 to 2000 according to modelling results (Behrendt et al. 2004)

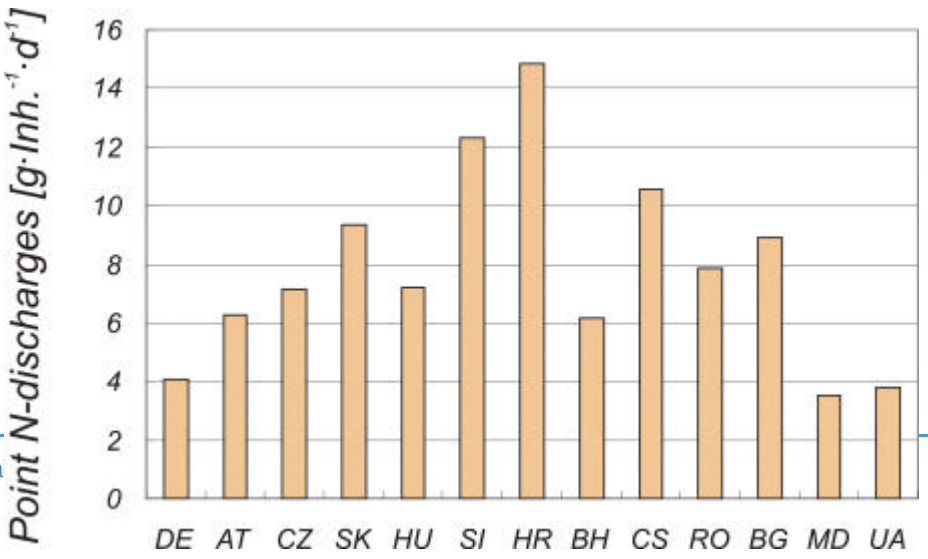
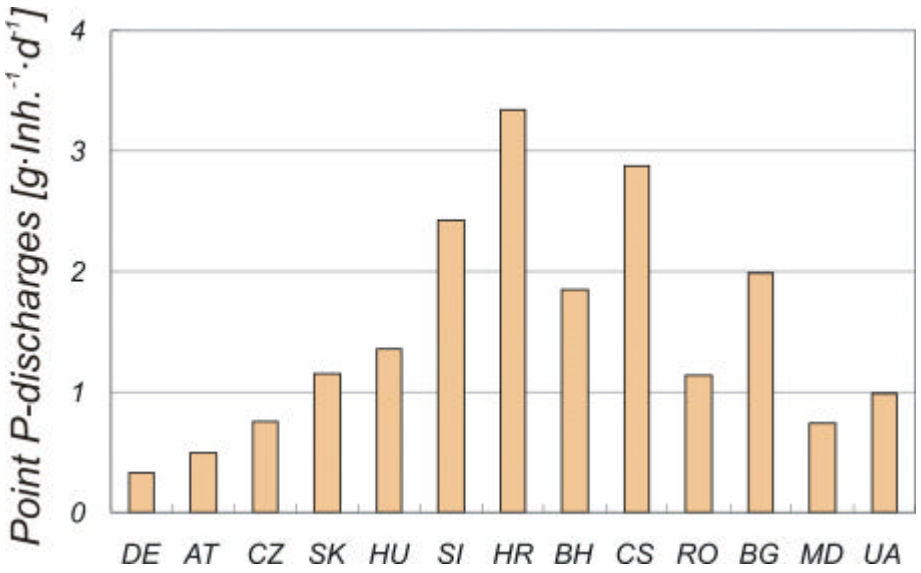


Figure 12: Inhabitant specific P discharges from point sources in the Danube countries for the period 1998 to 2000 according to modelling results (Behrendt et al. (2004)

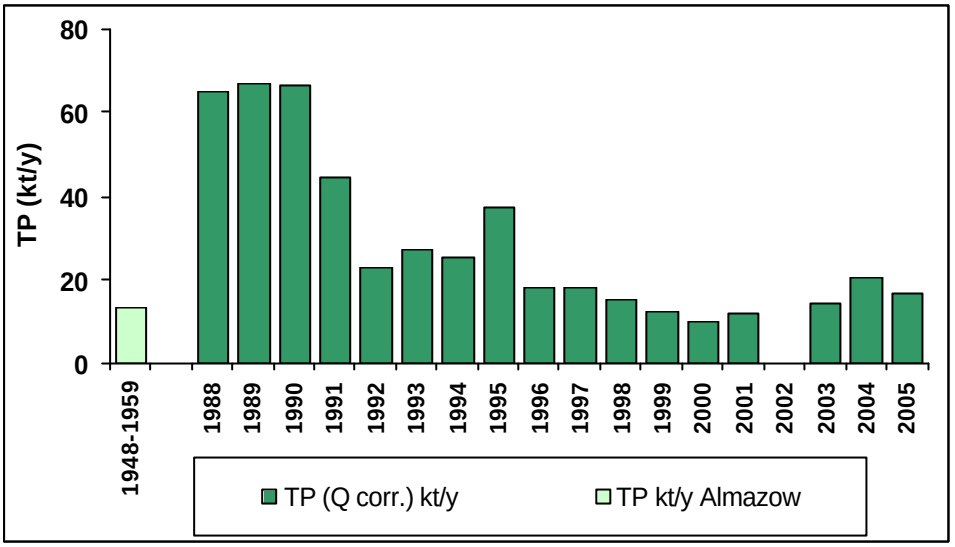


The picture for phosphorus (Figure 12) is similar to that for nitrogen (Figure 11). The differences between the countries are much larger due to the fact that the specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of phosphorus in detergents, and discharges from direct industrial sources.

In respect to nitrogen it has to be stated that the nitrogen discharges, which can be influenced by management, are actually in the same size for point and for diffuse sources. This means that nitrogen removal at point sources (treatment plants) will play an important role in nitrogen management, as diffuse sources from agriculture in the eastern Danube countries probably tend to increase with economic growth.

The development of sewer systems in response to the EU UWWD might lead to an increase of nutrient discharges to the rivers if the waste water is treated without nutrient (N and P) removal as for sensitive areas.

Figure 13: River Danube annual total phosphorus loads (corrected for annual discharge) to the Black Sea



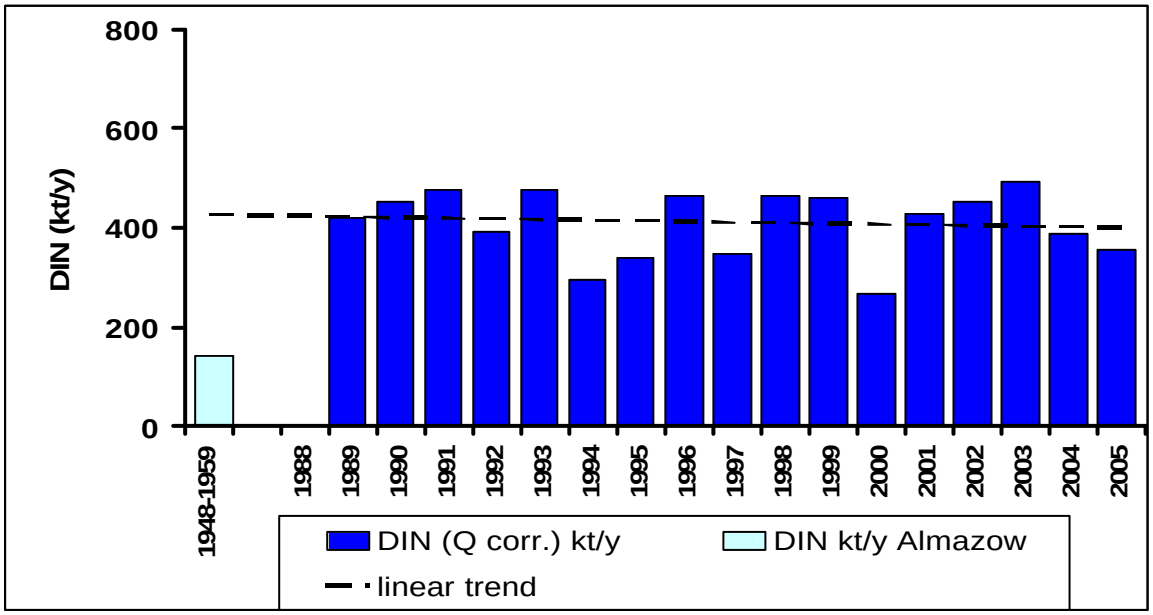
In respect to phosphorus point sources still play a decisive role. P-free detergents, P-removal at municipal and industrial waste water treatment plants and the avoidance of agricultural point sources are important measures in order to keep emissions of easily available dissolved P-compounds low.

A more recent assessment has been done using updated figures with trends since 1988, for Danube river annual total phosphorus (

Figure 13), respectively annual inorganic nitrogen loads (Figure 14), corrected for annual discharge, to the Black Sea.

TP loads of the period 1998 - 2000 have similar values, while in the period 2000-2005 show significantly lower values. The TP-measurements for the period beginning with 2000 have been made by the TNMN-dataset at Reni.

Figure 14: River Danube annual inorganic nitrogen loads (corrected for annual discharge) to the Black Sea



5.1.4 Municipal Discharges

5.1.4.1 Emission Inventories

Regulation of point sources is achieved through emission limits and best practices. The Danube countries use a number of methods to tackle the task of controlling emissions from point sources:

- Preparing emissions inventories of municipal point sources. Based on these inventories, the reduction of water pollution that can be achieved by implementing the various measures and the amount of investment needed and other costs involved are calculated.
- The elaboration of Best Available Techniques (BAT) for municipal wastewater discharges, including the setting up of a timetable for their step-by-step implementation.
- The elaboration of the common principles regarding the minimum monitoring required for wastewater discharges.

In recent years, EU environmental policy has evolved from a traditional, command-and-control approach towards a more integrated and flexible approach. At EU level, there are now at least three different instruments to tackle pollution caused by point sources:

- Prescriptive legislation containing minimum rules to be applied uniformly across the EU
- Flexible legislation imposing additional site-specific or national rules, which will vary from one installation to another within the Union (e.g. the IPPC Directive).
- Voluntary and/or market-based instruments setting the basic rules for operators who want to exploit market opportunities (e.g. introduction of phosphate free detergent, EMAS regulation and a future emissions trading scheme).

The quality standards provide the framework for both minimum emission limit values and additional BAT-based conditions. If the use of BAT is not enough to meet a quality standard, then more drastic measures must be taken.

The EMIS inventory developed in the ICPDR has expanded in scope to collect data from all settlements having more than 10,000 inh. Therefore, the municipal emission inventories include all municipal sources with more than 10,000 PE (wastewater treatment plants, irrespective of the type of treatment, as well the municipal sources without treatment, discharging into the riverine environment. Discharges of substances from the ICPDR List of priority substances were also considered.

The overview of reporting on discharges in the emission inventories shows that the largest number of reported point sources is for the municipal sector – 1,621 sources in 2005 (Table 15).

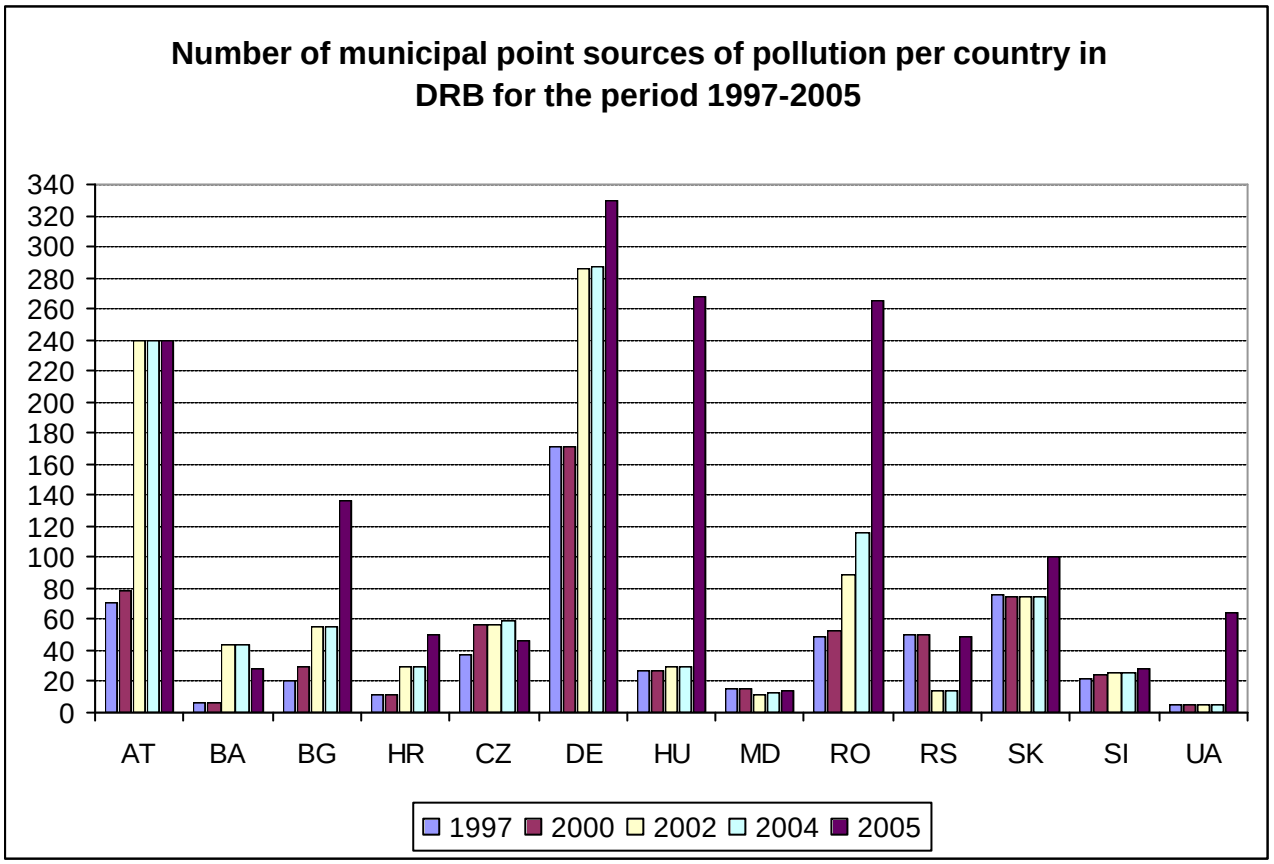
Table 15: Municipal discharges inventories in the DRB

Overview Emission Inventories Danube River Basin Municipal point sources					
Country	**1997**	**2000**	**2002**	**2004**	**2005**
AT	71	79	240	240	240
BA	6	6	44	44	28

BG	21	30	55	55	137
HR	12	12	29	29	50
CZ	37	57	57	59	47
DE	171	171	286	287	330
HU	27	27	29	29	268
MD	16	16	11	13	14
RO	49	53	89	116	265
RS	50	50	14	14	49
SK	76	75	75	75	101
SI	22	25	26	26	28
UA	5	5	5	5	64
Total	**563**	**606**	**960**	**992**	**1621**

Figure 15 shows the number of municipal point sources of pollution reported in the years 1997, 2000, 2002, 2004 and 2005. In almost all countries, the reporting on municipal discharges has been improved, mainly due to the UWWTD reporting obligations.

Figure 15: Overview reporting on municipal discharges 1997 – 2005, per country in the DRB



5.1.4.2 Harmonization of the reporting requirements under the Urban Waste Water Directive and the Water Framework Directive

The most relevant EU legislation related to controlling point sources pollution is the Urban Waste Water Treatment Directive (Council Directive 91/271/EEC concerning urban waste water treatment), which requires Member States to collect and treat urban wastewater discharged from agglomerations over a certain size by 30 June 1993.

The general objective of the Directive is to protect the environment from the adverse effects of discharges of urban wastewater and of wastewater from industrial sectors of agro-food industry. Specific objectives refer to:

- Waste water collection and treatment in all agglomerations above 2 000 p.e.
- Appropriate waste water treatment in all agglomerations below 2 000 p.e., if collected
- Biological treatment (secondary) as standard requirement
- More stringent treatment (tertiary) in sensitive areas and their relevant catchment areas

The Directive also requires Member States to:

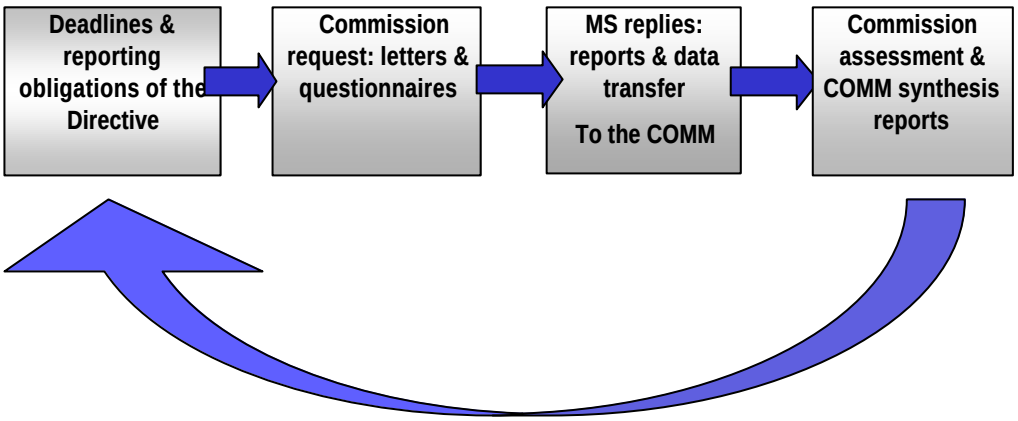
- provide prior regulation or specific authorization for all discharges of urban waste water and industrial waste water from the particular sectors mentioned in the Directive, as well as for all discharges of industrial waste water into urban waste water systems;
- ensure that by 31/12/2000 the industrial waste water from the mentioned sectors shall before discharge respect the established conditions for all discharges from plants representing 4.000 population equivalent or more;

- provide before 31/12/1998 general rules or registration or authorization for the sustainable disposal of sludge arising from waste water treatment and, by the same date, to phase out any dumping or discharge of sewage sludge into surface waters;
- ensure that the urban waste water discharges and their effects are monitored;
- publish situation reports every two years and establish implementation programmes.
- The sensitive areas must be designated according to one or more of the following criteria:
- water bodies which are found to be eutrophic (eutrophication is an enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life) or which in the near future may become eutrophic if protecting action is not taken;
- surface freshwaters intended for the abstraction of drinking waters and which could contain more than 50 mg/l of nitrates if action is not taken;
- areas where further treatment is necessary to fulfil other Council Directives.

On going developments at the EC level have been widely considered by the Danube countries in meeting reporting obligations of the ICPDR on pollution sources. The main goal was to look at the various reporting requirements of the WFD as to create an efficient information system, to ensure a coherent reporting system and to allow access to information. In addition to the WFD, the Directive on the standardization of reports i.e. a Reporting Framework Directive has been taken into account.

In order to have more homogeneous status on the UWWTD implementation all over the EU-25 and to simplify the reporting exercise, the Commission set up a unified reporting cycle for the UWWTD under all articles under which reporting is required (Figure 16).

Figure 16: Simplified structure of the interaction between the Commission and MS during the process of the reporting while implementing the Directive 91/271/EEC



A significant challenge is for the Danube countries the agreed transitional periods for the new MS and streamlining of reporting process for all Danube countries, including the non-EU countries.
A standardized reporting system is a key element to reduce the reporting burden for Danube countries under this directive but also under other closely related directives (e.g. WFD). The overall goal is complementary reporting system, which provides the ICPDR and other data users with the required information for the different purposes via a minimized and clearly ruled data exchange process with the Danube countries.

Sensitive areas require more stringent treatment e.g. the removal of nitrogen and/or phosphorus, microbiological treatment. The Czech Republic and Slovakia identified their entire territory as sensitive or applied Article 5.8. Hungary and Slovenia identified parts of their territory as sensitive. Austria has identified their entire territory as sensitive or applied Article 5.8. For Germany only Danube river basin is not identified

as sensitive. Romania confirmed that the entire territory is a sensitive area according to the provision of Chapter 22 on "Environmental protection". This is legally reflected in the update of the Governmental Decision 188/2002 in March 2005. Romania has taken steps to declare its entire territory a sensitive area for the purposes of UWWTD. Action plans for agglomerations have been prepared, together with an assessment of the current wastewater infrastructure. A methodology was developed for the designation of vulnerable zones that drain into waters affected by nitrate pollution.

The progress with respect to wastewater treatment varies widely. Each Danube accession country made estimates of the cost of implementing the more demanding directives, particularly the Urban Wastewater Treatment Directive (UWWT) and Integrated Pollution prevention and Control (IPPC).

Table 16: Estimated compliance costs for UWWT and IPPC Directives Directive

Danube country	Population 2000, mil inh.	Estimated cost for UWWT (MEUR)	Estimated cost for IPPC (MEUR)
Bulgaria	8,2	2,056 (65%)	3,261 (300-400 facilities)
Czech Republic	10,4	1,164 (74.9%)	3,725 (1,088 facilities)
Hungary	10	1,678 (60% sewage and 22% treatment)	1,761 (970 facilities)
Romania	22,4	1,385 (sewage)	806 (2,900 facilities)
Slovakia	5,4	499 (54.7%)	1596 (540 facilities)
Slovenia	1,99	914 (sewage)	50 (108 facilities)

The P&M EG of the ICPDR prepared a concept on the harmonization of the reporting requirements in line with the WFD and other directives ensuring as much consistency as possible between these reporting obligations and emission inventories of the ICPDR. This is justified by the need to create an unified system for reporting: (a) with the same reference years, (b) the same deadlines to report data and information, and (c) to have a unique computerized reporting form for all UWWT Directive requirements.

The group is implementing a two-step methodology to update the pressures analysis for urban wastewater treatment plants, making best use of the obligatory UWWTD reporting requirements. In the first phase (2006) the methodology was developed and the data on agglomerations with more than 10,000 p.e. were collected. In the second phase (2007) the data of the agglomerations between 2,000 and 10,000 p.e shall be collected. All Danube countries fulfilled the first step data collection: data on agglomerations with more than 10,000 p.e. are all available.

5.1.4.3 Assessment of DRB countries reports on municipal discharges in line with the UWWTD

The analysis of data provided by the countries had shown some gaps and inconsistencies. Nonetheless, an evaluation of the data was possible.

Data were reported on 1,441 Agglomerations having more than 10,000 inh p.e. The number of WWTP and of collecting system without treatment, and other information can be taken from Table 17.

Table 17: UWWTD reporting by the Danube countries

	Agglomerations	UWWTPs	Collecting systems	Discharging points
Member States	1241	1139	273	1457
Non - EU Countries	200	93	112	285
Total Danube river basin	**1,441**	**1,232**	**385**	**1,742**

According to the data model of the UWWTD the data model of the ICPDR Municipal Emission Inventory considers the following relation between agglomeration, UWWTP and discharge point:

- **One agglomeration** can be served by **one or no UWWTP** (relation 1:1)
- **One agglomeration** can be served by **several UWWTPs** (relation 1: n)
- **Several agglomerations** can be connected to **one UWWTP** (relation m :1)

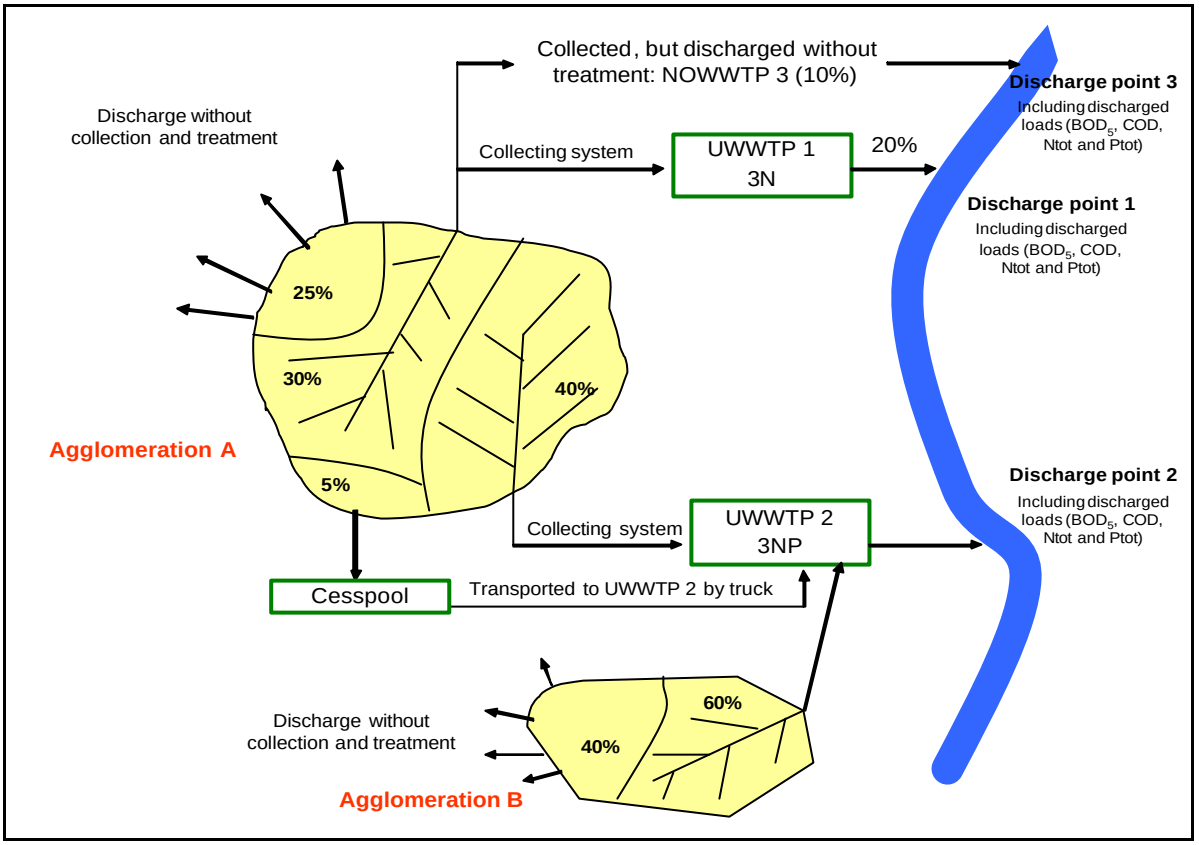
Besides this general relation between agglomeration, UWWTP and discharge point, the second important topic to consider is the pathway of wastewater from the agglomeration to discharge to the environment. These main pathways of wastewater from an agglomeration can be described as follows (Figure 17).

- Collection in collecting system (= system of conduits) and treatment in an UWWTP
- Collection in a collecting system (= system of conduits) and discharge without treatment (in the ICPDR Municipal Emission Inventory 2006 this situation is presented by so called "NOWWTP")
- Collection in individual and appropriate systems (e.g. cesspools) and transport to an UWWTP by truck
- Discharge without collection and treatment

The ICPDR Municipal Emission Inventory templates have considered aspects the principal data model and the different possible pathways. The link between agglomerations, UWWTPs/NOWWTP and discharge points is provided by defining unique codes (IDs) for each object and linking these IDs in the different tables. The different pathways of the wastewater are covered by the following parameters:

- Template agglomerations: % of generated load collected in a collecting system (estimate)
  % of generated load collected, but discharged without treatment (estimate)
- Template UWWTP: % of the generated load of the agglomeration treated in this UWWTP

Figure 17: Major pathways of wastewater from agglomerations as covered by the ICPDR Emission Inventory for municipal discharges as required by the UWWTD



The preliminary assessment of the results of reporting on agglomerations with a generated load > 10.000 are summarised below. Besides a description of the current status, at the end of the reference year 2005, the report prepared by UBA Vienna provides an estimate of the situation at the end of the year 2015.

The evaluation considered the following assumptions:

1. Only agglomerations with a generated load > 10.000 p.e. were considered for data evaluation.

2. It was investigated, whether all agglomerations were linked to at least one UWWTP/NOWWTP and whether all UWWTPs/NOWWTPs were linked to at least one discharge point via IDs. In case the link via IDs was not established, efforts were taken to define the link via names of agglomerations, UWWTPs/NOWWTPs and discharge points.

   In case an UWWTP/NOWWTP could not be linked to a discharge point, the discharged loads from this UWWTP/NOWWTP were estimated according the method described under point 5.

   In case an agglomeration could not be linked to any UWWTP/NOWWTP and in case the parameter "*% of generated load collected in a collecting system*" was 0, than it was assumed that the total generated load of this agglomeration is not collected and discharged without treatment.

   In case an agglomeration could not be linked to any UWWTP/NOWWTP and in case the parameter "*% of generated load collected in a collecting system*" was not 0, than it was assumed that the generated load of this agglomeration collected in a collecting system is discharged without treatment. In this case a NOWWTP was created and discharged loads were calculated for this NOWWTP.

3. In case the parameter "*% of the generated load of the agglomeration treated in this UWWTP*" was not given for an UWWTP/NOWWTP, this parameter was considered as identical with parameter

"% of generated load collected in a collecting system" and/ or "% of generated load collected, but discharged without treatment" (in case NOWWTPs were reported).

In case these parameters were also not reported, then the parameter *"% of population connected to combined sewage network"* and/ or the parameter *"% of population connected to separate sewage network"* was taken into consideration.

In cases where no information for all above mentioned parameters was reported, a default value of 75% was used for the parameter *"% of generated load collected in a collecting system"*.

4. In cases where more than one agglomeration was connected to one UWWTP/NOWWTP, the discharged loads (BOD_5, COD, Ntot and Ptot) reported for the discharge point connected to this UWWTP/NOWWTP were allocated to the different agglomerations. Allocation was done under consideration of the generated load of the agglomerations (p.e.) and the percentage of the generated load treated in the UWWTP/NOWWTP.

5. In cases where discharged loads for BOD_5, COD, Ntot and/ or Ptot were missing, this data was calculated by using estimation factors, considering the generated load of the agglomeration (p.e.), the percentage of the generated load treated in the UWWTP/NOWWTP connected to this discharge point and the type of treatment in the UWWTP/NOWWTP.

   In a first step the loads generated were calculated based on the following coefficients:

BOD_5	60 g/p.e./day
COD	110 g/p.e./day
Ntot:	8,8 g/p.e./day
Ptot	1,5 g/p.e./day

   In a second step, discharged loads were calculated on the basis of the loads generated and the treatment type.

6. The type of treatment was defined for each agglomeration. In case an agglomeration is served by more than one UWWTP/NOWWTP, UWWTPs/NOWWTPs with the same treatment level were grouped and the respective percentage values for the *"generated load of the agglomeration treated in this UWWTP"* were summarized. Tertiary treatment was considered without further differentiation in 3NP (removal of nitrogen and phosphorus), N (removal of nitrogen) and 3P (removal of phosphorus).

7. The discharged loads of BOD5, COD, Ntot and Ptot were summarized for all treatment types in a country

8. For all big agglomerations (= 100.000 p.e.) of a country a more detailed analysis of the treatment levels was provided, which means that the generated load (p.e.) treated in UWWTPs/NOWWTPs with different treatment level was indicated.

Key messages from the current assessment are:

(1) the Member States (Austria and Germany) have already implemented the UWWTD and applied the nutrient removal
(2) the other 6 Member States are currently implementing the UWWTD in line with the transition periods agreed with the EC
(3) there are 593 wastewater treatment plants with N removal and 622 plants with P removal
(4) the non-EU countries have provide data using the same methodology as the Member States. The assessment indicates the following preliminary conclusions and recommendations:

a. there are opportunities to meet at least the goals of the Danube Declaration
b. it is recommended in order to reach the Management objectives on quantitative reduction targets as described in the Issue Paper on Nutrient to implement at least P removal in all treatment plants above 10,000 p.e. Further more it is recommended to plan a possible upgrade (technology, space and capacity) of nitrogen removal in all treatment plants more than 10,000 p.e.

The second step of data collection is in progress. The expected outcome by the March 2008 would be a consistent description of the situation as an input from the PM EG for the Joint Program of Measures. The timeline of reporting has been harmonised for all Danube countries.

Further outcomes in relation to reporting on municipal discharges is linked to the ICPDR database. The ICPDR database is a model of the situation from wastewater generation to the discharge point, including information on various parameters, such as wastewater treatment plants, discharge points and water bodies, thus it is necessary to establish a link between wastewater discharge points and the river catchment areas (district, sub-basins) of the Water Framework Directive. The database can be used for other reporting requirements, pressures and impact assessments, etc. or for further evaluations and for comparison with further data collections in the future.

5.1.4.4 Implementation of JAP national investment programs: municipal sector

The Urban Waste Water Treatment Directive requires the construction of wastewater treatment infrastructure. It is expected by all countries to be the most expensive, with a total investment cost of around 15 billion €, and an average per capita cost of 235 €.

Funding instruments for accession countries are: Phare, Sapard and ISPA. Funding instruments for Member States include Structural Funds and Cohesion Funds. There are also others like Life, Interegg, etc.

Extensive municipal wastewater development is under implementation throughout the basin. In many of the upper Danube countries, tertiary upgrades (nutrient removal) have been made or are planned. At the same time, sewerage coverage and baseline wastewater treatment (primary and secondary/biological) are increasing in the middle and lower Danube countries. Nutrient removal technologies are expanding in the region, in response to the Urban Wastewater Treatment Directive, and the overall wastewater flow will continue to increase for a number of years.

5.1.4.4.1 JAP Interim reported results for municipal investments

The first selection of priority projects at a regional scale carried out by the ICPDR within the frame of EU DABLAS project was carried out in 2002.

The revision of lists of national projects of the Joint Action Programme and selection of municipal priority projects has shown that among the 158 projects, 45 are fully funded with a total of 622 MEUR.

The investment need for the remaining 113 projects is 2,567 MEUR, of which 2,121 MEUR are not yet secured.

Among the 11 Danube River Basin countries (excluding Austria and Germany), approximately 625 MEUR were invested by 2002 in 45 municipal wastewater projects, achieving reductions of 7,246 tons N/year and 1,259 tons P/year, which represent 19% for N and 11% for P of the total expected nutrient reductions (Table 18). These completed projects are situated in the new EU countries: Czech Republic, Hungary, Slovakia, and Slovenia. Roughly 2,500 MEUR are estimated to realise more than 100 other municipal projects throughout the basin.

The projects differ in size from >1,000,000 population equivalent (Belgrade, Bucharest, Budapest, Sarajevo, Zagreb) to ca. 10,000 PE.

Table 18: Emission reduction from municipal discharges in selected Danube countries, by December 2002

Country	Total Projects	Total Investments (MEUR)	Red. BOD (t/a)	Red. COD (t/a)	Red. Tot-N(t/a)	Red. Tot-P(t/a)
CZ	14	156.0	170	106	856	47
HU	9	142.3	9,231	20,126	1,802	442
SK	7	41.6	1,143	1,650	295	61
SI	15	282.7	25,265	42,461	4,293	709
Total Sum	**45**	**622.6**	**35,809**	**64,343**	**7,246**	**1,259**

Considering the 2004 results of the EU DABLAS II project, a total of 191 municipal projects (33 more than the assessment made in 2002) are to be realised (completed, in pipe line or in need of Technical Assistance) in the 11 Danube countries (without Germany and Austria).

A total of 19 projects were completed until December 2003, for a total of 205.8 MEUR.

Pollution reduction data were unavailable or unreliable for some municipal sector investments. In addition, pollution reduction was not fully represented in many cases, particularly for projects involving capacity extensions. Indirect pollution reduction benefits are attained as more sources are connected to the municipal sewerage network and fewer rely on septic systems. For these reasons, an empirical approach was used to estimate pollution reduction for the municipal sector projects.

According to the first period of reporting to the JAP, by December 2003, the total achieved reduction of pollution load for municipal wastewater treatment plants is: 13,850 t/a BOD; 29,700 t/a COD; 4,915 t/a Tot-N and 977 t/a Tot-P (Table 19).

Table 19: Municipal wastewater treatment plants completed by 2003

Municipal Sector (projects completed by 2003: Interim Report on JAP implementation)						
Country	No. of Projects	Total Investment MEUR	Breakdown of Funding Sources, %			
			National	EU	IFIs	Missing Funds
Czech Republic	5	40.6	69.9		23.7	6.4
Hungary	8	57.7	82.7	8.9	3.4	0.0
Slovakia	3	34.4	100			0.0
Slovenia	3	73.0	20.5	20.5	58.9	0.0
Total:	**19**	**205.8**				

The completed projects by 2003 were carried out in the four new EU Member States, Czech Republic, Hungary, Slovakia, and Slovenia, and total investment costs range from 40.6 MEUR in the Czech Republic (5 projects) to 73 MEUR in Slovenia for completion of 3 projects.

Slovenia accounts for more than 35% of the total investment costs, followed by **Hungary**. National funding accounts for significant (**Hungary**) or in totality (**Slovenia**) proportion of the investments.

The total number of completed and proposed municipal wastewater treatment plants and related investments having N and P removal reported are presented in the Table 20.

Regulatory demands regarding implementation of tertiary treatment are variable among the DRB countries, depending primarily on how the sensitivity of surface water resources have been classified in national legislation. The majority of the projects in the countries have tertiary treatment technology, as a result of legislative transposition during the EU accession period. N removal is more prevalent than P removal among the municipal projects. All projects completed by 2003 do have tertiary treatment technology (Table 21).

Table 20: Municipal projects with N and P removal, completed by 2003

Municipal Sector: Projects Completed by 2003					
Project	**Location**	**Tertiary Treatment**		**Emission Reduction (t/a)**	
		N	**P**	**N**	**P**
1. CZ-M-03-0	HODONIN	No	Yes	139	11
2. CZ-M-04-0	PROSTEJOV	No	Yes	222	18
3. CZ-M-05-0	PREROV	No	Yes	202	16
4. CZ-M-08-0	VYSKOV	No	Yes	64	5
5. CZ-M-13-0	Hranice	No	Yes	41	3
6. HU-M-02-2	Budapest South Pest	Yes	Yes	803	257
7. HU-M-07-1	Szolnok	Yes	Yes	307	88
8. HU-M-09-1	Székesfehérvár	Yes	No	562	52
9. HU-M-10-1	Tatabanya	Yes	No	207	17
10. HU-M-11-1	Dunaújváros	Yes	No	137	11
11. HU-M-13-1	Szekszárd	Yes	Yes	255	81
12. HU-M-14-1	Salgótarján	Yes	Yes	140	44
13. HU-M-17-1	Baja	Yes	Yes	222	69
14. SI-M-01-1	Maribor WWTP	Yes	Yes	485	139
15. SI-M-04-1	Celje	Yes	Yes	217	62
16. SI-M-09-1	Kranjska Gora	Yes	Yes	23	7
17. SK-M-01-1	Košice	Yes	No	803	80
18. SK-M-10-1	Rožnava	Yes	No	37	3
19. SK-M-12-1	Banská Štiavnica	Yes	Yes	49	14
			Total:	**4915**	**977**
Emission reductions based on empirical calculations where data were not available/reliable.					

Table 21: Municipal projects completed by 2003 and achieved pollution reduction

	Country	Total	Total cost	Red BOD t/a	Red COD t/a	Red Tot-N t/a	Red Tot-P

Nr.		projects	MEUR				t/a
1	Czech Republic	5	40.6	415	1474	668	53
2	Hungary	8	57.7	5062	11486	2633	619
3	Slovakia	3	34.4	3396	6889	889	97
4	Slovenia	3	73.0	4977	9851	725	208
Total Sum		**19**	**205.7**	**13,850**	**29,700**	**4,915**	**977**

In **Croatia,** as to the JAP programme, in the frame of improving municipal wastewater discharges, measures for more than 540 MEUR were taken.

From the national reports on the JAP interim implementation, Austria and Germany reported:

In **Austria**, between 1959 and 1999 investment in wastewater treatment plants and sewerage totalled to about 25.000 MEUR (price level 2000). Financial promotion by the State had an important role in fostering wastewater treatment and in-plant water protection measures of communities and industry. The annual BOD-load of the total wastewater is reduced by 95 %, the annual COD-load by 91 %, and the nutrient loads of P by 83 % and of N by 68 % (2001).
In the years 2001-2003 on average 950 MEUR per year were invested in measures for wastewater collection and wastewater purification, summing up to 2.858 Mio EURO.

The estimated investment costs of measures, which AT listed for 11 defined wastewater treatment systems as part of the JAP 2001-2005 were 370 MEUR. However; investments between 2001 and 2003, dedicated only for measures to enlarge wastewater purification plant capacities amount to approximately 270 MEUR.

Apart from the ongoing upgrading of large urban wastewater treatment plants (e.g. Vienna, Graz and Linz) for improving treatment efficiency and for N-removal a number of smaller wastewater treatment plants (size > 15.000 PEQ) are in erection in line with national provisions and in implementing the EU-Urban Wastewater Directive.

By investments in enlargements of the canalisation the degree to which population is linked to central wastewater treatment plants has been slightly raised. These investments theoretically do not all result in a reduction of pollution loads because for a part former decentralised wastewater treatment facilities become substituted by central systems ensuring thereby a higher degree of performance security.

Germany has significantly achieved high standards of emission reduction und water pollution control. Current investment in the water sector in the German part of the Danube River Basin is at the level of about 1,8 billion € per year of which 1,5 billion € is spend for communal wastewater treatment facilities (including 3rd stage for nutrient removal). With this investment Germany responds to EU Water Directives and in particular the Urban Waste Water Directive. Concerning the projects indicated in the ICPDR JAP, further investments of 234 MEUR for Germany were spent for the period from 2001 to 2005. Specifically, Germany reported 3 municipal wastewater plants (Leutkirch, ZV Starnberger See and ZV Chiemsee) completed by 2003, with a cost of 46.5 MEUR. All three plants fulfil requirements of the EU Urban Wastewater Directive 91/271/EEC after completed upgrade.

5.1.4.4.2 JAP Final results for municipal investments

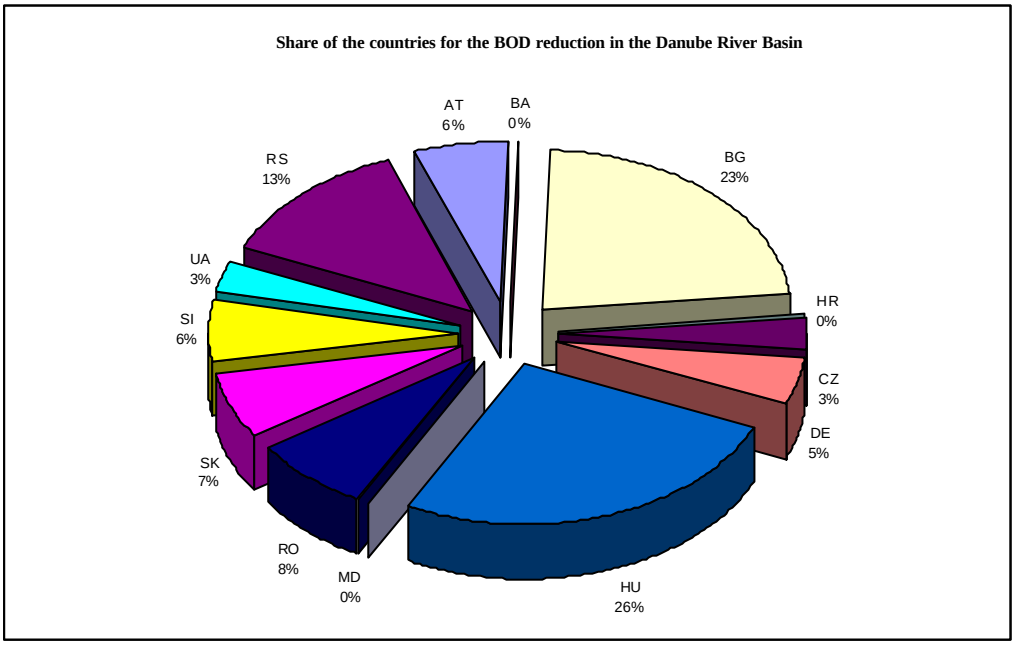
The national reports provided results on the JAP implementation for the whole reported period, for municipal projects, in Annex 1 (attached to the report).

Through December 2005, a number of 1,621 municipal investment projects are to be finalised, and again there are predominantly located in the Member States (Germany, Hungary, Romania, Austria, Bulgaria).

A total of 4,265 MEUR has been invested in addressing pollution from municipal (87%), industrial and agro-industrial (8%) and wetlands (5%) projects, in response to the measures planned in the JAP.

The analysis of individual countries contribution to the pollution reduction efforts in the DRB illustrates a range between insignificant (Bosnia & Herzegovina, Croatia, Moldova, Ukraine) and 26% as being the largest share (Hungary) (Figure 18).

Figure 18: Countries contribution to the BOD reduction from municipal projects

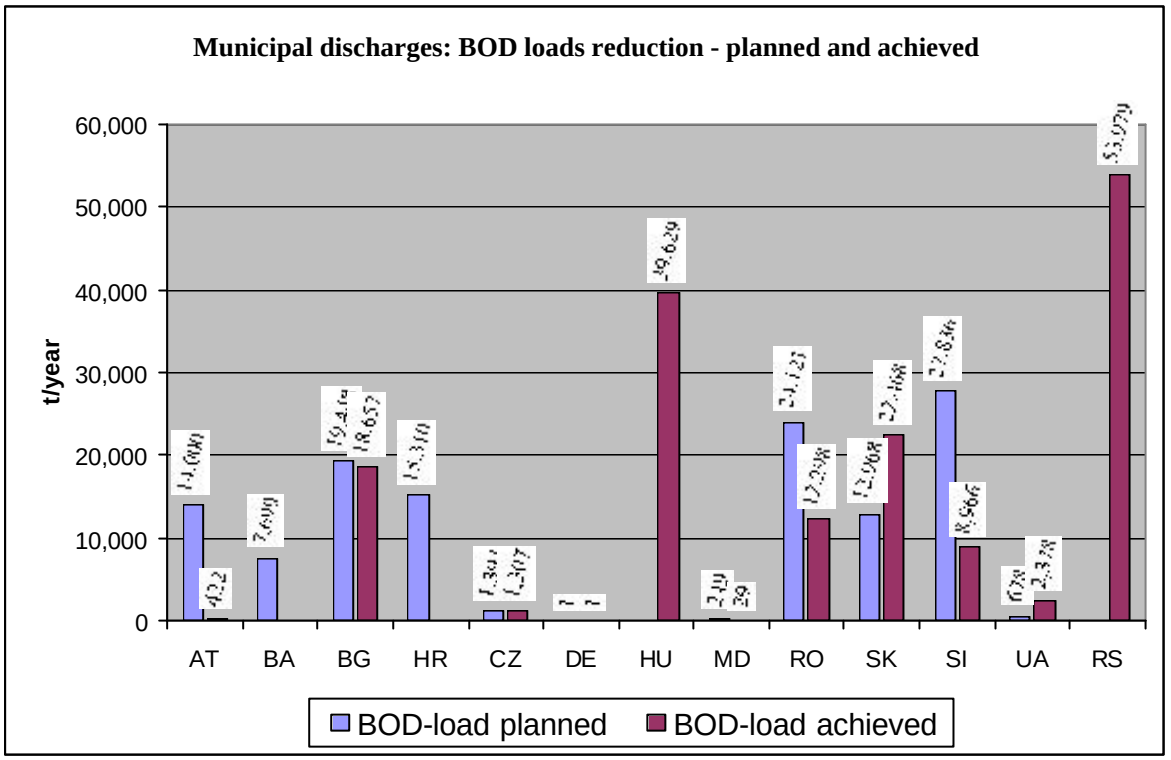


Objectives for water pollution reduction are usually incorporated as sub-components of higher objectives. However, most countries have established a system of priorities for pollution reduction, usually defining the sequence of construction, extension, or improvement of treatment standards for WWTPs, which are usually

- differentiated by sector (municipal / industrial/ agricultural);
- classified by plant capacity (small / medium / large) and treatment standards;
- differentiated by sensitivity of area (vulnerable areas / significant impact areas).

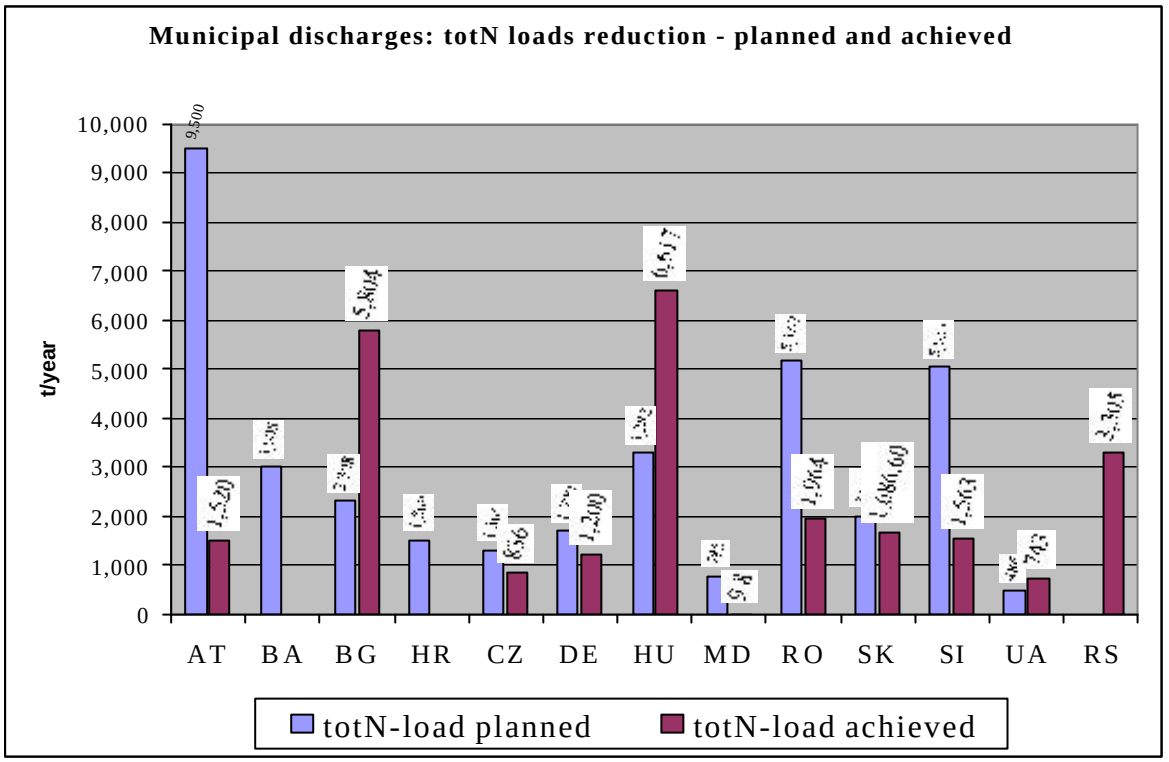
The municipal sector accounts for the majority of nutrient reduction, but the other sectors are also significant contributors. The Figure 19 shows the largest achieved BOD reduction, as compared with the planned values in the reported period, in Serbia and Hungary. This should have been seen also in the context that the old Member States Austria and Germany have, long before the JAP has started, finalised their program of achieving wastewater treatment plants.

Figure 19: Planned and achieved BOD reduction due to municipal measures



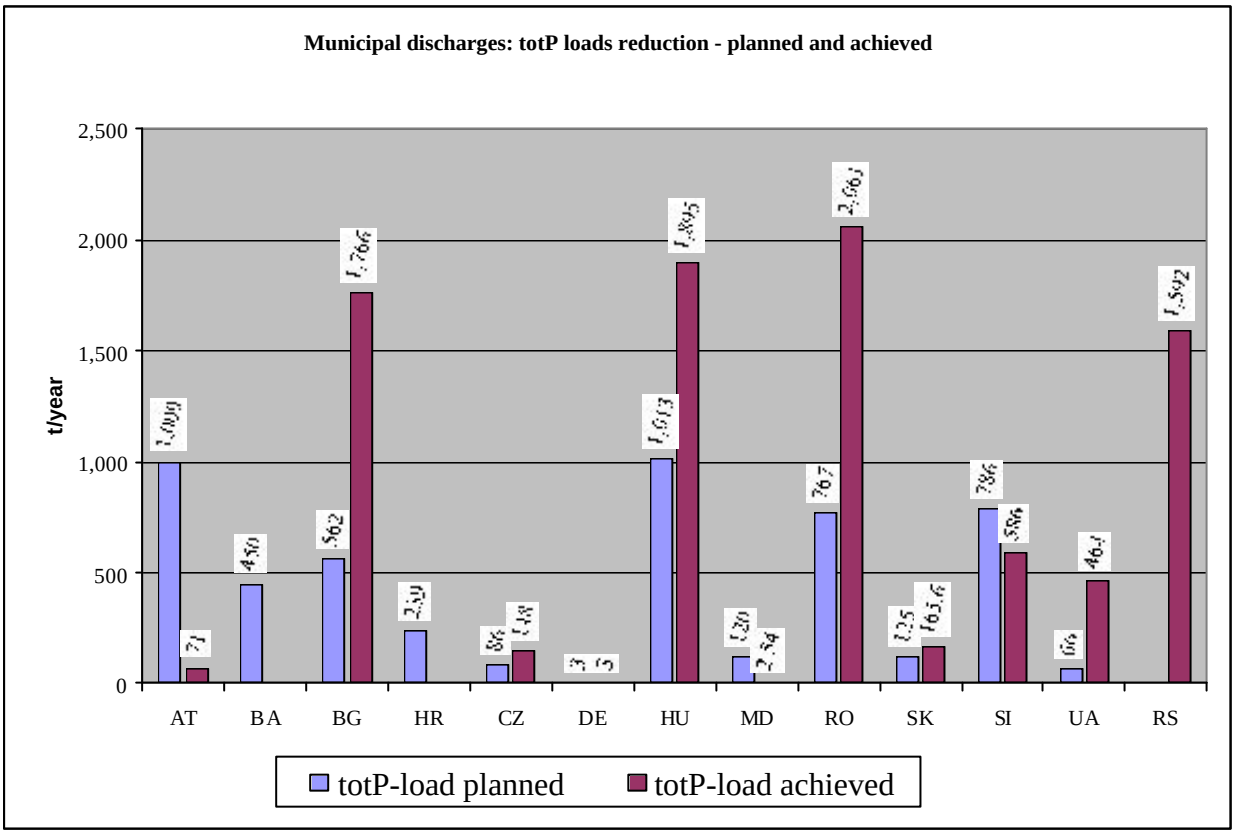
Significant load reduction has been also reported for Total Nitrogen loads, with Hungary (6,617 t/year achieved against 3,282 t/year planned) and Bulgaria (5,804 t/year achieved against 2,308 t/year planned) having the largest reduction (Figure 20).

Figure 20: Planned and achieved Total N loads reduction through municipal investments



The same significant load reduction has been reported also for Total Phosphorus loads (Figure 21). Romania, Hungary, Bulgaria and Serbia having the largest reduction in comparing with estimates of 2000.

Figure 21: Planned and achieved Total P loads reduction through municipal investments



For all Danube countries, the assessment indicates the total achieved reduction from municipal projects: BOD - 160, 134 t/year, COD - 58,219 t/year, totN – 25,248 t/year, and totP - 8,754 t/year.

5.1.5 Industrial Discharges

Consistency in industrial prevention and reduction programs across the DRB is important for the overall improvement of the Danube River water quality.

In addition to the commitment of *"Contracting Parties that have agreed to implement the proposed measures, under the assumption that the financial resources are available during the implementation period* of the JAP, i.e. till 2005", article 3.2.2. of the JAP requested that " *Recommendations on Best Available Techniques in the industrial sectors Chemical, Food, Chemical Pulping and Papermaking Industry to be translated into the relevant administrative languages used within the Danube States and made available by ICPDR (Danubis), at latest by June 2002*

5.1.5.1 Emission Inventories

Regulation of industrial point sources is achieved through emission limits and best practices: emissions inventories of industrial point sources and elaboration of Best Available Techniques (BAT) for industrial wastewater discharges, including the setting up of a timetable for their step-by-step implementation.

Table 22: Number of industrial sources of pollution EMIS inventory (including agro-industrial)

Number of industrial sources of pollution EMIS inventory (including agro-industrial)				
Country	**1997**	**2000**	**2002**	**2004**
AT	10	13	13	13
BA	7	9	57	62
BG	16	21	34	35
HR	25	16	31	31
CZ	3	3	4	7
DE	9	9	11	14
HU	47	47	50	51
MD	13	13	13	0
RO	61	100	113	122
RS	0	0	9	9
SK	12	12	14	17
SI	9	9	12	13
UA	4	4	5	5
Total	**216**	**256**	**366**	**379**

The framework piece of legislation is 96/61/EC IPPC (Integrated Pollution Prevention Control) Directive. Pollution coming from point industrial units is partly addressed by the IPPC, and partly by a number of specialised directives covering specific sectors. The IPPC Directive takes an integrated approach, which means that authorities need to consider as well the transboundary effects, to take into account the costs, as well as the advantages, of pollution prevention and control, and make sure that they are up to date with the latest developments in best available techniques. This important obligation has lead to the establishment of the EU-wide exchange of information on BAT and the Seville Process.

Historically, the EMIS inventory was developed to provide the base data supporting the identification and development of policies aimed at pollution reduction in the Danube Basin. Thus data from inventory can help to identify industrial pollution sources by industrial sector, pollutant impact, location or other criteria.

The ICPDR Emission inventory uses a conceptual approach that has been used by the European Environmental Agency, the OECD and others. This approach shows the causality between human activities and environmental policies. In this conceptual framework driving forces describes human activities, for instance, industrial production or wastewater treatment plants.

Pressure describes the problems caused by the driving force on the function/use in the river basin. State means, for example, what concentration of pollutants are present or what are the characteristics of the ecosystem. The impact describes the loss of function/use e.g. toxicity that causes a decrease in the fish population. Finally, responses describe the political action taken to deal with the problems.

Table 23 compares the current ICPDR industrial emission inventories categories and threshold limits with the EU IPPC categories and threshold limits.

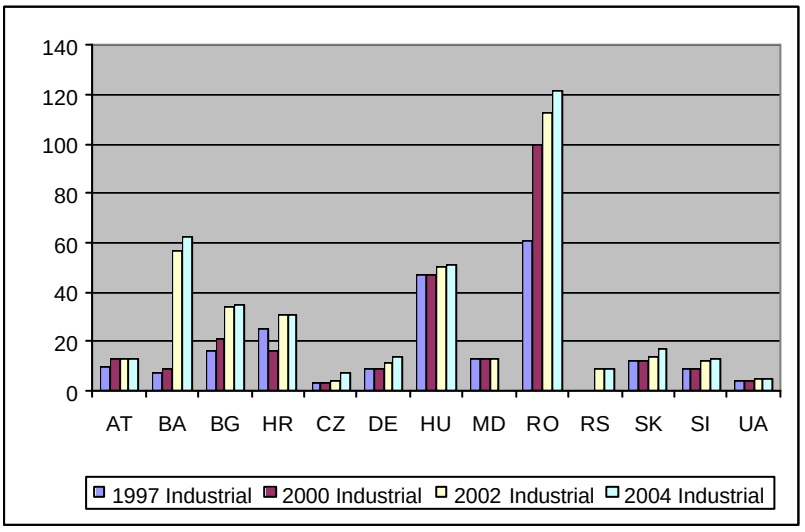
The ICPDR industrial emission inventories deals with selected industries that are grouped into 11 sectors following a classification system developed for the inventory. The main related EU Directive; the IPPC directive uses an internationally recognized coding system, which has very similar coding.

Table 23: Comparison of the ICPDR Industrial Emissions Inventory parameters and the IPPC data sources

Current ICPDR Industrial Sectors		IPPC Source Categories	
1	Food industry	1	Energy industries
2	Chemical industry	2	Production and processing of metals
3	Pulp&paper industry	3	Mineral industry
4	Fertilizer industry	4	Chemical industry and chemical installations
5	Mining	5	Waste management
6	Iron and steel industry	6	Other Annex I activities
7	Metal surface industry		
8	Textile industry		
9	Leather industry		
10	Agriculture		
11	Other relevant industry		

The first EMIS inventory was published in 1998. It was updated in 2000 and potentially contains data on 13 countries in the DRB. The 2000 EMIS Inventory covered all direct industrial discharges from approximately 220 industrial installations, which are bigger than 2 ton/a, COD or 1 ton/a BOD.

Figure 22: Overview of reporting on industrial sources in the DRB



The data for IPPC installations will be kept according to the EPER Decision that prescribes the threshold values of pollutants of pollutants.

The EMIS Inventory provides base data in a number of key areas. The inventory may potentially be used as an input into the development of the DRBMP and effective industrial policy. The inventory is designed to identify the major polluters, loads, locations and future costs of upgrading. The inventories were regularly updated, each second year, the last update was concluded in 2006, for the reference year 2005. The Table 24 provides the information on the loads of BOD, COD, N and P considered for the pressures assessment in the Danube Basin Characterisation Analysis, in line with Art. 5 Report of the WFD, 2004.

The number of reported industrial and agro-industrial pollution sources has increased along the years, being double in 2005 comparing with 1997 reports (Table 22). The largest increase in reporting is noticed in Bosnia and Herzegovina, Bulgaria, Croatia and Romania (Figure 22).

Table 24: Overview of pollution loads from industrial sources, 2004

Industrial sources of pollution, per catchments as considered in the pressures assessment, Roof Report, 2004				
Catchment	**BOD**	**COD**	**N**	**P**
01 Upper Danube	7,346	49	20	8
02 Inn	8,469	375	305	20
03 Austrian Danube	4,825	196	12	9
04 Morava	1,911	136	130	19
05 Váh-Hron	8,294	2,681	96	4
06 Pannonian Central Danube	16,424	3,515	352	13
07 Drava-Mura	29,718	6,083	185	52
08 Sava	33,965	6,772	310	374
09 Tisza	16,622	3,315	331	32
10 Banat-Eastern Serbia	1,158	120	20	2
11 Velika Morava	na	na	na	na
12 Mizia-Dobrudzha	9,244	na	na	na
13 Muntenia	16,173	5,166	2,312	5
14 Prut-Siret	4,456	903	136	1
15 Delta-Liman	982	na	24	15
16 Romanian Black Sea Coast	842	242	390	na
Total DRBD	**160,427**	**29,555**	**4,625**	**555**

In line with Article 9 of the Danube River Protection Convention in which the Contracting Parties are invited to develop joint or harmonised methods for monitoring and assessment of wastewater discharges including processing, evaluation and documentation of data taking into account the branch-specific approach of emission limitations, the ICPDR produced a Guidelines for Monitoring of Wastewater Discharges, with related Reporting format. The guidelines provide that for industrial discharges those parameters should be analysed which represent the production of the industrial plant and the existing pollutants in the wastewater. If substances from the ICPDR Danube List of Priority Substances exist or are expected in the wastewater, the parameters, which are analysed, should be complemented by parameters, which include those substances. In general monitoring by authority includes group parameters (COD or TOC, AOX, suspended solids), single substance parameters (heavy metals, nitrogen compounds and other organic substances) and in special cases biological effect parameters (e.g. toxicity to fish, algae).

An assessment of the national reports is presented in the Table 25.

Table 25: Monitoring of industrial polluters in the DRB

Country	Self-monitoring of industrial polluters required			National/regional monitoring of industrial polluters required			Monitored data on industrial emissions collected and processed			Authorization of labs required		Monitored parameters harmonized with the EU DS Directive		Availability of monitored data			Name of responsible institution responsible for reporting to ICPDR
	Yes	No	Only specific polluters	Yes	No	Only specific polluters	Centrally	Regionally	No	Yes	No	Yes	No	Public	Upon request and prior approval	No-public	
Austria	●			●				●		●		●		●	●		
R. Srpska (part of FBiH)	●				●				●	●			●		●		Not in place
BiH			●	●				●		●			●		●		Not in place, several institutions designated
Bulgaria	●			●				●		●		●			●		Ministry of Environment and Water
Croatia			●	●			●			●			●		●		State Water Directorate and Croatian Waters
Czech Republic	●			●			●			●		●			●		Water Research Institute
Germany	●		●	●			●	●		●		●		●	●		Federal government and Federal States
Hungary	●		●	●			●	●		●		●			●		Ministry of Environment and Water
Moldova						●	●			●					●		Ministry of Ecology and Natural Resources
Romania	●		●	●			●	●		●		●		●	●		Romania Waters
Serbia			●			●	●			●					●		Ministry of Agriculture, Forestry and Water Management
Slovakia	●			●			●			●			●		●		Ministry of Environment

Slovenia	●			●													The Ministry for Environmental Protection and Spatial Planning
Ukraine						●											Ministry for Environmental Protection

The EMIS inventory has been used in several research and development projects:

- The formulation of the Joint Action Program (JAP) 2001-2005
- Monitoring program (TNMN) and Joint Danube Surveys (2001, 2007)
- The pressures assessment for the WFD Roof Report, 2004
- The UNDP/GEF project on Strengthening the Implementation Capacities for Nutrient Reduction and Trans-boundary Cooperation in the DRB
- The selection of priority industries in the preparation of the BAT for those industries.

The ICPDR Industrial Emission Inventory requirements have been adapted to the DRBMP and the methodologies were harmonized with the WFD methodologies.

The update of the Emission inventory for industrial discharges considered the increase of the number of industrial installations and reducing the gaps in reporting parameters. As quality assurance varies widely, a uniform system harmonised with the EU legislation has been put in place. The EU Water Framework Directive requires a river basin approach for European Union Member States, therefore the data provided in the industrial inventories uses international standard coding so that comparisons can be made with other data from other European river systems.

The Emission inventory for industrial discharges analyzes other developing sources which provide data for a significant portion of the DRB for example, the data reporting required under the EU Directives, to see if that data will be useful in assisting the WFD work of the ICPDR. An initial comparison of EMIS Industrial Inventory and the reporting requirements of the UWWT, Dangerous Substances and IPPC Directives indicate the following. The Industrial Emission Inventory requires reporting on the basis of tons of BOD and COD emitted. The UWWT Directive requires the reporting for the agro food industry on the basis of sources emitting more than 4,000 PE. The data for 2004 have been published in 2006 under the UWWT Directive.

The EMIS inventory is placed on DANUBIS, so it is accessible to the public.

5.1.5.2 Harmonization of the reporting requirements on industrial pollution under the EU legislation (WFD, IPPC, EPER, e-PRTR, Dangerous Substances Directive)

In the field of pollutant emission registers, the European Pollution Emission Register (EPER) - the first European-wide pollutant emission register for releases from industrial facilities - has been in place since 2000. It has been established by Commission Decision 2000/479/EC to implemented the provisions of article 15 (3) of the IPPC Directive on public accessibility of the results of monitoring. The EPER, created as part of the IPPC Directive, requires reporting from all installations, which fall under the IPPC. An IPPC institution is one that uses one or more of the six categories of technology. Data is reported on the basis of threshold limit values of parameters.

According to the provisions of the EPER Decision, Member States for the first time in June 2003 delivered data on releases into air and water of industrial facilities for 50 pollutants if threshold values as specified in Annex A1 of the EPER Decision were exceeded.

The first reporting year was 2001 (although Member States also had the option of providing data for 2000 and 2002). The second reporting year was 2004, and the Member States provided data in June 2006. For the third reporting year in 2007, EPER will be replaced by the European Pollutant Release and Transfer Register

(European PRTR). Since the European PRTR Regulation includes more pollutants and activities than those contained in EPER and since, in addition to releases into air and water, releases to land and off-site transfers of waste have to be reported by the facilities, it has been necessary to upgrade and extend the EPER into a fully comprehensive European PRTR.

As an innovation of the European PRTR in comparison with EPER - according to Article 8 of the European PRTR Regulation - information on releases from diffuse sources shall be included in the reporting where such information exists and has already been reported by the Member States. This shall serve the aim to clarify the relation of releases from large point sources and diffuse sources not covered by the E_PRTR regulation.

Data from the new EU member states have been included in the 2006 publication, which has the data from 2004.

Not all industrial plants existing are considered for EPER reporting – only those activities which are listed in Annex A3 of the EPER Decision are included. For the next reporting cycle, EPER will be integrated in the European Pollutant Release and Transfer Register (E-PRTR).

The threshold values have been chosen in order to include about 90% of the emissions of the industrial facilities looked at, so as to prevent an unnecessarily high burden on all industrial facilities.

According to column 1b of the table in Annex II to the E-PRTR Regulation, a total of 71 pollutants are specified as relevant water pollutants. Releases of water pollutants, which exceed the threshold values in column 1b, must be reported by the facility. This is the case in respect of all 71 water pollutants.

An off-site transfer of pollutants in wastewater means the movement beyond the boundaries of a facility of pollutants in wastewater destined for wastewater treatment including industrial wastewater treatment. The off-site transfer may be carried out via a sewer or any other means such as containers or (road) tankers.

Operators shall report off-site transfers of any pollutant specified in Annex II to the E-PRTR Regulation in wastewater destined for wastewater treatment for which the threshold value specified in column 1b of the table in Annex II to the E-PRTR Regulation is exceeded.

The results of a recent evaluation of the current status of all Danube countries on the EPER status, PRTR preparation (status, responsibility, deadlines), IPPC implementation and related problems identified through implementation process are presented in the Table 26.

Table 26: Evaluation of EPER, E-PRTR and IPPC implementation

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
AT	EPER was implemented in line with the EPER Ordinance (26 July 2002). Since 2005 Austria is collecting the data for EPER II that were published in 2006. In the year 2003 (EPER I) 368 reports were made by the industry from which 128 succeeded the threshold values for air or water. The EPER I data are at (www.umweltbundesamt.at)	The PRTR as further development of EPER is currently under preparation in Austria. According to the timeframe of the PRTR Protocol it will take some more years until PRTR is available by internet for the public.	The IPPC Directive demands the adaptation of existing facilities to its requirements by 30 October 2007 at the latest and intends regular inspection and the updating of approval conditions by the competent authorities. The IPPC is fully implemented: the Industrial Code 1994, the Waste Management Act 2002, the Mineral Materials Act 1999 and the Water Act 1959 as well in the framework of some Provincial laws. Operating permits for industrial plants apply to production sites and include provisions for environmental protection and procedural regulations, as well as rules to ensure health and safety. Demands on plants and any established emission standards are based on the implementation of BAT.	
DE	Germany is now collecting the data for the EPER 2 round. End 2005 the data were transferred from the Federal State authorities to the UBA and its consultant LfU BW where the complete dataset will be generated. The work is on schedule.	Germany is currently preparing the PRTR. Presentation of the EPER data is improving as a prototype for the PRTR. Preparation of the legal implementation in accordance with the EPER Protocol and the ePRTR Regulation; streamlining data collection and data flows with the European PRTR, using the experiences of EPER as much as possible (c.f. www.eper.de and www.prtr.de); integrate available information on diffuse sources.	IPPC directive was fully implemented in national legislation. Details can be taken from the last article 16(1) and 16(3) reports to the Commission.	
CZ	In 2003 the Act No. 76/2002 Coll. on	Draft of the new Government Decree in	The IPPC Directive has been fully	

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
	IPPC and on integrated register of pollution entered into force. It has been supplemented by the Government Decree No. 368/2003 Coll. on integrated pollution register, which already considers provisions of the Protocol on PRTR. The legislation covers also issues of release of information to public, penalties etc. The Report for the year 2004 has been sent to EC. The Report for the year 2007 will be sent to EC in June 2009.	preparation creates conditions for direct application and implementation of the EC Regulation No. 166/2006. It stipulates responsible authorities, sanctions etc. It also simplifies procedure of reporting to registers of pollution in different environmental sectors.	implemented in the CZ by the Act No. 76/2002 Coll. on integrated pollution prevention and control and on integrated register of pollution, which entered into force in 2003 and has been supplemented by other executive legislation. Details can be taken from the last article 16 (1) and 16 (3) reports to the EC (September 2006).	
HU	Hungary took part in the first EPER reporting on a voluntary basis, as the first representative of the new Member States. Hungary prepared for the second reporting of EPER data for reporting year 2004 in June 2006. The 2004 emission data was reported by the facilities in the first quarter of 2005 and they are checked and recorded to the databases by the responsible authorities. The quality assessment of the data finalised 2005.	The final text of the new EU regulation on E-PRTR was published in SEP 2005. It has been reviewed in 2006. The databases concerning waste transfers and emissions to land already exist, they have to be slightly modified and included to the integrated software system. The whole system will be established for 2007 as the first year of reporting.	The Directive was transposed into national law by October 2001 and established the necessary institutional framework of the permitting procedure ensuring that new installations cannot start their operation without an integrated permit from that date. The number of installations falling under the IPPC is ~ 1000, number of the permits issued by the end of July 2005 is more than 300. All installation will be operated according to the integrated permit by October 2007.	Some difficulties still exist concerning the data collection. The software tool containing data on emissions to surface water does still not exist. New software tools querying data for the EPER purposes are in testing phase. Problems also occur with the calculations of agricultural diffuse emissions. Since July 2004 (http://eper-prtr.kvvm.hu).
SK	Data and information concerning facilities and emission to air and water from 2004 year were reported to EPER. Register of the facilities and their	The Slovak Republic is in accession process to PRTR Protocol (Slovakia is not signatory country). The activities on the implementation of the requirements of	IPPC Directive is fully implemented into national legislative in Law No. 245/2003 Coll. about IPPC and into public notice. For integrated permitting process in the	Operators of waste disposals have problem concerning providing emission data into air

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
	emission to air and water are publicly accessible at the national level on the web site of the Ministry of the environment and SHMI.	"Regulation of the European Parliament and of the Council 166/2006 concerning the establishment of a PRTR and amending Council Directives 91/689/EEC and 96/61 EC" (IPPC Directive) into national legislative are finalised. This relevant legislative came into force SEP 2007. SHMI - as responsible institution for data collection, validation and data reporting, is in stage of preparation of the first reporting to E-PRTR.	Slovak Republic is responsible the Slovak Inspectorate of Environments, this process finalised OCT 2007.	and water. There is a need to prepare methodology on national level and inform operators with calculation methodology of amount of emissions SHMI has experience with IPCC methodology (EC methodology for National Greenhouse Gas Inventories). SHMI states insufficient range of monitored and logically also provided information about pollution substances at some point pollution sources. Operators provide mainly data from self-monitoring (M-measured) and do not use expert judgement (E-estimation).
SI	Data for the reference year 2004 were reported in June 2006 to EPER II on 93 facilities that exceeded threshold values for air and water emissions. From those reported 72 facilities had emissions to air, 32 direct into the water and 17 had indirect emissions into water.	Slovenia was active in the process of adopting of European PRTR regulation. The E-PRTR Protocol (Regulation 166/2006/EC) was fully implemented into the national legislation. Regarding this Regulation on implementing the Regulation 166/2006/ES (O.J. of the Republic of Slovenia, No. 77/06) was adopted. Slovenia will make its first E-PRTR report in year 2009 for the reference year 2007. The national E-PRTR database is	IPPC directive was fully implemented in national legislation through the Environment Protection Act (O.J. of the Republic of Slovenia, No. 39/06, 49/06, 66/06 in 33/07) and Regulation on activities and facilities that can cause environment pollution of greater extent (O.J. of the Republic of Slovenia, No. 97/04 and 71/07). The IPPC permits are issued for ~170 installations. For 17- transitional period	

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
		already established and is in testing phase.	2015 allowed during the accession negotiations. www.arso.gov.si/ippc	
HR	The EPA will be responsible for establishing a reporting system on emissions to air and the Ministry of Agriculture, Forestry and Water Management will be responsible for establishing a reporting system regarding emissions to water. The register to collate all individual reports will be established by EPA. Deadline for implementation: 2009.	The EPA is responsible for establishing Register. At the moment, target date is 2009.	The Ministry of Environmental Protection, Physical Planning and Construction is responsible for transposing and implementing the IPPC. The State Inspectorate and inspectorate departments in various ministries will be involved in enforcement. 2006: the Croatian Centre carried out a first inventory of the IPPC installations for Cleaner Production under supervision of the ministry. Full implementation to identify all relevant installations is 2013. Timetable for the technical assessment of installations covered will be prepared during 2008/2009.	
BA	No obligation to provide data for EPER.	No obligation to provide data for EPER.	IPPC is conditionally reflected thorough Law on Environmental Protection. Law on environmental protection is harmonized for both Entities and Brcko District. The Laws are adopted in RS in 2002, in FB&H in 2003 and in BD in 2004. LEP introduces concept of “environmental permit” and “environmental permitting” equivalents of terms “IPPC permit” and “IPPC permitting”. Principles of IPPC are mentioned in the article 12 of each entity’s LEP defining integrated environmental protection. EU CARDS project estimated 55 installations under IPPC, of which 3 were granted.	
RS	No obligation to provide data for EPER.	A new Law on IPPC has been adopted in		

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
		December 2004. Permits are to be issued at the latest by 2015 (there is a Program and time schedule for harmonizing industrial sectors with this law). There is still no national database on pollution emission either to water, air or land. At present there is a project under implementation on national register of polluters (data base with innovated data).		
RO	The EPER Decision was transposed in the Romanian laws by the Order of the Minister of Waters and Environment Protection no. 1144/2002. In order to facilitate the application of the EPER Decision provisions, "The EPER Implementation Guide" was transposed in the Romanian laws through the Order of the ministry no. 1440/2003 for approving the National Guide for completion of the Pollutant Emission Register (RPE), in accordance with the provisions of Article 3 of the EPER. In June 2007, according to the Article 1, 2 and 3 of the EPER Decision, Romania has voluntarily decided to provide the "National EPER Report 2005 of Romania Emission Data of Individual Facilities" having in view the format of Annex 2 of the EPER Decision. The ministry in cooperation with the National Environmental Protection Agency (NEPA) has prepared the report and it has been sent to the DG ENV (EC) - EEA. This report is available for public (it is	From legal point of view, Ministry of Environment and Sustainable Development will transpose into Romanian legislation the Regulation 166/2006 of European Parliament and of European Council on setting up the European Pollutant Release and Transfer Register (European PRTR) through a Governmental Decision, which has been issued in 2007. Also, in the frame of Twining Projects for technical assistance, some efforts are making for drafting the database and for software endowment.	The IPPC Directive is fully transposed into Romanian legislation through the Law 84/2006. In present, there are 660 installations under the IPPC Directive and for 161 of this installations, Romania has obtained transition period, between 2 and 9 years. Till middle of August, 575 integrated permits have been issued. From water management permits point of view, 629 water users have been authorized (595 have valid permits and 34 are in re-authorization procedure) and 7 are in process to obtain water management permits. Related to the Best Available Technologies (BAT), there have been issued 3 Orders (37/2003, 566/2003 and 169/2004) for the approval of the Guidelines on BAT and the Reference Documents on BAT in some industry categories/types. In 2005, according to the Minister Order no. 249/2005, the "National Centre for coordination, information and up-dating of BAT guides and for communication with European IPPC Bureau and with European Forum of Information" has been setting up.	

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
	published on internet). The total number of installations which have been reported under EPER is 260, representing approximately 40 % of the total number of 638 IPPC installations inventoried. Out of the total of 260 reported EPER installations, 75 have been reported emissions into water. Responsibility: Technical Secretariat for the elaboration of the EPER - Ministry of Environment and Sustainable Development, Interministerial Committee, Environmental authorities.			
BG	In September 2002, Bulgaria adopted the Environment Protection Act (EPA), which brought the requirement of integrated permitting for a wide range of installations. Article 130 of the EPA requires the Executive Environment Agency to maintain a public register of the results of emissions monitoring as provide for in the integrated permits and to transmit this data to the European Register of Noxious Substance Emissions.	The information provided should be assimilated into databases that allow Bulgaria to meet its commitments under IPPC Directive, the European Pollution Emission Register Decision and the Protocol on Pollution Release and Transfer Registers.	In March 2003, the Bulgarian Council of Ministries issued a Regulation setting out the conditions and procedure for the issuing of IPPC permits for the construction of new and the operation of both new and existing industrial installations and equipment. These two pieces of legislation are designed to bring the EU IPPC Directive 61/96 into full force in Bulgaria. Article 125 (5) of the EPA obliges operators of installations to "prepare and publish an annual report on implementation of the activities for which an integrated permit has been granted". Article 21 of the IPPC Regulation requires that an operator of an installation to submit an annual report.	
MD	Currently some attempts to establish a national PRTR for the energy sector are being made. However, to establish the	The country signed the PRTRs to the Aarhus Convention in Kiev in 2003. Preparations for the protocol ratification	There is widespread agreement on the need to introduce integrated permitting for large industry within the framework of	There is a lack of integrated indicators of the industrial impact on

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
	Register there is a need to review the national monitoring parameters and environmental quality standards: (1) to limit substantially the number of regulated parameters by making the remaining ones consistent with international standards and guidelines; (2) to introduce additional parameters and standards monitoring that are required by multilateral environmental agreements and EU environmental directives, and to set time schedules for phasing in those new parameters and standards that could not be introduced immediately; and (3) to focus on a core set of parameters and standards when planning the upgrading of monitoring stations, equipment and devices, and analytical laboratories including relevant staff retraining; (4) to draft legislation and necessary by-laws to introduce an integrated permitting system for installations having significant impact on the environment, following the approach of the EU IPPC Directive as a benchmark; (5) to ensure that self-monitoring requirements for enterprises are included in the permits, etc.	need to be intensified by involving key monitoring institutions, compliance authorities, sectoral ministries, business and industry, and NGOs in the development of a plan of action to set a legal, institutional and technical framework for the establishment of a national PRTR.	convergence with the European Union (EU) environmental legislation, in particular IPPC Directive. There have been several attempts in recent years to study and plan a transition to integrated permitting, e.g., in 2000-2001, an EC project on the country's prospective approximation to the EU legislation produced a draft strategy and recommendations and, also in 2001-2002, another EU-funded project on environmental approximation in the western NIS. A group of Ministry of Ecology officials and local experts developed in 2001 a draft law on integrated environmental permitting ("On Regulation of Economic and Social Activities with an Environmental Impact"). However, the draft was not put in the context of other necessary legislative changes to enable the new system; it faced significant opposition from various key stakeholders, and as a result, was not approved by the Government.	the environment. Emissions of pollutants into the atmosphere and surface waters from industry are not reported in any official statistical data source. Industrial pollution is not being analysed and reduction targets are not established in industrial development programmes or environmental documents. Though enterprises must report annually on their air emissions, wastewater discharges and waste generation, industry is not always fulfilling its obligations. Only waste generated by industries is reported on a regular basis in official information sources. The lack of environmental indicators to monitor pollution in industry is related to the environmental standards inherited from the past. A gradual implementation of the

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
				IPPC Directive would help improve the situation. The few existing data on industrial pollution, water and energy use show a slight increase in environmental efficiency from the decrease in air polluting emissions and industrial waste generation being sharper than the decrease of the total industrial output.
UA	No obligation to provide data for EPER.	The Committee on Water Management is responsible for the National Register on pollutant emissions to water bodies. At present these data are close for public.	The major piece of legislation is the Water Code, June 1995. The article 70 of the Water Code mandate conditions of pollution emission to the water bodies. Regulations concerning IPPC Directive include: Hygienic Requirements to Content and Properties of Waters at Sites of Industrial and Drinking, Cultural and Domestic Water Use (4.7.1988); The Maximum Permissible Concentrations of Hazardous Substances in Water of Water Bodies, Used for Industrial, Drinking, Cultural and Domestic Water Use (4.71988); Regulation on Protection of Surface Water (typical provisions) (1.3.1991); List of Maximum Permissible Concentrations (MPC) and Approximately Safe Impact Levels of Hazardous Substances on Water of Fishery Water Bodies (relating to Regulation on	The software tool containing data on emissions to surface water is out of date, in DOS format. The national legislation on statistical data prohibits publishing data on pollution emission for community.

Country	EPER status	PRTR preparation (status, responsibility, deadlines)	IPPC	Problems identified
			Protection of Surface Waters. 1991); Rates of maximum permissible discharges of polluting substances which contents is normalized; Rules on protection of surface waters from pollution by return waters Operating permits for industrial plants are given by State Ecological Inspection which is subordinated to the ministry.	

Table 27 presents results of Danube countries reporting to EPER, on both direct and indirect discharges into water. Values indicated under "direct to water" are emissions by facilities directly into the water environment. Values indicated under "indirect to water" are releases by facilities via a sewer system into an off-site municipal or industrial WWTP. Since the pollution load is general significantly reduced in these plants the values under "direct to water" and "indirect to water" should be compared.

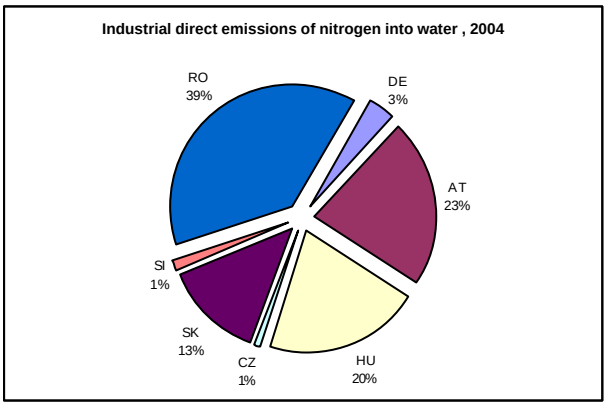
Table 27: Overview current status of EPER reporting in the Danube River Basin

Countries of the Danube River Basin reported to EPER												
Countries	Direct discharges into water						Indirect emissions to water					
	2001			2004			2001			2004		
	No of facilities	No of pollutants	No of activities	No of facilities	No of pollutants	No of activities	No of facilities	No of pollutants	No of activities	No of facilities	No of pollutants	No of activities
Germany	17	13	9	14	13	12	41	9	12	48	10	13
Austria	38	17	13	33	16	12	29	16	14	31	15	14
Czech Republic				5	5	4				1	1	1
Hungary	17	13	10	20	14	9	19	13	10	26	12	8
Slovakia				17	18	10				12	9	9
Slovenia				15	13	8				17	8	6
Romania*				46	20	13				33	12	14
Total:	**72**	**17**	**18**	**150**	**21**	**23**	**89**	**18**	**16**	**168**	**19**	**22**

* The reference reporting year for Romania is 2005

Figure 23 and Figure 24 show the EPER reported industrial, direct, respectively indirect discharges of N and P into the water, for reference year 2004. Romania reported before being legally obliged in 2006, for reference year 2005. Among the seven Danube Member States, which have reported, Romania has the largest amount of wastewater discharged, followed by Austrian and Hungary. Slovenia, Slovakia and Czech Republic have the smallest contributions.

Figure 23: Direct industrial discharges of N and P into water, reference year 2004/2005



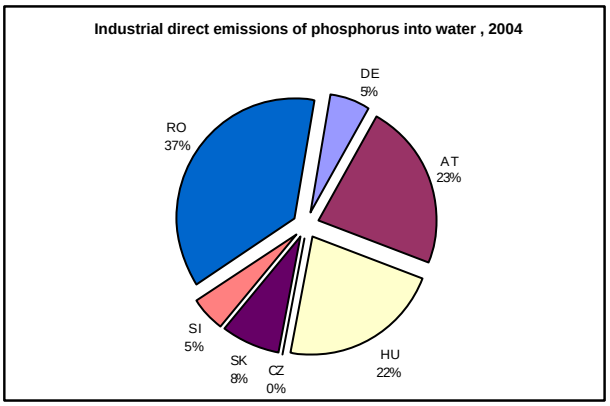
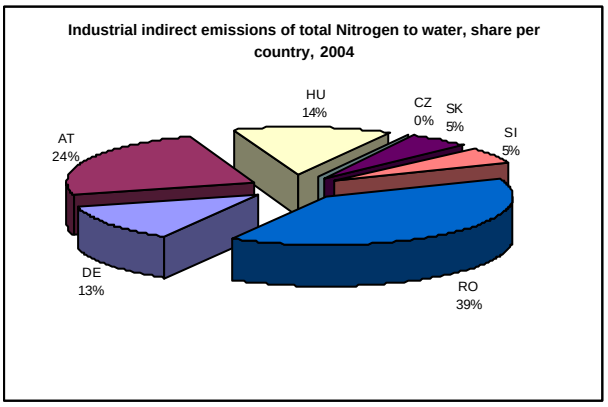
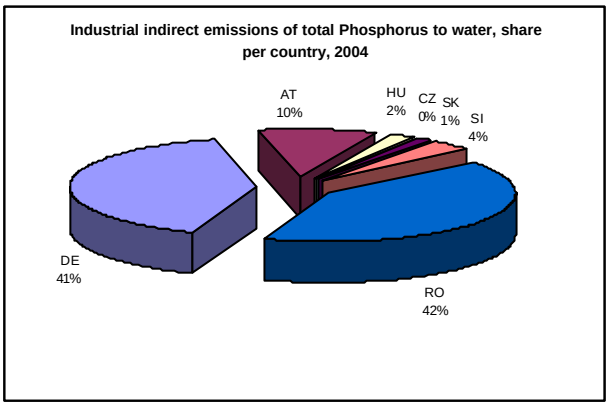


Figure 24: Indirect industrial discharges of N and P into water, reference year 2004/2005





The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives) controls the release of dangerous substances to water. The DSD prime aim is to identify and control individual dangerous chemicals and raw materials.

The main objective of this directive is to communicate intrinsic hazardous properties of substances through classification and labelling. In order to make it easy to recognize the meaning of the classification, the classification system uses risk phrases and icons. For example, a substance that is classified as "highly flammable" will carry an icon that shows a flame. This classification system communicates the intrinsic hazards of the substances and not the risk associated with their use. Risk depends on many other factors, especially concentration in the finished product.

The Dangerous Substances Directive contains parameters, which are most consistent with the ICPDR Industrial Emission Inventory. Under the Dangerous Substances Directive (DSD) data will be collected annually and will be available to the EU Commission upon request.

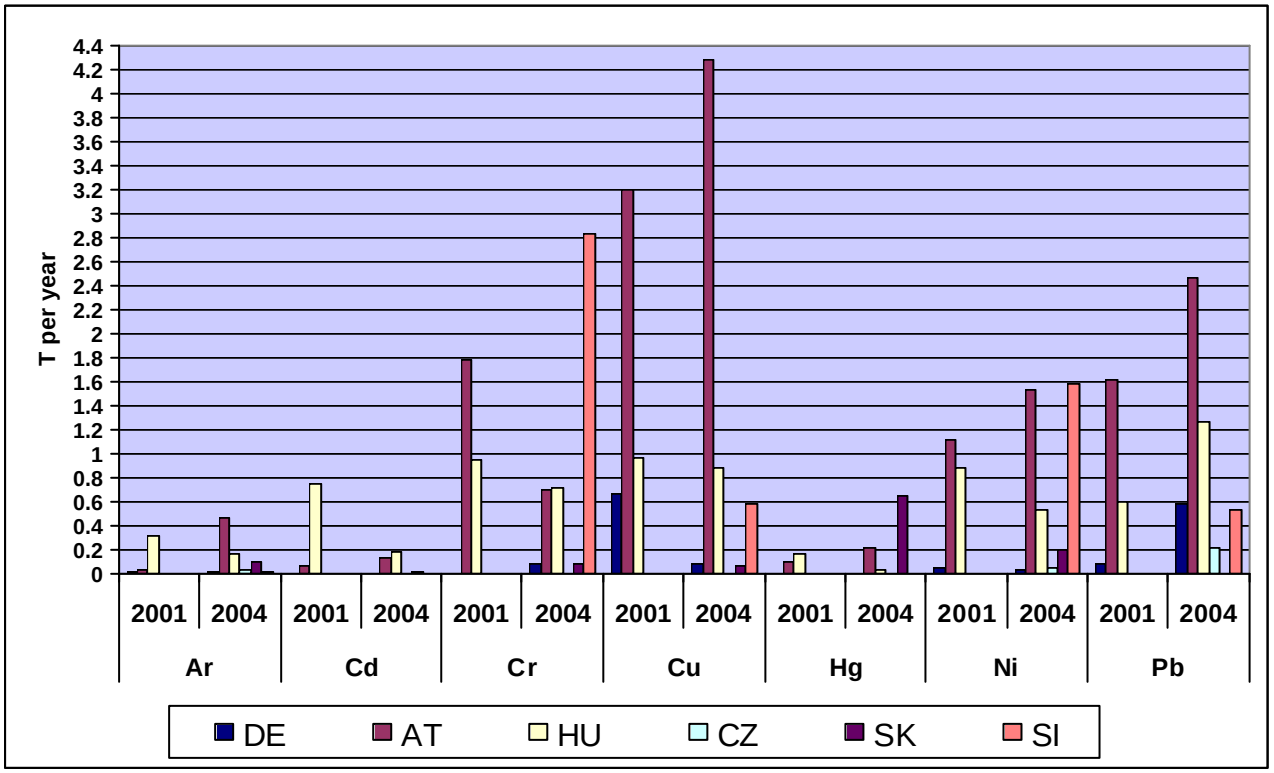
Information provided by the Danube Member States on EPER reporting (Table 28) shows an increase of the reported loads values of Ar, Cd, Cr, Cu, Hg, Ni, Pb and Zn in 2004, comparing with the 2001 values.

Table 28: Overview of reported loads of substances, reference years 2001 and 2004

	Ar		Cd		Cr		Cu		Hg		Ni		Pb		Zn	
	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004	2001	2004
DE	0.0181	0.013				0.0792	0.6636	0.08	0.00382		0.0582	0.0299	0.0837	0.576	12.315	10.953
AT	0.0319	0.4606	0.073	0.134	1.79	0.699	3.2	4.28	0.1	0.219	1.12	1.53	1.62	2.46	30.46	31.16
HU	0.315	0.169	0.753	0.175	0.954	0.708	0.972	0.889	0.162	0.04	0.884	0.538	0.596	1.26	1.24	4.32
CZ		0.0307								0.0014		0.042		0.21		
SK		0.09903		0.0158		0.0916		0.064		0.641		0.1954				2.58
SI		0.0143				2.84		0.59		0.0037		1.59		0.5395		0.979
Total:	**0.365**	**0.78663**	**0.826**	**0.3248**	**2.744**	**4.4178**	**4.8356**	**5.903**	**0.26582**	**0.9051**	**2.0622**	**3.9253**	**2.2997**	**5.0455**	**44.015**	**49.992**

Figure 25 presents the direct discharges of heavy metals into water, compared per country for 2001 and 2004.

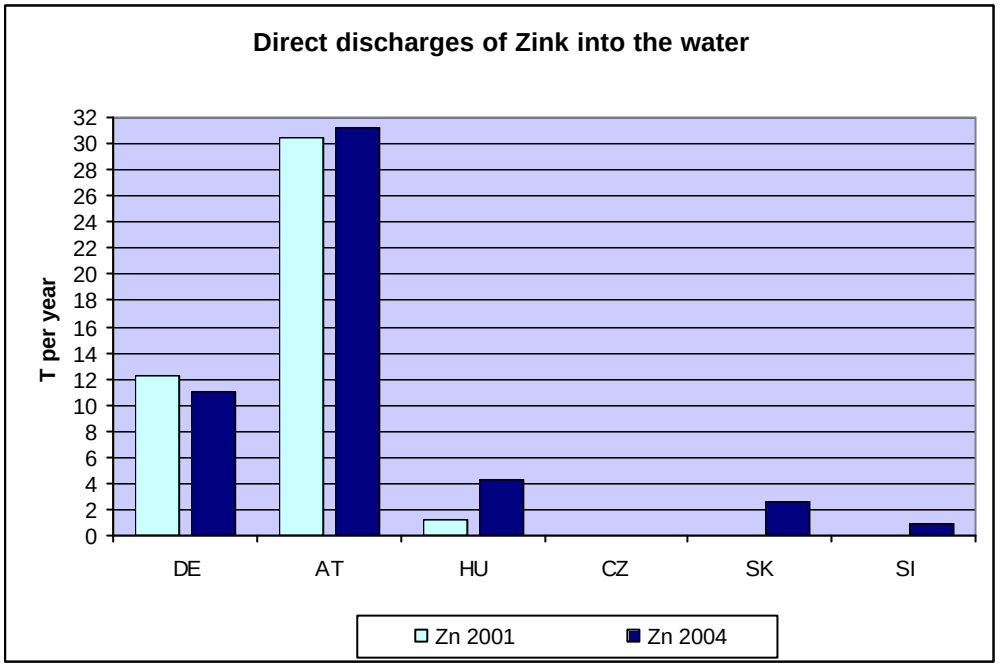
Figure 25: Direct discharges of heavy metals according to EPER reports



The graph shows a considerable increase of reported Cr in Slovenia, and of Cu and Pb in Slovakia. The lowest values of heavy metals loads are registered for Ar, Cd and Hg. Hungary reduced in 2004 the loads of Ar, Cd, Cr, Cu, Hg, and Ni, but had an increase of Pb loads. In 2004, Austria reduced the loads of Cr, while Germany reduced Cu and Ni.

Figure 26 presents the direct discharges of Zink into the water as reported by the Member States, reference year 2001 and 2004. Only Germany registered lower amounts in 2004 comparing with 2001.

Figure 26: Direct discharges of Zinc loads into the water, 2001 and 2004



5.1.5.3 Assessment of DRB countries reports on industrial and agro-industrial discharges in line with the EU legislation

The closure of many heavily polluting industrial activities has contributed to a decrease of industrial pollution. Meeting the requirements of the IPPC Directive by the deadline of 2007, is one of the more demanding parts of EU environmental legislation, and requires high investment for technology and clean production processes. Activities listed in Annex I of the Directive are required to obtain IPPC licence, i.e. one licence dealing with emissions to all media. Directive applies an integrated approach to a wide range of activities. The existing links WFD/IPPC has been clarified as well as reporting obligations towards European Pollutant Emission Register (Decision 2000/479) and E-PRTR (New proposal COM (2004) 634 of 7.10.2004). The key components of the new Directive on priority substances are:

- Environmental Quality Standards,
- Pollution control,
- Priority hazardous substance identification
- Analysis, monitoring and reporting
- Repeal existing daughter Directives.

At the EC level, revision takes place on the obligations under Art 16 WFD on strategy against pollution, Art 11 on the programme measures for river basin specific pollutants 2009/2012 and the preparation of new instruments on 33 priority substances and certain other pollutants. Apart of a proposal for a Directive, the Commission is preparing a communication on the "Strategy against chemical pollution of surface water ".

In **Germany** big direct industrial discharges are reported according to EPER. Additionally, reporting to the ICPDR Emission inventories and List of priority substances is included.

Several Danube countries have already been granted a longer transition period for the IPPC Directive, justified by relatively high investments required for outdated equipment.

In **Czech Republic**, the Act on IPPC came into force on 1 January 2003, and progress has been made with the establishing of an IPPC Agency. According to the Czech law the permission for the discharge of wastewaters is issued for the time period of maximum ten years, in the case of dangerous substances for four years. For discharged pollution exceeding limits stated in the Water Act the polluter must pay pollution tax for COD, dissolved substances, undissolved substances, total phosphorus, total nitrogen, ammonia nitrogen, inorganic nitrogen, AOX, mercury and cadmium. This tool creates financial incentive for polluters to reduce their pollution discharges. Czech Republic reported for 20 enterprises (9 papermaking, 6 food industry, and 5 chemical) the state of technological procedures for pollution reduction according to the ICPDR recommendations for best available techniques in papermaking, food and chemical industries.

Implementation of IPPC Directive in **Hungary** had challenged the country's environmental administration, as the permitting system is revised. There are in Hungary approximately 1050 installations, which fall under the IPPC regulation. All of them must have integrated permit and fulfil the BAT requirements defined in the respective permit by October 2007. In 2001-2005 periods the local environmental, nature conservation and water protection inspectorates issued about 50 % of these integrated permits.

In connection with the IPPC Directive Hungary reported the emission data of IPPC installations for the EU EPER database in 2003 and 2006 for the reference years 2001 and 2004. A Hungarian EPER-PRTR database were also established and launched for public in 2004.

The number of EPER facilities in Hungary was 96 in 2004. Thereof 8 facilities had only direct emissions into water and 12 facilities into air and water (direct emission). The most emissions come from the chemical industry, production and processing of metals, mineral industry and "other activities", mainly paper industry, slaughterhouses and food production. Financing needs of this program until end of 2007 are cca. 1,8 billion EURO.

Hungary indicated 3 industrial projects: Mátra Sugar Co., Szolnok; MOL Rt. Százhalombatta and Dunapack Co. Brownpaper.

The joint programme of the Ministry of Environment and Water and the Hungarian Development Bank offers supplementary interest subsidy for investment programs of small and medium size enterprises as well as of local governments related to the protection of the environment.

A subsidized credit line is available in frame of this project for decontamination of polluted areas, for investments for projects in the filed of water quality protections as well.

Hungary succeeded in acquiring all the environmental protection grants of ISPRA and the Cohesion Fund 2004-2006.

Hungary also applied for the available resources of the Structural Funds until 2005.

With regard to IPPC, **Slovakia** still has to introduce integrated permits and strengthen IPPC permitting capacity. **Slovenia** requested a four-year transition period so that 15 facilities can meet the requirements of the IPPC Directive.

Integrated permitting under IPPC came into force in January 2003 in **Romania,** which has time until 2015 to achieve compliance for all facilities.

In **Croatia**, measures and activities related to the reduction of industrial pollution are going to be harmonized with a program of activities related to the IPPC Directive, which is the responsibility of the Ministry of Environmental Protection, Physical Planning and Construction, and with industries.

A project under the title *Study on the identification of existing production processes and characterization of industrial wastewater according to industrial branches* is under way. This study is being carried out with the aim of identifying the actual condition of the industrial sector in terms of its

capacities, and production technology and technique, and actual characteristics of wastewater produced in that process, as well as identifying the method and efficiency of wastewater treatment prior to its final discharge from an industrial plant. The project is expected to be completed in 2008.

The development of the Water Information System (WIS) has an important role in the promotion of the "polluter pays principle". Among other things, the WIS includes a inventory of polluters with the characteristics of effluent, wastewater, and recipients.

A specific program dealing with the identification of dangerous substances entering the water through industrial wastewater discharges is under way.

In **Austria**, the ICPDR-BAT-recommendations are covered by the branch-specific Ordinances for the limitation of emissions from the respective industries in combination with the General Wastewater Emission Ordinance. In terms of COD-load the industrial share reported by Austria comprises about 273.000 t/a, i.e. approximately 50 % of the total COD-load transported to central urban wastewater treatment facilities. Directly discharging industry accounts for about 237.000 t COD/a. Approximately 90 % of this COD-load undergoes tertiary treatment, the remainder biological purification, which altogether results in a treatment efficiency of 85 % reduction of pollution expressed in terms of COD.

Common problems in the non-EU counties are an insufficient level of information concerning discharges of dangerous substances and the lack of legally binding emission level values. Therefore comprehensive surveys of all discharges of substances regulated by the IPPC Directive and priority substances is recommended as the first step to be undertaken.

In **Bosnia & Herzegovina** and **Serbia**, the IPPC Directive has been transposed into national legislation and the BAT concept is in place. However further implementation of the integrated permission process including BAT reference documents still require improvement including additional capacity building. On the other hand **Moldova** and **Ukraine** still need to adopt new legislation, which will ensure the further implementation of the integrated approach related to industrial pollution reduction and the introduction and implementation of the BAT concept.

The State Program of Development of Water Industry was approved by the Parliament of **Ukraine** and has a status of the law. The program is aimed at the implementation of the national policy regarding the improvement of qualitative water supply to the population and industrial sectors, creation of the opportunities for sustainable functioning of water industry. Program identifies the source of the financial resources to be provided for implementation of the measures (total payments for special usage of water resources and payments collected from water transport and hydro energy entities for water bodies exploitation). The only problem is that all these payments are not able to cover expenditures needed for projected measures implementation. Ministry of Environmental Protection and State Committee on Water Management are responsible for the implementation of the Program.

The assessment of the BAT implementation in the Danube countries is based on some estimate of selected pilot IPPC installation case studies in two industrial sectors: chemical and pulp and paper. The pulp and paper industry was selected, in part, because it is the largest discharger of COD accounting for almost 50% of total discharges in the DRB (Emission Inventory 2004).

The detailed information gathered from the two case studies provided the basic data on the reduction of pollution and other impacts due to BAT implementation at the installation. This information was then projected to provide a sector estimate and then aggregated to provide a more general impact of impacts for the Danube River Basin as a whole.

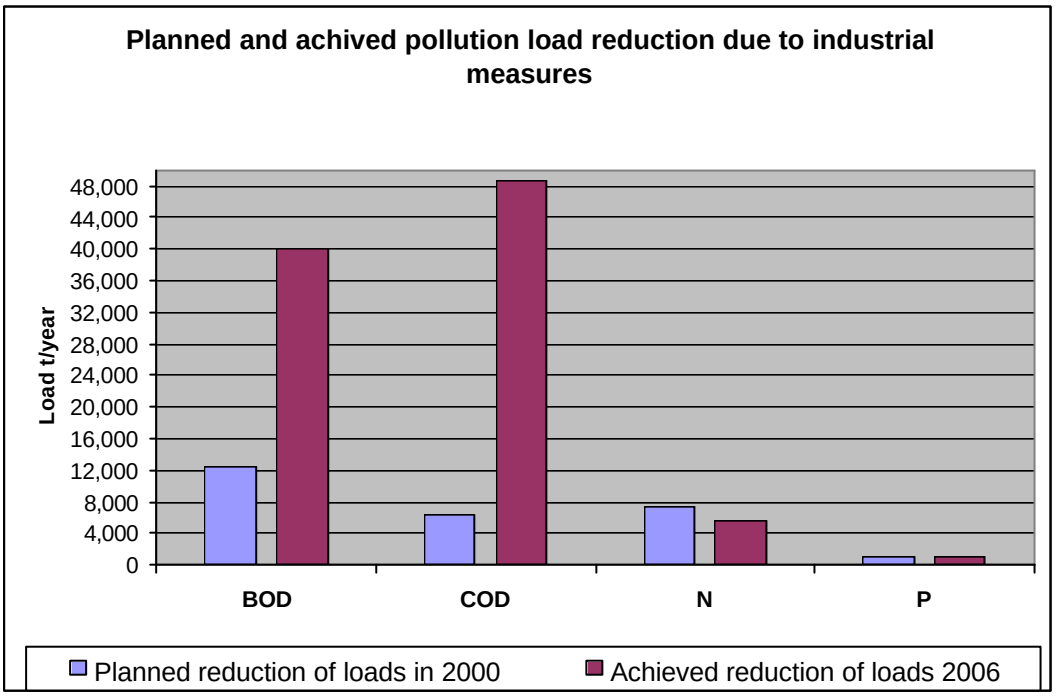
The analysis shows clearly that the hypothesis of that BAT implementation will have a positive impact on pollution reduction in the DRB is correct. The reduction of 50% estimated for COD for the pulp and paper industry would result in an annual reduction of 26,653 t/a in that sector. Applying the same calculation to total industrial COD discharges of 133,950 t/a (excluding Austria and Germany) the reduction would be 66,975 t/a.

Results of these case studies were presented and discussed at a meeting of the Pressures and Measures Expert Group of ICPDR to be used for future policy, programme and project development.

5.1.5.4 Implementation of JAP national investment programs: industrial and agro-industrial sector

The industrial investments achieved in the Danube countries contributed to the reduction of BOD, COD and Phosphorus loads targets of 2000. For the Nitrogen, the targets to reduce the industrial pollution were not totally achieved, only 80% (Figure 27).

Figure 27: Planned and achieved load reduction in the DRB



5.1.5.5 JAP Interim reported results for industrial investments

Annex 2 of the JAP includes planned measures for the reduction of industrial wastewater discharges, incl. agricultural (point) sources for the period 2001-2005.

The achievements reported in 2004, for the Interim Implementation Report of the JAP, until December 2004, in terms of reducing the pollution and related investments are presented below.

For industrial discharges, according to the reporting of industrial discharges in 2004, 26,877 t/a BOD; 29,534 t/a COD; 3, 437 t/a TOT-N; and 1,575 TOT-P t/a have been reduced in the period 1997-2002.

In **Austria**, the investments concerned upgrading and optimisation measures for wastewater collecting systems and wastewater treatment of the following industrial plants are presented in the Table 29.

Table 29: Industrial wastewater treatment plants completed by 2003 in Austria

Nr.	Name of Location	Remarks to load reductions	Estimated Investment Costs for load reduction MEUR
1	MoDo Hallein, Pulp and Paper	Biological WWT plant, reduction of around 6,000 t BOD p.a.	33
2	Steirische TKV	Extension of biological WWTP, reduction of around 1 t BOD p.a. and 11 t COD p.a.	2.1
3	Salinen Austria GmbH	Sewage sludge diversion and treatment, settling out of 38,000 t NaCl p.a.	8.2
4	Mayr-Melnhof Karton GmbH	WWTP, reduction of 27 t BOD p.a. and 193 t COB p.a.	5.5
5	Rauch Fruchtsäfte GmbH	WWTP, reduction of 48 t BOD p.a. and 1,164 t COB p.a.	2.4
6	Schlempetrocknungs-GmbH	WWTP, 60,000 m³ wastewater p.a., reduction of 5,140 t BOD p.a.	2.7
7	AMI Agrolinz Melamine International	Stripper for ammonia-production, 6,500 m³ wastewater p.a., reduction of 46 t COD p.a.	1.7
8	Burgenländische TKV	Biological wastewater pre-treatment, additional reduction of 600 t COD p.a.	1.7

In **Germany**, two wastewater treatment plants were completed before 31 December 2003: Esso Ingolstadt, and Nitrochemie Aschau. The total costs were 0.6 MEUR, respectively 7.5 MEUR. The reduction of tot N t/year is 20 t/year, respectively 55 t/year.

Slovakia reported 6 industrial projects completed by 31 December 2003, with an investment of 12 MEUR. The reduction achieved for these investments are 224 BOD t/a and 1,504 COD t/a. Until 2005, 14 projects shall be completed for an investment of 62.1 MEUR in: **Bosnia and Herzegovina** 1 project, **Croatia** 2 projects, **Hungary** 2 projects and **Slovakia** 9 projects.

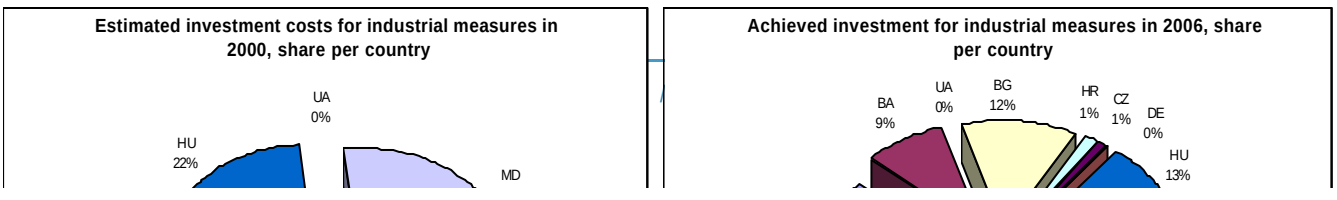
Hungary accounts for more than 66% of the total investment costs in industrial wastewater treatment plants, followed by **Slovakia**. National funding accounts in totality for investments in **Bosnia and Herzegovi**na, **Hungary, and Slovakia.**

5.1.5.6 JAP Final results for industrial investments

The planned and achieved (based on the countries reporting) measures for the reduction of industrial wastewater discharges, incl. agricultural (point) sources for the period 2001-2005 are presented in the Annex 2.

A total of 66 investments have been realised during the JAP, which means 9 more projects as planned in 2000. The objectives to reduce pollution due to industrial sources have been achieved for BOD of 40,039 t/year, comparing with the 2000 estimates of 12,347 t/year; for COD of 48,748 t/year, comparing with 6,445 t/year, estimated in 2000, and for Phosphorus of 1,078 t/year, comparing with the estimates of 2000 of 916 t/year. The Nitrogen load reduction is less than the 2000 estimates of 7, 255 t/year estimates, being only ~ 80% of the planned values. The total reported investments costs for the achieved measures are 328.2 MEUR, representing 9% more than the 2000 estimates (295.50 MEUR).

Figure 28: Estimated and achieved investments in industrial measures



5.1.5.7 Impact of the ICPDR BAT Industrial Sector Recommendations

ICPDR has identified the industrial sectors Chemical Industry, Food Industry, Chemical Pulping Industry and Papermaking Industry being amongst the main industrial polluters in the Danube River Basin. The industrial discharges of these industries shall comply with the 'best available techniques (BAT)' defined in the DRPC. In each of these priority industrial sectors, ICPDR has developed 'Recommendations on Best available Techniques' including timetables for their implementation. The 'best available techniques reference notes (BREF-Notes)' published by the European Commission in the framework of Directive 96/61/EEC (IPPC-Directive) have been considered in these Recommendations:

- *Recommendation concerning the Treatment of Municipal Waste Waters*
- *Guidelines for Monitoring of Waste Water Discharges*
- *Recommendation on Best Available Techniques in the Chemical Industry*
- *Recommendation on Best Available Techniques in the Food Industry*
- *Recommendation on Best Available Techniques in the Chemical Pulping Industry*
- *Recommendation on Best Available Techniques in the Paper Making Industry*

These Recommendations translated into the different administrative languages existing in the Danube River Basin have been distributed to the administrative authorities, to industry, and to the interested public. The Danube countries are regularly reporting on the implementation of BAT at the specific industrial sector.

The EMIS/EG members were given the responsibility to report on how the national and local water authorities would make the most efficient use of these recommendations, with respect to enforcement, compliance and implementation, including:

(i) preparation of a list of the potential beneficiaries (water authorities, industries, industrial associations, etc.),
(ii) proposal for the development of other guidelines and recommendations and
(iii) ways on how best the information exchange can be maximised among the local authorities and local industrial beneficiaries.

The completion of the first reporting period according to the reporting formats of the ICPDR recommendations on the use of BAT for the selected four industries: chemical industry, chemical pulping industry, food industry, and paper making industry, was 30th of June 2004. The second reporting will be finalised by end 2007.

The countries have been asked to specify in the industrial emission inventories those installations that fall under the IPPC obligations. Taking into account both that only selected industrial facilities will be included and

the reduction of water pollution is not the specific objective of the legislation it may only have a marginal effect on water management in individual countries.

The degree of success in the implementation process of BAT implementation varies among Member States. Member States indicated that the BAT Reference Documents (BREFs) are taken into account generally and in specific cases when determining BAT. Some countries (HU, Sl, SK, RO and BG) have established legal measures for the adoption of the national BAT guidelines related to specific industries, based upon the BREFs.
Public involvement in the integrated permitting process has been improved as well as the access to public to information concerning the monitoring results and sources of pollution.

The Impact of the ICPDR BAT recommendations has been positive as evidenced by the countries examples. However, circumstances have changed with the widespread implementation of the IPPC Directive to the extent that it may no longer be necessary for the ICPDR Recommendations to be used in the Member States, but only in the remaining countries. It is therefore reasonable to conclude that the future of BAT application in the DRB will be largely based upon the IPPC BAT legal requirements. A road map was designed for each of the non-accession countries using the policy and institutional analysis of the UNDP GEF DRP; a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and applying the lessons learned from other DRB countries. The road maps used the Water Framework Directive timetable as a basis for scheduling future individual activities making the recommendations consistent with other related ICPDR activities.

There are several factors to be considered in the implementation of the ICPDR Recommendations, including:

- Priority
- Impact
- Administration
- Inspection and Enforcement
- Cost to Government
- Cost to Industry
- Implementing Cost Effective Approaches
- Information and awareness activities
- Strategic negotiation
- Incremental approach

The process of implementation of BAT varies among Member States. The Member States indicate that the BAT Reference Documents (BREFs) are taken into account generally and in specific cases when determining BAT. Some countries (HU, Sl, RO and BG) have established legal measures for the adoption of the national BAT guidelines related to specific industries, based upon the BREFs.

The assessment shows (Table 30) that there are scarce resources for monitoring and enforcement in the non-EU countries of the DRB, and the IPPC is what might be referred to as a second level legislation in that it assumes those media specific standards and other basics measures are in place. In addition, it is observed that IPPC is limited impact legislation in that it only applies to those industries using the prescribed technology. Therefore, each country needs to look at the number of installations, which would be required to implement BAT under national IPPC legislation and further to estimate the reduction in pollution.

Table 30: Danube River Basin Countries Legal, Institutional and Enforcement Summary, February 2006

Country	Legal framework for industrial pollution prevention and reduction	Institutional arrangements			Implementation and enforcement		
		Permitting	Monitoring	Inventory	PRP	BAT	PP

Bosnia Herzegovina	**XX**	**PC+PR**	**v**	**-**	**-**	**-**	**L**
Bulgaria	**XXX**	**PC**	**vv**		**-**	**N**	**F**
Croatia	**X**	**PR**	**v**	**-**	**-**	**-**	**L**
Czech Republic	**XXX**	**PR**	**vv**	**+**	**+**	**E**	**F**
Hungary	**XXX**	**PR**	**vv**	**+**	**+**	**N**	**F**
Moldova	**X**	**PC**	**v**	**-**	**-**	**-**	**F**
Romania	**XXX**	**PR**	**vv**	**+**	**-**	**N**	**F**
Serbia	**XX**	**PC+ PR**	**v**	**-**	**-**	**-**	**L**
Slovakia	**XXX**	**PR**	**vv**	**+**	**+**	**E**	**F**
Slovenia	**XXX**	**PC**	**vv**	**+**	**-**	**N**	**F**
Ukraine	**X**	**PRv**	**v**	**-**	**-**	**-**	**L**

Notes:
Legal framework:
XXX – legislation in compliance with EU Directives in place
XX - legislation in place and but not in compliance with EU Directives (ICPDR BAT)
X - limited legislation in place not in compliance with EU Directives

Institutional arrangements:
PC - permitting authorities on central level
PR - permitting authorities on regional level

vv - complex monitoring of industrial pollution
v - limited monitoring of industrial pollution
+ industry pollution inventory in place
- industry pollution inventory not in place

Implementation and enforcement
PRP: Pollution Reduction Programmes in compliance with the Dangerous Substance Directive (+ in place, - not in place)
BAT: **N** - National guidelines in place
E - EU BAT documents used directly
- No guidelines
PP – Public Participation in the permitting process and public data availability
F – Full
L - Limited

An assessment of the impact of the ICPDR BAT implementation has been performed for three relevant types of industry in the DRB: (i) Pulp and paper sector, (ii) chemical sector and (iii) food sector.

The estimates were based on the ICPDR emission inventory 2000, 2002 and 2005 (Table 31).

(i) Pulp and paper sector

The pilot installation Kappa Sturovo is a Slovak pulp and paper company which discharges wastewater into the Danube River.

Table 31: Emissions in the pilot installation Kappa Sturovo in 2000, 2002 and 2005

Pollutant	Unit	Total load discharged		
		Year 2000	Year 2002	Year 2005
Wastewater volume	Thousand m3 /year	12823	12600	9700
COD	t/year	7489	6310	3000
BOD	t/year	2963	2140	970
TOT-N	t/year	84,6	4,3	19
TOT-P	t/year	498	96	39
SS	t/year	2411	2430	1500
Extractable substances	t/year	-	14	5,5
Dissolved inorganic substances	t/year	6180	5500	4300

The 2005 data show a reduction of wastewater volume as well as total load of pollutants discharged as a result of technology and wastewater treatment changes. In 2004 the company introduced a change of pulp production technology to non-sulphur technology and changed the mechanical treatment of wastewater to anaerobic and aerobic treatment. As seen from Table 31 the technology and wastewater treatment resulted in significant reduction of wastewater volume and all substantial pollutants while the production capacity has not changed. The changes resulted in a more than 50 % reduction in some pollutants (BOD, COD).

Additional calculations based on average concentration of pollutants in wastewater were done for installations, which indicated the use of BAT (Germany) and companies that use out of date technologies (Romania, Croatia). The results confirm an almost 50 % difference in those companies which use BAT. Unfortunately the specific BAT parameters cannot be calculated, as the production capacities were not known.

In conclusion it can be seen that the use of BAT in non-EU countries can result in significant reduction of industrial pollution, which can reach more than 50% in the case of COD. The total annual COD emission in the pulp and paper sector in 2002 (excluding Austria and Germany where BAT was already in place) was 53,306 t/a. Therefore applying the estimate of a 50% reduction would result in a reduction in pulp and paper industrial COD discharges of 26,653 t/a.

The total number of pulp and paper installations in the DRB excluding Austria and Germany is 21 and their distribution by country is seen in Table 32. Non-EU countries have 12 installations with potential reduction of pollutants similar to the pilot installation.

Table 32: Pulp and paper installations in DRB countries

Bosnia and Herzegovina	1
Bulgaria	1
Croatia	1
Czech Republic	3
Hungary	3
Romania	5
Slovakia	1
Slovenia	2
Ukraine	4
COD total	53306,86 t/year

(ii) Chemical sector
The Novaky Chemical Plant was selected as a pilot installation. The company produces a large volume of inorganic and organic chemicals (Table 33). The company is very complex. It has 12 IPPC installations and three IPPC permits have already been issued (ethylene chloral hydrine, dichlorl-ethane and poly-vinyl alcohol/poly-vinyl acetate).

Table 33: Emissions in the pilot installation Novaky Chemical Plant in 2000 and 2002

Pollutant	Unit	Total load discharged	
		Year 2000	Year 2002
Wastewater volume	Thousand m3 /year	4853	5890
COD (chemical oxygen demand)	t/year	1391	1990
BOD5 (biological oxygen demand)	t/year	282	545
SS (suspended solids)	t/year	-	101
Hg (mercury)	t/year	-	.2
Extractable substances	t/year	-	3.5
Dissolved inorganic substances	t/year	-	31500

The technological changes and the use of BATs have already resulted in reduction of pollutants in the three IPPC installations, which received integrated permits. The company is undergoing further technological changes which will result in significant reduction in mercury discharge (de-mercurisation) as the emission limit values exceed almost 100 times the BAT required values.

(iii) Food sector
Simple calculations of average concentrations of some pollutants in discharges in installations in EU member countries and those in non-EU countries have shown significant differences in favor of EU countries. The differences in average concentrations were up to 50 % higher in non-EU country installations. Unfortunately, the lack of more detailed data makes more reliable estimates for this group of industries impossible.

The above analysis shows clearly that the hypothesis of that BAT implementation will have a positive impact on pollution reduction in the DRB is correct. The reduction of 50% estimated for COD for the pulp and paper industry would result in an annual reduction of 26,653 t/a in that sector. Applying the same calculation to total industrial COD discharges of 133,950 t/a (excluding Austria and Germany) the reduction would be 66,975 t/a. The estimates are very preliminary and based upon the data available so caution should be used in their use. Actual reductions may be higher or lower and are subject to a variety of factors, which are not part of this analysis for example the closure of installations, and new installations, which may be built. Nevertheless, it is anticipated that these estimates will be only the first step in developing estimates for future pollution reductions due to the implementation of BAT and other measures in the DRB, useful in the development of the Joint Program of measures.

The introduction of IPPC legislation requires a dedicated inspection and enforcement capability. The cost to government including new organization units, permitting staff hired and trained, a technology pool of experts identified and a capable enforcement function established may in some cases be equal or higher that the total budget for existing national government environmental expenditures. Further, the most cost effective time to apply BAT is when the installation is initially being constructed. Since many of the installations in the transitional economies are quite old the technology is also outdated, it is likely that the legal requirement to introduce BAT would cause installations to close due to economic reasons.

Introduction of BAT (cleaner technologies integrated into the production process as well as end-of-pipe solutions) in selected enterprises of the Danube countries (Romania, Slovakia, Hungary, Bulgaria and Croatia) represented the essence of the implementation of the UNIDO TEST integrated approach at enterprise level. The selection of the enterprises was done based on the ICPDR hot spots list and reporting to industrial emission discharges.

The UNDP/GEF Danube Pollution Reduction Programme has identified in 1999, through its Transboundary Analysis (TDA) 130 major manufacturing enterprises (hot spots) within the Danube River Basin of which a significant number of these are contributing to transboundary pollution in the form of nutrients and/or persistent organic pollutants. It was considered that industry is responsible for most of the direct and indirect discharges of hazardous substances into the Danube Basin. Depending on the type of industry, the effluent might contain heavy metals (smelting, electroplating, chlorine production, tanneries, metal processing, etc.), organic micro-pollutants (pulp and paper, chemical, pharmaceuticals, etc.) or oil products and solvents (machine production, oil refineries, etc.).

The outcomes of the TEST project provided evidence on the potential of achieving (i) significant reduction of transboundary pollution/nutrients into the Danube River and Black Sea, and (ii) enhancing institutional capacity in the country to assist other polluting plants contributing to transboundary/nutrient pollution in the Danube River and Black Sea.

The UNIDO TEST project has developed a detailed methodology and provided examples of the benefits of applying environmental sustainable technologies to individual industrial installations in the Danube River Basin. The approach has been based upon a number of tools including an initial review, an environmental management system, cleaner production assessment, environmental sound technology assessment and a sustainable enterprise strategy. By providing an approach, which is both economic and environmentally advantageous, it is an approach that can be supported by industry and those advocating pollution reductions.

The testing organised in the five selected countries provides arguments on the benefits to the industrial installations from the voluntary implementation of BAT. There were 11 installations considered as possible case studies. The greatest potential for pollution prevention and reduction occurs in those installations, which will continue to operate. In industrial installations using older, out of date, highly polluting technologies there is little potential for the implementation of BAT for technical and economic reasons. There are also country based Cleaner Production Centres capable of providing cost effective support for the implementation of BAT. The UNIDO TEST project substantially improved the number of such centres and their capabilities with respect to the implementation of BAT at the level of the individual installation.

The lessons learned in the case studies have been useful in a number of ways for the Danube countries. Firstly, it stimulated other installations within the countries to recognize the benefits and better understand the process of applying BAT. In the DRB this could cause more rapid introduction of BAT in installations so that pollution reduction and production efficiencies benefits will be gained sooner. Then, it helped to convince the national governments in removing any policy or legal barriers that may exist and therefore promote further application at BAT. Finally, the experiences of the case studies have been used to revise the total potential impact of the introduction of BAT application on a sector, country, or region within the pressures assessment of the WFD Art. 5 Reports.

There were reported cases in the Danube countries where in addition to the reduced pollution load, the profitability enhanced and the enterprises became more attractive to investors and opened new markets. The reports on the investments in the ICPDR database for industrial projects provide information on the pollution reduction due to the introduction of new technological developments, and on the availability of investment funds for existing industrial installations which has decreased and therefore the competition for these funds has increased among existing installations. Industrial installations, which have adopted BAT, are in a better position to attract investment funding because it shows that they are modernizing.

The analysis and lessons learned from the national reports on the implementation of the ICPDR BAT as well from the UNDP GEF Danube Regional Project investigation on the industrial reform towards reduction of nutrients and dangerous substances identifies a number of observations which will be useful to industrial installations in the DRB which are considering adopting BAT on a voluntary basis:

- BAT is a very new concept for several installations in the DRB. Senior managers are not familiar with the concept. Environmental managers may have some information about BAT but usually do not have enough information to understand what the benefits would be to their installation.
- Companies will voluntarily introduce BAT when there is a financial incentive for them. For companies, which are economically viable, there is a stream of benefits in the short and longer term, which can provide the necessary financial incentive.
- General public data is insufficient to identify potential benefits. Potential benefits may be identified from comparing the experience of other similar installations or from an initial screening process based upon installation specific installation
- Support materials and other assistance are becoming more readily available for voluntary BAT implementation. The substantial body of information related to implementing the EU IPPC Directive is public information and can be used by the installation.
- BAT can be implemented in phases. Installations, which have gone through an ISO certification process, are more likely to be prepared to implement the process of introducing BAT.

Therefore, it can be concluded that, in the absence of a specific legal requirement industrial installations in the DRB have the opportunity to implement BAT on a voluntary basis. There are additional benefits for those installations, which are in countries that will have legal requirement in the future. In these cases the voluntary introduction of BAT allows the installation to implement BAT in a time frame, which fits the circumstances of the installation, rather than a timetable, which is legally binding for all installations.

In developing the Danube River Basin Management Plan, the ICPDR's role is to encourage all of the Danube countries to adopt and implement IPPC legislation. The majority of the countries have a mandatory obligation to the EU while the remaining countries could be encouraged to adopt legislation requiring the application of BAT as basic measures in the Joint Program of Measures.

BAT is a concept that may be implemented without the need for a specific legal framework. When BAT is implemented it often results in cost savings in the operation of the industrial installation so there may be an economic incentive.

The initial step would be to do a needs analysis in each country. Based upon the analysis a country specific work plan would be developed in cooperation with national officials. A key factor in developing the country work plans would be sustainability. Sustainability is dependent upon a number of factors; however, the key factor is the priority and commitment of the host government. This can best be assured by detailed discussions and agreement during the needs analysis phase and a flexible approach to implementation. As part of the country needs analysis other donor initiatives will be reviewed. This review can identify not only gaps but also extension possibilities. These are situations where a previous project can be extended by the ICPDR to obtain additional benefits to the country in a very cost efficient way because it builds upon the prior resource allocation.

5.1.6 Agro-industrial Discharges

5.1.6.1 Agro- industrial emission inventories

According to the Article 3.2.3. of JAP, the following actions are proposed:

- *Establishing of an inventory of point discharges from agriculture*
- *Establishing of a recommendation on the reduction of point discharges from agriculture before 2004.*

Annex 2 of the JAP lists the planned measures for the reduction of pollution loads from industrial discharges and includes also some agricultural point discharges.

The EMIS inventory 2002 developed in the ICPDR has collected data from all agricultural discharges: all emissions from agricultural sources (farms) with more than 2000 pigs, more than 30 000 chicken, more than 2000 dairy cows, and more than 1000 sheep. Food industry sources were reported under the industrial inventory. Additionally, reporting to the ICPDR List of priority substances is included.

A number of 63 locations were identified in the emission inventories, 2002. In 2004, only 6 countries have reported agro-industrial sources of pollution discharging directly into the water (Table 34). The basin wide update of the emission inventory for agro-industrial point sources, reference year 2005 will be available end of December 2007.

Table 34: Overview of pollution loads, Roof Report, 2004

Loads discharged by agro-industrial sources considered for the pressures assessment Art. 5 Roof Report, 2004				
Sub-catchment	**COD (t/y)**	**BOD (t/y)**	**N (t/y)**	**P (t/y)**
07 Drava-Mura	2	1	na	1
08 Sava	191	41	107	3
09 Tisza	2,263	579	749	na
10 Banat-Eastern Serbia	357	104	57	16
13 Muntenia	2,040	1,085	881	57
14 Prut-Siret	285	1,074	326	5
15 Delta-Liman	901	206	na	na
Total DRBD	**6,039**	**3,089**	**2,121**	**82**

5.1.6.2 Recommendation on BAT at Agro-industrial Point Sources

Good/best practices for agriculture have been under development for many years. Stakeholders involved in the development of good/best practices typically include governmental and non-governmental organisations, farmers, consumers, food processors and retailers etc. – all of who seek to meet a variety of objectives for food quality, production efficiency, rural livelihoods and environmental benefits. The definition of good/best practices offers a means for these different stakeholders to promote their objectives within a clear framework that communicates the best available knowledge on a particular issue or issues. For example, a growing number food processors and retailers increasingly require farmers to follow Codes of Practice for the production of fresh fruit and vegetables, cereal crops and livestock in order to achieve their required standards for quality assurance, consumer satisfaction and profit.

Agricultural development will have to be based on best available techniques and best available practice in regard to nutrient release to the waters.

The general concept of good/best practice is also an increasingly important part of introducing and maintaining minimum environmental standards as the basis of promoting more sustainable agricultural systems. Such environmental standards are becoming a key part of the European model of agriculture due to international trade agreements, public environmental concerns and market forces. They are necessary to ensure minimum environmental protection on farmland and comparable production conditions (preventing uneven competition) across Europe.

Different countries implement such minimum environmental standards in various ways using a variety of different policy measures and instruments, but conceptually there are three main levels of environmental performance in agriculture that relate to good/best practice:

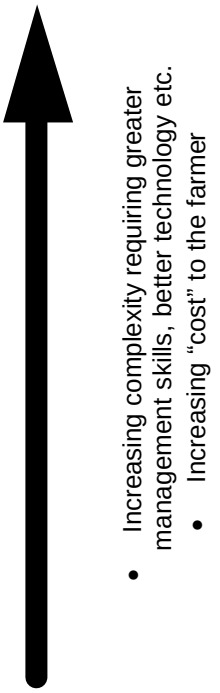
"Red Zone"	These are the practices by farmers that are considered unacceptable and therefore commonly prohibited by law to protect natural resources, human health etc.
"Blue Zone"	This includes the minimum level of environmental management that it is considered "reasonable" to expect a farmer to undertake as part of "usual" farm management and without expecting any form of compensation/financial assistance. There are significant variations in the way that "good practice" is defined in different countries, but it is likely to include respect for environmental legislation (i.e. avoidance of the "red zone"), following advice from extension services, taking into account scientific and technical progress etc.
"Green Zone"	This involves a higher level of environmental management practice that delivers greater environmental benefit, but usually at greater "cost" to the farmer which may require some form of compensatory payment

The objective of developing a concept of Best Agricultural Practice (BAP) under the work program of the EMIS EG was to support the design of new agricultural pollution control policies for the central and lower DRB countries – as well as encouraging compliance with existing and emerging national legislation (including that driven in many countries by the process of EU accession) – that will promote the greater integration of pollution control considerations into the day-to-day management of crops, animals and agricultural land by farmers in the central and lower DRB.

In the context of the DRB it is important to clearly distinguish between the concept of BAP and the existing EU concepts of Codes of Good Agricultural Practice (GAP) under the EU Nitrate Directive and verifiable standards of Good Farming Practice (GFP) under the EC Rural Development Regulation 1257/1999.

BAP actually encompasses a broad spectrum or hierarchy of activities (Figure 29) that must be interpreted according to local agronomic, environmental, social and economic context. It is this hierarchy of activities that forms a clear and common concept for BAP throughout the DRB countries as shown below:

Figure 29: Increase complexities of BAP activities



The higher levels of the hierarchy will involve: • a significantly greater undertaking by farmers than simple compliance with prevailing legislation and regulations • encompass the whole farm and/or agricultural production system, not just the management/optimisation of inputs • promote a fundamental re-appraisal of farming's relationship with the environment that involves the development of more environmentally-friendly, ecologically-based farming systems
The intermediate levels of the hierarchy will follow: • compliance with prevailing legislation and regulations • common knowledge amongst farmers within the context of his/her local circumstances (cultural, social, economic and environmental) • some minimal cost for the farmer • they often require inputs of information and know-how
• The lowest levels of the BAP hierarchy involve: • awareness amongst farmers of the polluting effects • willingness by farmers to comply with all relevant legislation • no cost for the farmer

To be effective, any BAP must not only be technically and economically feasible, it must also be socially acceptable to the farming community. For example, the social and economic circumstances of many rural communities in Moldova are very difficult and this will inevitably limit the ability of farmers to adopt the full BAP hierarchy above, even basic action such as ensuring that manure is collected and returned to the land rather than discarded in the village dump with other household waste can be difficult to encourage when local farmers cannot afford the cost of transporting manure to their field. In Bulgaria or Romania we might expect the more commercially-orientated farmers there to have the willingness and ability to prepare a "whole farm waste management plan" and to make the necessary calculations for restricting manure application to the need depending on soil N supply etc.

> The concept of Best Agricultural Practice in the DRB is define as:
> "…the highest level of pollution control practice that any farmer can reasonably be expected to adopt when working within their own national, regional and/or local context in the Danube River Basin"

As such, BAP can be applied as a uniform concept across the whole DRB, but the level of environmental management/performance that can be expected from farmers in different regions/countries will vary significantly according to:

a) the agronomic, environmental and socio-economic context in which they are operating

b) the availability of appropriate policy instruments for encouraging farmers to "move up" the hierarchy and adopt more demanding pollution control practices

c) the availability of appropriate knowledge and other technical resources for supporting farmers to "move up" the hierarchy and adopt more demanding pollution control practices.

In 2003, the ICPDR has developed in line with Article 7 of the DRPC a Recommendation on BAT at Agro-industrial Units including (i) technical in-plant measures for the reduction of wastewater volume and abatement of pollution load, (ii) reduction of pollution load by end-of-pipe measures, and (iii) environmental

management improvement actions. Additional measures are proposed to improve environmental compliance at the plant and enforcement of the permitting environmental authority. According to Resolution of the 2nd Standing Working Group of ICPDR, the Contracting Parties will implement the recommendation from January 2006 and report each 2 years from 2007.

The recommendation also includes a provision that all agro-industrial units be required to prepare a Manure Management Plan, when applying for a permit to discharge and in addition to BAT relating to (i) pollution abatement at source and (ii) waste water treatment. Danube Countries will implement the provisions of this document at the national level starting with 1st of January 2006.

Some observations on the promotion of Best Agricultural practices in the DRB countries are presented below (Table 35).

Table 35: Promotion of Best Agricultural Practices

			Specifically includes water pollution by:			
	Concept of GAP/BAP Exists?	**Includes Reducing Water Pollution?**	**Crop Nutrients?**	**Animal Wastes?**	**Pesticides?**	**Soil Erosion**
CZECH REPUBLIC	Yes	Yes	✓	✓	✓	✓
Description	These are more like "Verifiable standards", because these are supposed to be controllable, simple and not numerous (will become even more simple in RDP). One of the reasons is there are enough standards already in legislation.					
How is information available to farmers	Published annually and attached to application form for support.					
Are there any special projects or programmes for promoting GAP/BAP	Only in case of Code of Good Farming Practice towards nitrates there is massive campaign (web pages, training, seminars etc.)					
HUNGARY	No	No	-	-	-	-
Description	Concept of good agricultural/farming practice is part of EU co-funded agri-environment schemes from 2004 under Rural Development Plan and the document is available.					
SLOVAKIA	Yes	Yes	✓	✓	✓	✓
Description	Elaboration of the Code of Good Agricultural Practices is part of the Strategy for Implementation of Nitrate Directive 91/676/EEC - protection of waters against nutrients from agricultural resources. Since 2004, it is obligatory for area of agri-environmental schemes, less favourate areas and volnurable zones. The Code of Good Agricultural Practice for the Protection of Water Resources is available. This comprehensive document deals with pollution from nitrates and all other types of pollution arising from agricultural activities, including the following areas: • Rules for storage of solid manure, slurry, silage effluent, dirty waters (evaluation of storage capacity according to animal production, etc.). • Rules for application of organic and mineral fertilisers to soil • the construction of new facilities (prohibition in first and second protection zone of water resources, buffer strips to observe near water courses). • Appropriate irrigation practices. • Animal production - technical requirement for in door keeping facilities, limits on grazing capacity (number of animals per hectare) • Appropriate soil cultivation practices.					
How is information available to	Published in brochure					

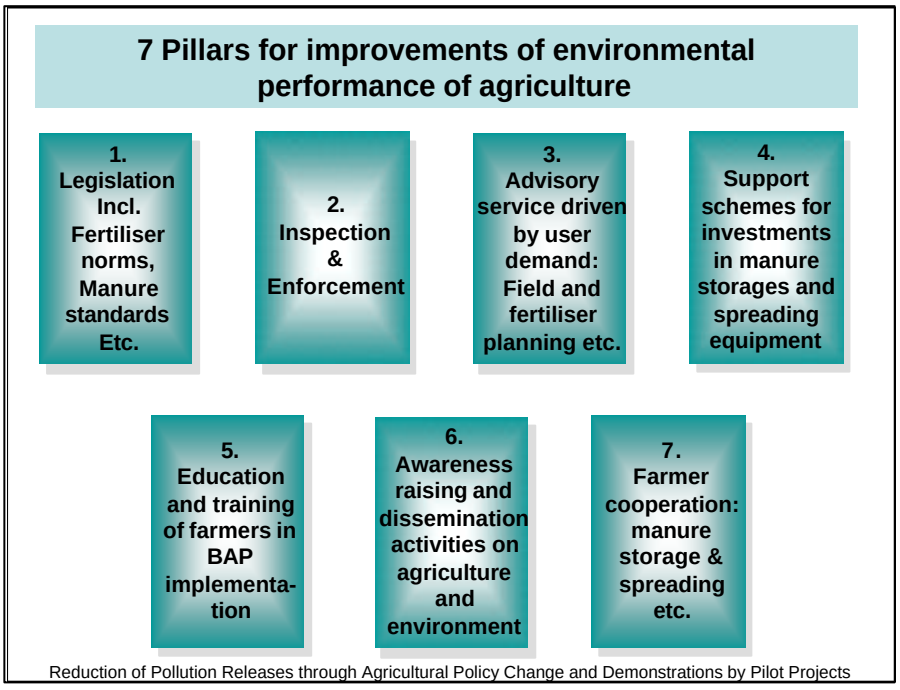
			Specifically includes water pollution by:			
	Concept of GAP/BAP Exists?	**Includes Reducing Water Pollution?**	**Crop Nutrients?**	**Animal Wastes?**	**Pesticides?**	**Soil Erosion**
farmers						
Are there any special projects or programmes for promoting GAP/BAP	Strategy for implementation of Nitrate Directive 91/676/EEC -protection of waters against nutrients from agricultural resources					
SLOVENIA	Yes	Yes	✓	✓	✓	✓
Description	The MAFF document titled "Principles of a good agricultural practice and a good farmer" are composed of two chapters that refer to the previously published documents (different Guidelines, Regulations etc.) that have been published in the Official Journal of the Rep. Slovenia or by the MAFF. The responsibility for its contents and implementation is shared by several ministries (Health, Environment, Agriculture).					
	The first chapter *"Principles of a good agricultural practice"* deals with: Fertilization. This chapter refers to the *"Guidelines for good agricultural practice in fertilization"* (Official Journal of the Rep. Slovenia 34/00). Plant protection. This chapter refers to the *Principles of good agricultural practice in plant protection* (Ministry of Agriculture, Forestry and Food, 2000). The second chapter is titled *"Principles of a good farmer"*: This chapter refers to the *Law on Agricultural Land* (OJ RS 59/96) that requires from the owner, tenant or any other user of agricultural land to farm the land as a good farmer, adjusting agricultural production to the environmental and soil conditions and preventing erosion, pollution and ensuring a durable fertility of the soil. The criteria for a good farmer are set in the *Guidelines for judging the appropriateness of the farmer's practice* (OJ RS 29/86) that are the reference for the contents of the principles					
How is information available to farmers	A small booklet on good agricultural practice has been published by the Ministry of Environment and Spatial Planning.					
Are there any special projects or programmes for promoting GAP/BAP	No					
BULGARIA	Yes	Yes	✓	✓	✓	✓
Description	-					
How is information available to	The Code of Good agricultural practices is developed and published in a booklet					

			Specifically includes water pollution by:			
	Concept of GAP/BAP Exists?	**Includes Reducing Water Pollution?**	**Crop Nutrients?**	**Animal Wastes?**	**Pesticides?**	**Soil Erosion**
farmers?						
Are there any special projects or programmes for promoting GAP/BAP	No					
ROMANIA	Yes	Yes	✓	✓	✓	✓
Description	Advice is offered to farmers on good practice regarding: • Fertilization rates adapting fertiliser rates to suit the type of crop and soil • Precautions for avoiding the risk of water pollution when using mineral fertilisers e.g. when soil is waterlogged or frozen • Fertilisation with manure and other waste resulting from poultry and animal husbandry • Soil erosion control e.g. depth, direction and time of poughing Good agricultural practices for optimising the use of fertilisers and manure					
How is information available to farmers?	The Code of Good Agricultural Practice is available (World Bank project).					
Are there any special projects or programmes for promoting GAP/BAP	This project promoted public awareness and mechanisms for replicability. The project envisaged as a demonstration activity in Calarasi County in the southern part of Romania, along the lower Danube, may provide replicable lessons for introduction of similar practices in other districts of Romania as well as other Black Sea Riparian Countries					
BOSNIA & HERZEGOVINA	The concept only exists in Federation B&H. Not yet enforced.	Yes	✓	-	✓	✓
Description	Best agricultural practices are applied voluntarily by the farmers, although very occasionally.					
How is information available to farmers?	There is no code of good agricultural practice issued by authorities yet. Within the framework of the project entitled "Strengthening of Diffuse Source Pollution Control in FB&H" a handbook on best management practices to reduce diffuse pollution has been printed.					
Are there any special projects or programmes for promoting GAP/BAP	The project entitled "Strengthening of Diffuse Source Pollution Control in FB&H", financed by the LIFE-Third Countries program of the EC.					

			Specifically includes water pollution by:			
	Concept of GAP/BAP Exists?	**Includes Reducing Water Pollution?**	**Crop Nutrients?**	**Animal Wastes?**	**Pesticides?**	**Soil Erosion**
MOLDOVA	The concept of "good agricultural practice" exists in Moldova, but partially implemented	Farmers apply few procedures which reduce the risk of water pollution	✓	✓	✓	✓
Description	The practical measures on implementation of "good agricultural practice" in Moldova are developed in following Programmes and Project: • the National Complex Programme concerning the increase of soil fertility for 2001-2020 period envisages the elaboration of the Law on soil conservation and the implementation of agrotechnic and ameliotative procedures to combat soil erosion; • one of the scopes of the National Programme on Production and Municipal Wastes Management for 2000-2010 period is to implement activities regarding farm waste, phytotechnic waste and mud management; • Agricultural Pollution Control Project aims at implementing in Moldova the EU Nitrates Directive, at implementing the Organic Farming System and at elaborating the Code of Good Agricultural Practices, in accordance with the peculiarity of agricultural management in Moldova.					
How is information available to farmers?	The booklet "The methods of soil protection. Your Guide for 30 ecological methods in farmer activity", elaborated by USDA, was translated from English into Romanian					
Are there any special projects or programmes for promoting GAP/BAP	Agricultural Pollution Control Project (APCP)					
SERBIA	Yes	Yes	-	✓	✓	✓
Description	-					
How is information available to farmers?	There is no such publication on "good" or "best agricultural practice". There are publications on organic farming and a set of legal regulations on organic farming					
Are there any special projects or programmes for promoting GAP/BAP						

Preliminary observations from the UNDP GEF DRP pilot farms in **Serbia** and country-specific traditional, social and economic issues indicate that manure management is the key challenge in relation to BAP for livestock farms. Presently the utilisation of the nutrients in the manure for crop production is very low, implying that the majority of nutrients ends as pollution in surface water and groundwater.

Figure 30: Results of pilot projects implementation on the use of BAP, Serbia, 2006



The issues as lined up in the "Red Zone" (Discharging manure directly to water courses) and the "Blue Zone" (Restrict manure application to periods of active crop growth etc.) can only be addressed if interventions target the "Green Zone" (Investment in new storage/treatment facilities). It is only through the necessary storage capacity and equipment for spreading manure that the economic benefits in relation to the use of the nutrients in manure for the farms can be realised, so that the nutrients in manure are used for crop production and do not end as pollution.

Plant protection products are often used in inadequate quantities and kinds, due to a lack of knowledge. The benefit from using plant production products is therefore rather low. Wrongly applied pesticides in high dosages or the use of not registered pesticides are polluting the environment. Spraying equipment is often in a poor condition due to lack of maintenance and adjustment.

Inadequate storage of plant protection products, cleaning of spraying equipment and disposal of leftover spray solutions are contributing a lot to pollution of surface water and groundwater.

In order to be effective in introducing BAP to the DRP countries the concepts for the application of BAP should include the following components:

(i) National strategy

In order to succeed with introducing BAP it is necessary that each DRB country has a clear and targeted national strategy for water protection that integrates respective laws and different policy measures and shows the necessary path to the achievement of indicated goals. Such kind of national strategy already exists in the Member States and will be prepared for the non-EU countries. The national strategies should not only include the preparation of laws and regulations and adoption of EU directives, but also the definition of the corresponding institutional framework responsible for implementation, regulatory instruments for implementation, a system of monitoring, budgets attached to use of the instruments for implementation ,

means to boost the capacity of official staff to implement the strategy and means to raise farmers and public awareness about the problem of pollution from agriculture.

(ii) Regulatory Instruments and Enforcement

All DRB countries have addressed or are about to address the main agricultural pollution issues by legislation including regulatory instruments in the DRB, with the most extensive coverage of issues in those countries preparing for EU accession. However, provisions of law, although very explicit in some documents, are frequently ignored by the farmers and some agrochemical companies. The introduction of BAP with the aim to reduce pollution from agriculture require that all farmers, as well as official staff from advising, enforcing and monitoring authorities are well informed about them, that they have the means to implement BAP and that there is a monitoring system to ensure compliance.

Country-specific traditional, social economic and reasons for non-compliance have to be addressed in order to succeed. Reasons for non-compliance with the laws are complex and vary between the different DRB countries.

Over the last years, there are attempts to devise tools encouraging the citizens to comply with the law related to environmental protection, largely through contribution of technical assistance projects. However, these attempts are still very weak and usually do not reach rural communities, where soil and water pollution with agricultural chemicals occurs.

There are no detailed written procedures to guide the staff in their communication with customers, there is no office manual, no procedures for solution of conflict, no written notices for customers. The officers and inspectors were never trained in communication skills, only some of them speak a foreign language. Participation tools and principles are unknown to most of the staff. The salaries of the staff even after the recent increase are not motivating. An ecological inspector has a monthly salary of about 1,000 lei (about 66 euro) which does not cover even the bill for heating in cold months of the year. All these deficiencies leave much room for ambiguous decision making, corruption and inefficiency.

Communication between relevant agencies. The Ministry of Agriculture and Food, the Ministry of Health and the Ministry of Ecology and Natural Resources are the three ministries that share responsibility for the state of the soils, water, air in the country, as well as for the quality of the foodstuffs produced in the country. The responsibility is allocated among their own departments and among the subordinate institutions. The institutions and department do their share of work and almost never communicate with the other institutions and agencies that carry out the other parts of the job.

(iii) Economic Instruments

Economic instruments to ensure the implementation of BAP may be incentives or disincentives and can be important tools for modifying the management practices of farmers and reducing agricultural pollution. The economic instruments used in several DRB countries are currently mainly disincentives due to the lack of financial resources to introduce incentive schemes.

A crucial issue for the successful implementation of BAP in the lower DRB countries is the storage capacity for manure on farms and technically more advanced equipment for spreading of manure and application of pesticides in the field. Many farmers, however, do not have the economic resources to buy this equipment or to construct appropriate storage facilities for manure.

EU-financing possibilities for incentive schemes for agricultural investments in manure storage facilities depend on the status of the DRB countries in relation to the EU. **Bulgaria** and **Romania** did received support for storage capacity for manure from animals and for renovation and construction of new farm buildings for

animals, machinery, storage of grain and animal feeds through SAPARD (Investments in agricultural farms) and the Animal Breeding Programme.

Other DRB countries can get financial support for farm investments from technical assistance projects.

5.2 Reduction of Pollution from Non-Point Sources

According to the definition in the European PRTR Regulation - Art. 2 (12) - diffuse sources are the many smaller or scattered sources from which pollutants may be released to land, air or water, whose combined impact on those media may be significant and for which it is impractical to collect reports from each individual source.

According to Article 3.4 of the JAP, the following actions are agreed:

- *"Finalize the Inventory of Diffuse Sources of Nitrogen and Phosphorus and propose further measures for their reduction" and*

- *"Set up an Inventory of the programmes of measures undertaken in the States of the Danube River Basin".*

5.2.1 Inventory of Diffuse Sources of Nitrogen and Phosphorus and propose further measures for their reduction

5.2.1.1 Use of MONERIS in estimating the nutrient emission into the surface waters of the DRB

The estimation of the nutrient emissions into surface water of Danube river basins, by point sources and various diffuse emissions has been calculated using a harmonized inventory for point and diffuse sources of pollution based on the model MONERIS (MOdelling Nutrient Emissions in RIver Systems). Whereas point emissions from waste water treatment plants and industrial sources are directly discharged into the rivers, diffuse emissions into the surface waters reflect the sum of different pathways. Seven pathways (Figure 31) are considered: point sources; atmospheric deposition; erosion; surface runoff; groundwater; tile drainage; urban surface water runoff. The model allows estimation of nutrient emissions to the surface water on a very large geographical scale and provides quantification of nutrient emissions to the surface water at the catchments level (rather than administrative units), in order to optimally support the river basin approach. Figure 32 gives an overview of the pathways and main processes used in the model.

Along the pathway from the source to emission into the river, manifold processes of transformation, retention and loss govern substances. To quantify and forecast the nutrient inputs in relation to their source requires knowledge of these transformation and retention processes. The use of a GIS allows a regional differentiated quantification of nutrient emissions into river systems. The EU research project daNUbs made use of MONERIS to assess the situation in the Western Black Sea coastal (WBSC) area and to provide information that it has improved significantly since the late eighties and early nineties. Reduced nutrient inputs led to:

- reduced eutrophication (algae production),
- regeneration of zoo-benthos and
- regeneration of phytoplankton.

The improvement is caused by reduced nutrient inputs by Danube River. Transported phosphorus loads are reduced to about 50 % as compared to the situation around 1990. Phosphorus is the limiting nutrient now for algae growth which seems to be the main reason for improvement of marine ecology in the WBSC.

The present level of the diffuse nitrogen emissions into the Danube river system is about 1.8 times higher than in the 1950s. This is mainly due to the change of the point source discharges. The increase from the 1950s to the end of the 1980s is approximately a factor 5 and the decrease within the 1990s is about 20 %. This is due to a decrease in the number of industrial discharges in the lower Danube countries after the political changes and substantial improvement of wastewater treatment especially in Germany and Austria.

For total N-emissions, it was found that the present state is a factor of 1.8 higher than in the 1950s but about 23 % lower than in the late 1980s.

Figure 31: Diffuse nutrient pollution by pathways for the total Danube river systems (2002-2004)

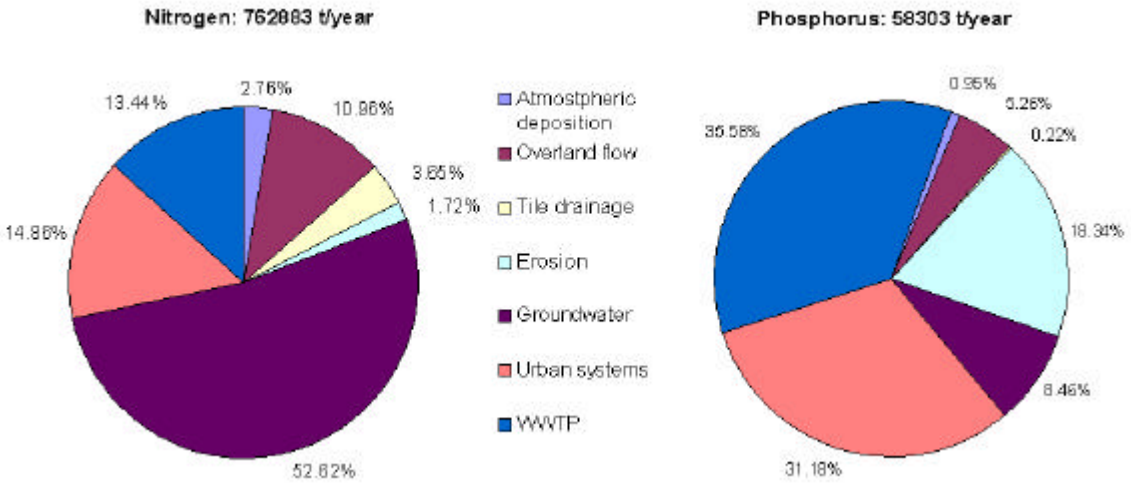
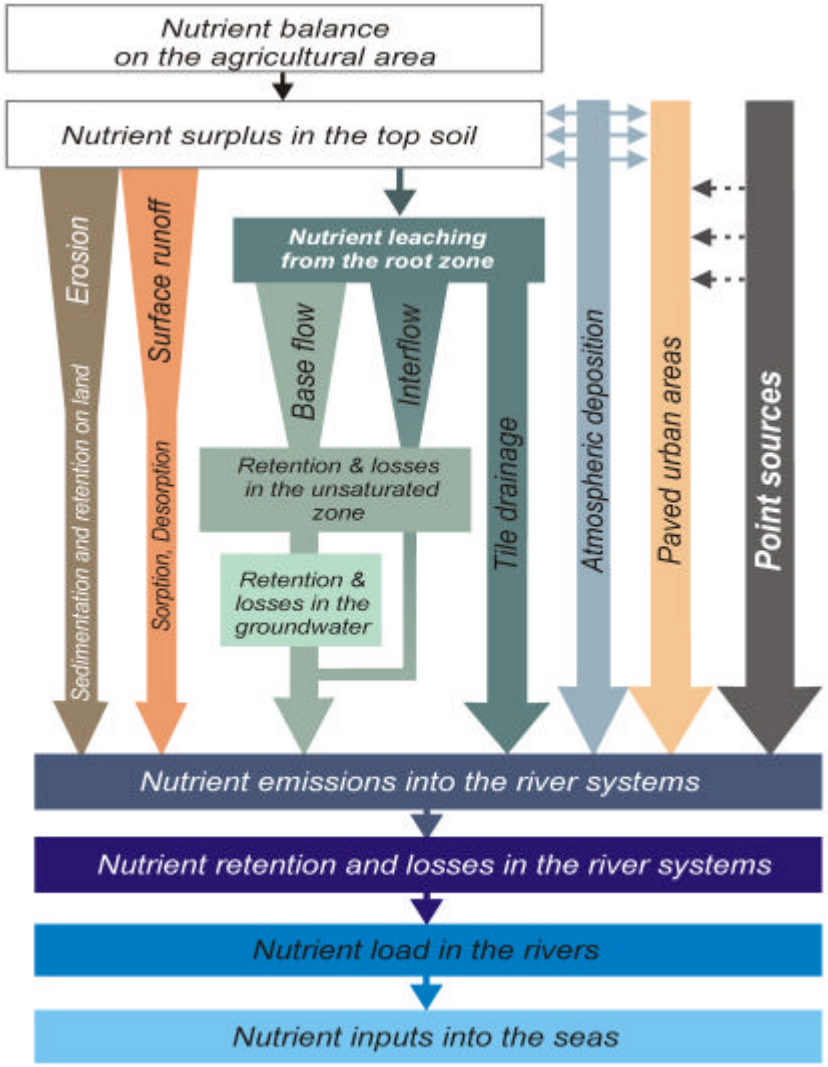


Figure 32: Pathways and processes used in MONERIS



In many Danube countries, the increasing importance of non-point sources is connected with decreasing pollution from point sources, due to the reducing of economical activity. The current relatively low discharges of N and P to the Black Sea are to a certain degree a result of the economic crisis in the lower Danube countries resulting in (i) a dramatic decrease of the application of mineral fertilizers, (ii) the closure of large animal farms (agricultural point sources) and, (iii) the closure of nutrient discharging industries (e.g. fertilizer industry). However, the main risk for not reaching good ecological status in respect to eutrophication is the recovery of the economic situation in the future, which potentially results in increasing nutrient loads to the Black Sea (e.g. agriculture,

fertiliser industry).

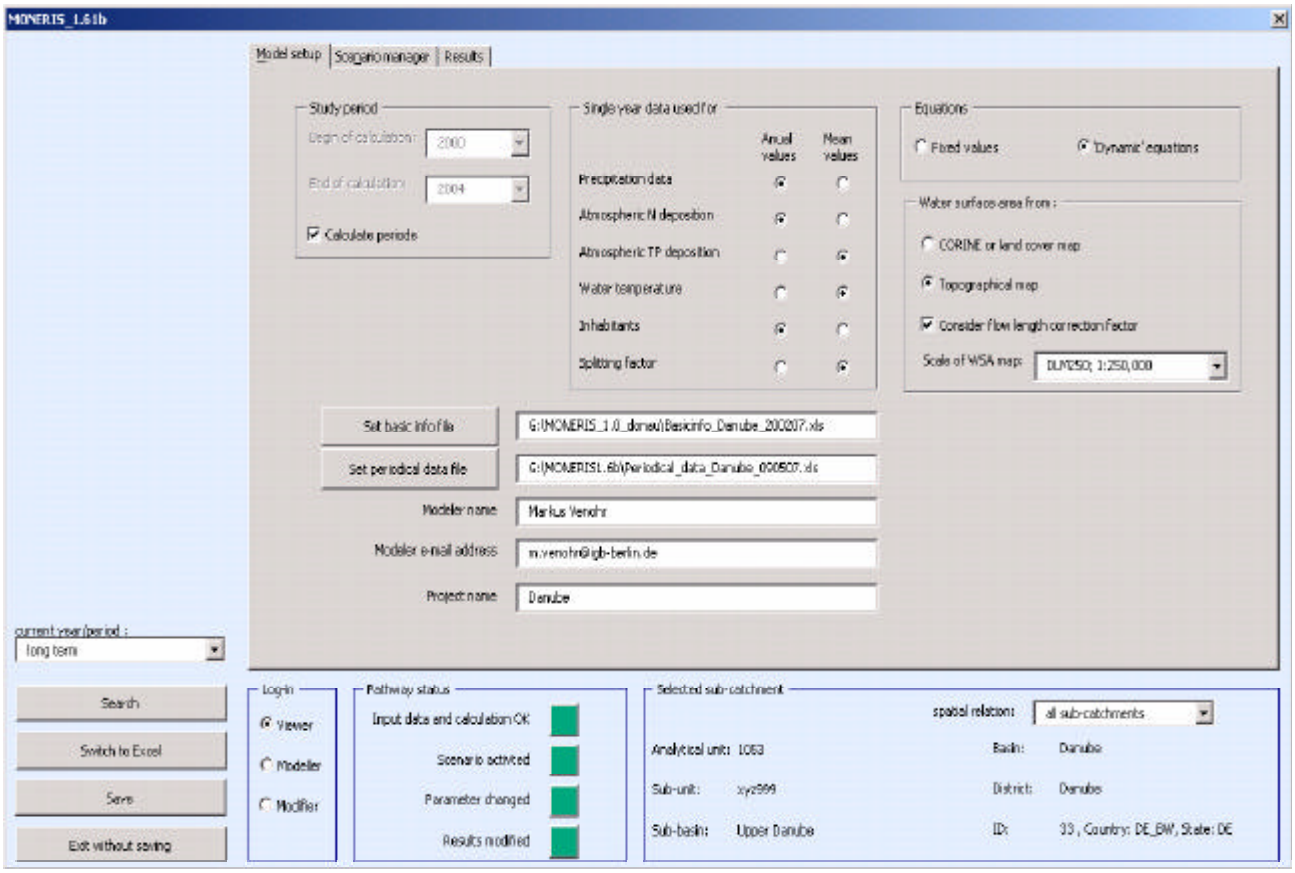
The total pollution from nitrates and acidification is significant, less for phosphorus, and is diverse in different regions of the DRB. The inputs are dependent on population density, percentage of treated wastewater disposal, intensity and way of farming and the level of atmospheric deposition. The Nitrates Directive requires development and application of codes of good agricultural practices, identification of zones vulnerable to nitrate pollution, and implementation of special action programmes in these zones.

5.2.1.2 Development of a Decision Support and Management Tool based on MONERIS for Pollution Control in the development of River Basin Management Plans in the DRB

The need for further development of MONERIS as a management tool was conceived in recognition of some of the limitations of current approaches for management activities and decisions involving significant pressures, major environmental costs and/or significant environmental consequences/impacts, as required by the WFD.

The objective is to develop a Pollution Control Decision Support Tool based on MONERIS for implementation and evaluation of programs of measures to achieve a good water status. The goal is to determine if the implemented measure or packages of measures meet WFD and DRPC targets in one specific sub river basin or the whole catchment. This is seen as a support for the ICPDR in given a policy advice to the governments on the need to invest in nutrient reduction projects, or implement specific measures in response to EU Directives. The tool will facilitate the decision process based on the comparison on the effects of various measures implemented in different sectors, countries, regions or group of countries in the DRB.

Figure 33: Overview on the user interface of the MONERIS model



The tool is seen as management initiative with a specific environmental focus designed to enable ICPDR Secretariat and Danube countries to better understand pollution and economic effects of interventions and policy actions in their river basins systems and to take the appropriate decisions. The system will allow the calculation of scenarios for the possible changes of the nutrient loads within the Danube river system and to the Black Sea according sets of measures proposed by the ICPDR. Examples of the many uses that may benefit from MONERIS include: pollution prevention and control, river basin management, design for priority investments, reporting.

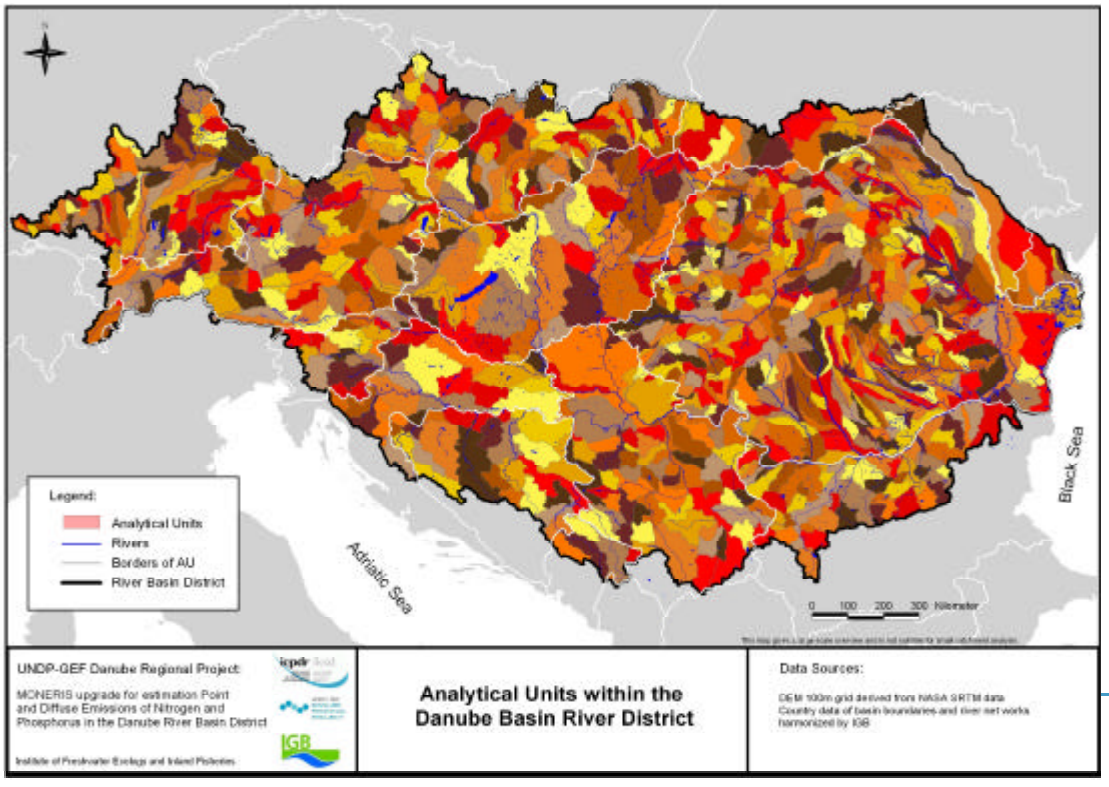
The improvement of MONERIS has been based on the support of the P&M EG and included several steps:

1. Develop a concept on the integration or data which are required for reports to various EU regulations (e.g. EPER, PRTR, UWWT- or Nitrates-Directive) for the MONERIS calculations
2. Develop of a detailed harmonized database for estimation of point emissions, per sub basins and countries. The sub river basins delimitation, including the Romanian coastal basins has been done according to the WFD. The current version of MONERIS is using the catchment boundaries agreed for the WFD Roof Report.
3. Adaptation of the existing MONERIS datasets to the new ICDPR / Water Framework catchment structure
4. Review and update methodology for quantifying diffuse pollution for various pathways, in particular for “important transboundary “groundwater bodies

5. Estimation of the state of nutrient inputs and loads within the Danube river system for the period 2002 to 2007.
6. Identification of management variables and the effects of measures and their integration into the MONERIS calculation algorithm
7. Programming of a user-friendly management application in English language, which can easily also customized for application by the Danube countries.
8. Training

Analytical units (AU) were defined for the DRBD map. This task included the aggregation of existing national maps for the water body catchments (if such maps are delivered) the implementation of national maps of AU's and the establishment of AU's based on digital elevation maps for all DRBD areas where national data could not be delivered. These different sources of maps for the AU's within the DRBD had to be harmonized at the country borders to a complete and harmonised set of AU's for the total DRBD. The result of this work is presented in Figure 34. In total 919 analytical units with a mean area of 880 km² were identified.

Figure 34: Subdivision of the RBD Danube into the analytical units



This basic subdivision can be aggregated to 68 subunits (a part of a main river basin of the Danube within one country) as presented in Figure 35. These subunits can be aggregated to the areas of the countries within the RBD Danube or to the main sub basins.

Figure 35: Subunits in the RBD Danube based on the subdivision of analytical units.

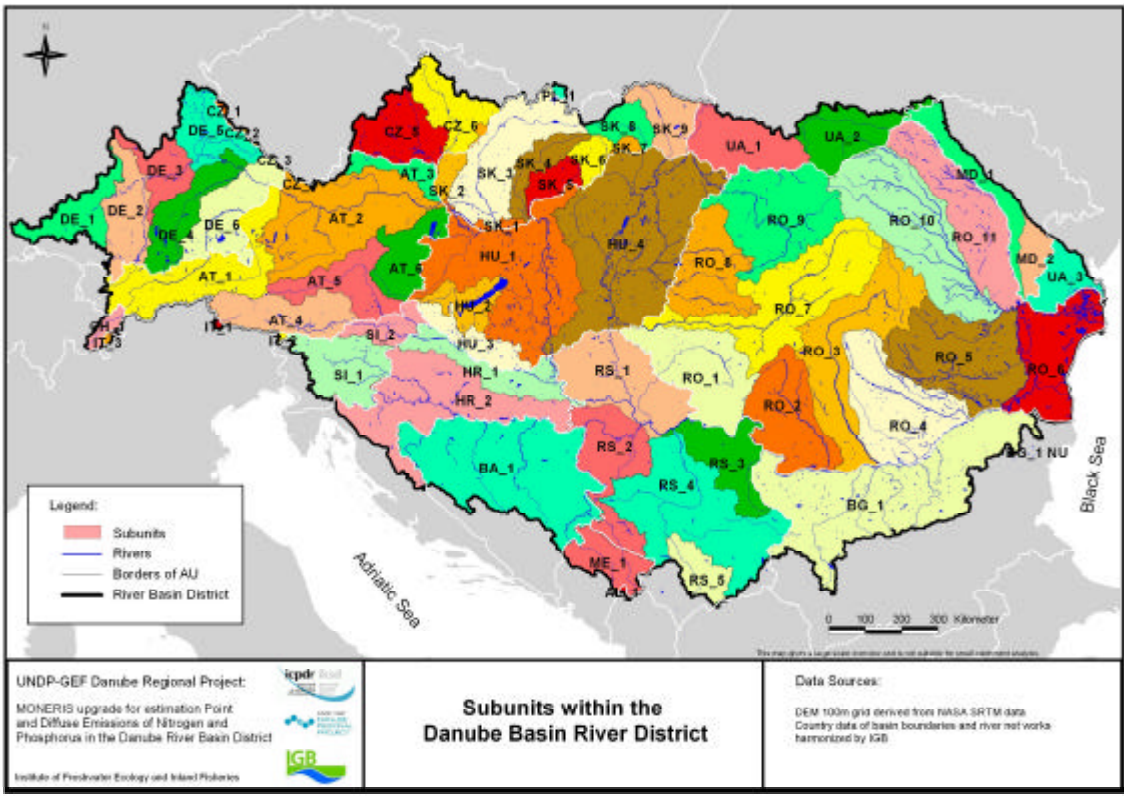
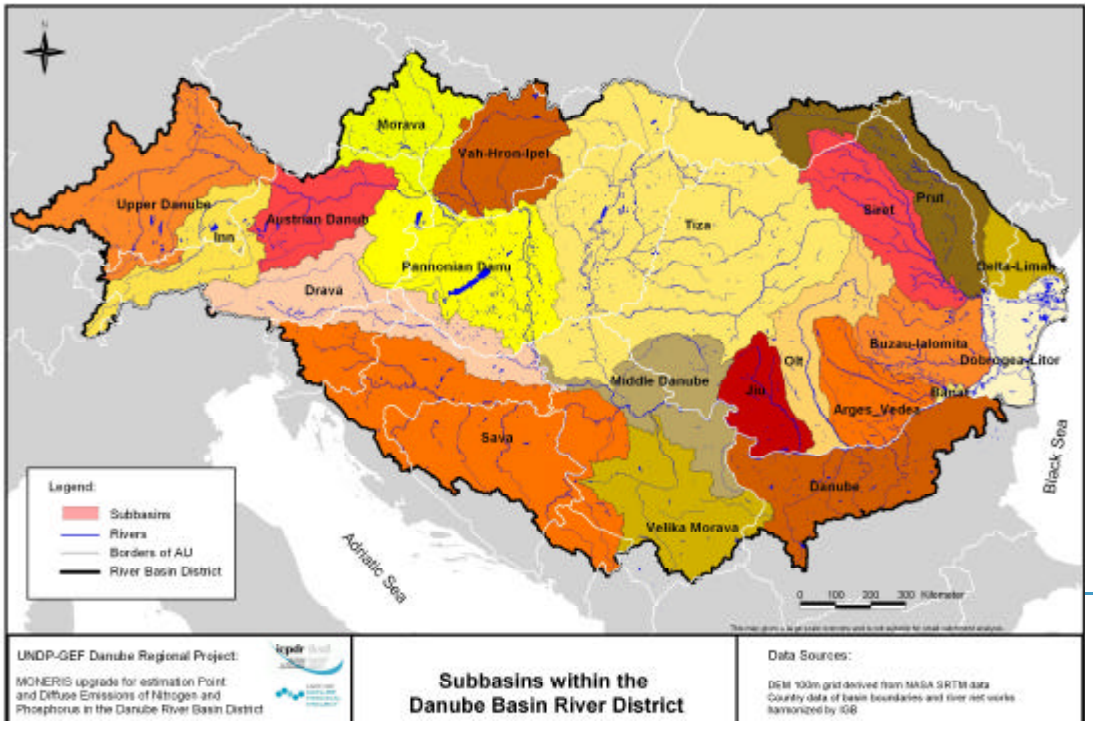


Figure 36: Main subbasins in the RBD Danube based on analytical units

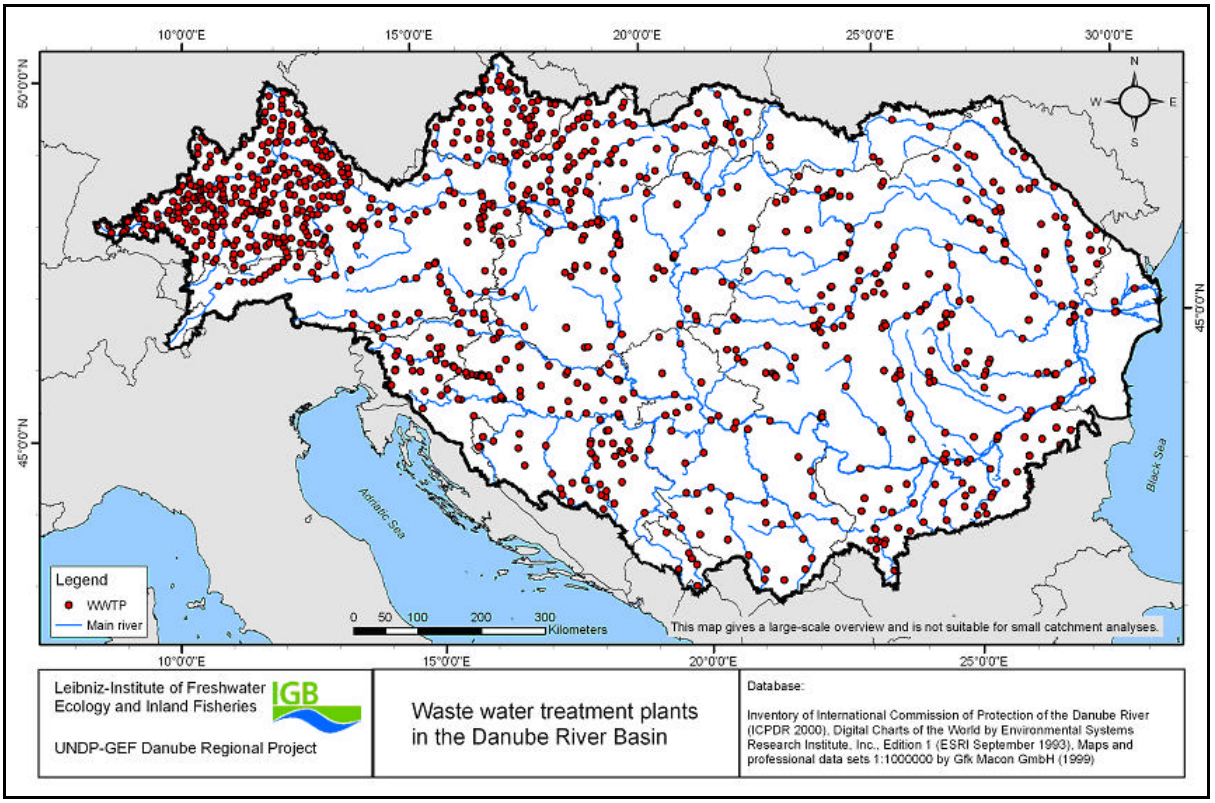


For the use of the MONERIS upgrade for the Danube a complete new version of the Model was developed. Beside the implementation of new scientific approaches according to retention of nutrients in the river system and for erosion the model has got an user interface (Figure 33). This user interface allows in different levels the access to the model. Modellers can change input data and viewers can select the results of the calibrated model for selected years and calculate scenarios. The user interfaces includes the calibrated model for the DRDB, the scenario manager for certain measures in the field of agriculture, urban settlements and waste water treatment plants, the possibility to present the model results of selected years as figure and tables as well as the export functions to use the model results within further work.

Point source emission data was taken from the ÌCPDR Emission Inventory and information of monitoring station from the TNMN 2006.

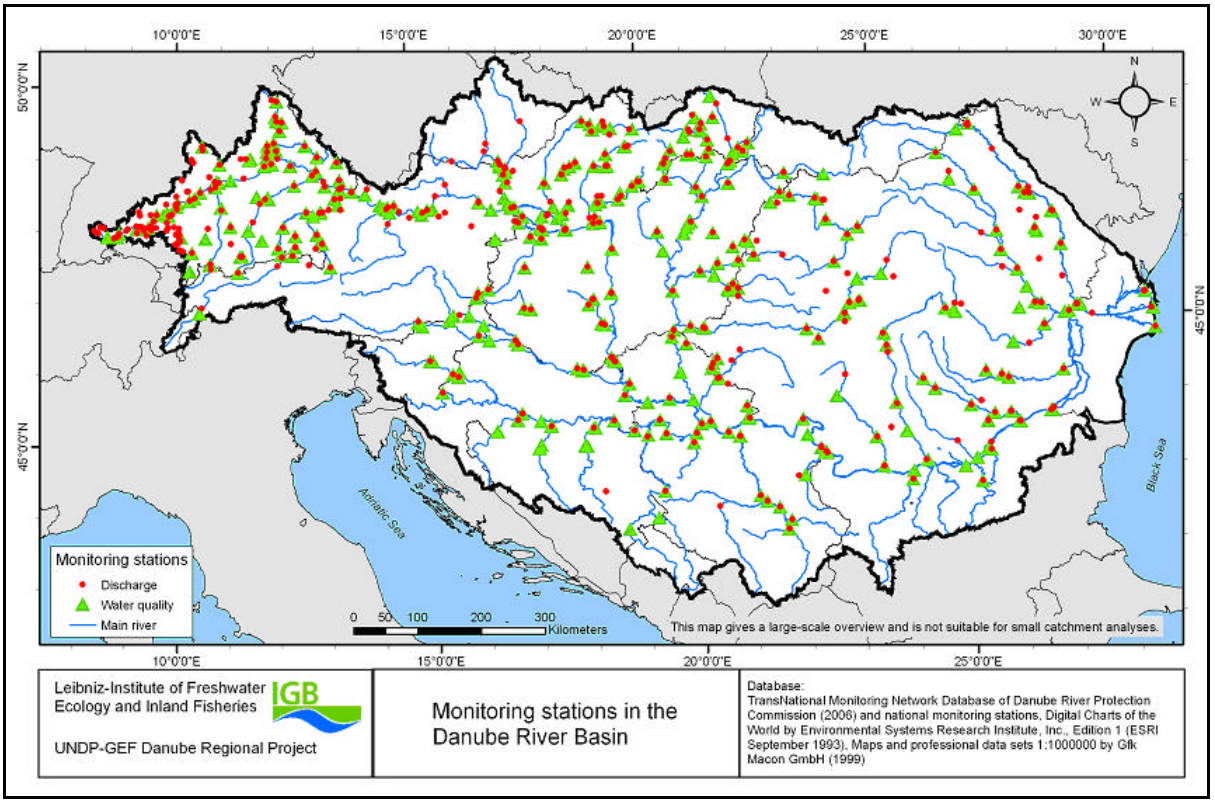
For the MONERIS upgrade of the Danube a manual was developed, which includes a detailed description of the methodology used for the modelling, a description to work with the MONERIS user interface as well as maps and data used as input data for the modelling of the RBD Danube.

Map 1: Wastewater treatment plants in the Danube River Basin according to national reports



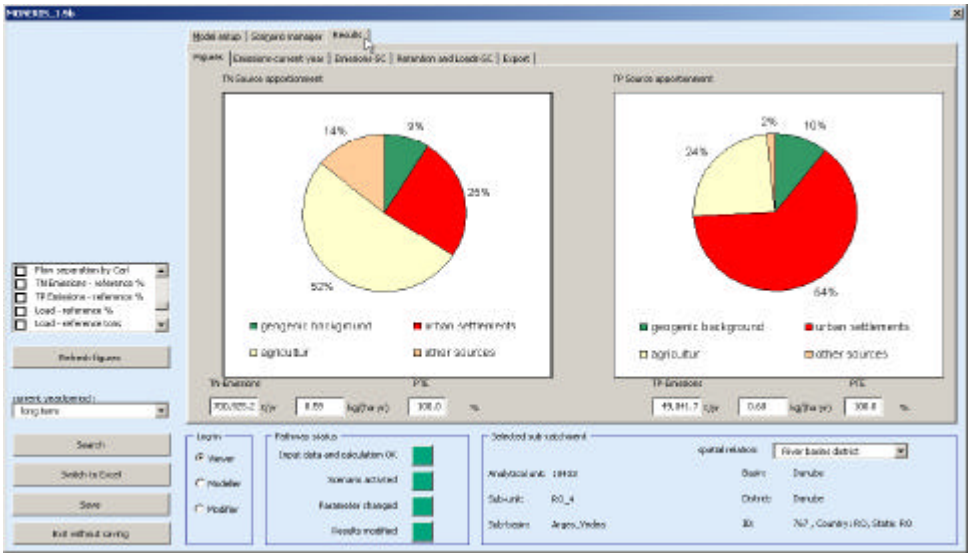
Map 2 presents the monitoring stations in the Danube River Basin in line with the Water Framework Directive.

Map 2: Monitoring stations in the DRB in line with WFD



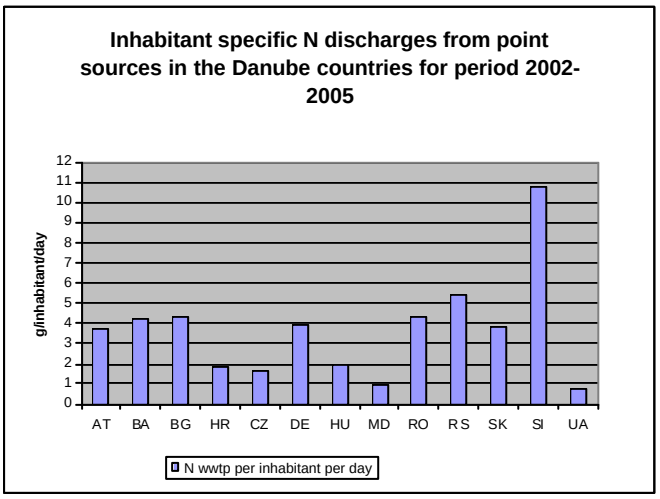
The current status of nutrient emissions in the DRB calculated with MONERIS is presented in the Figure 37. Agriculture provides the largest contribution of N (52%) while urban settlements brings largest amount of P (64%).

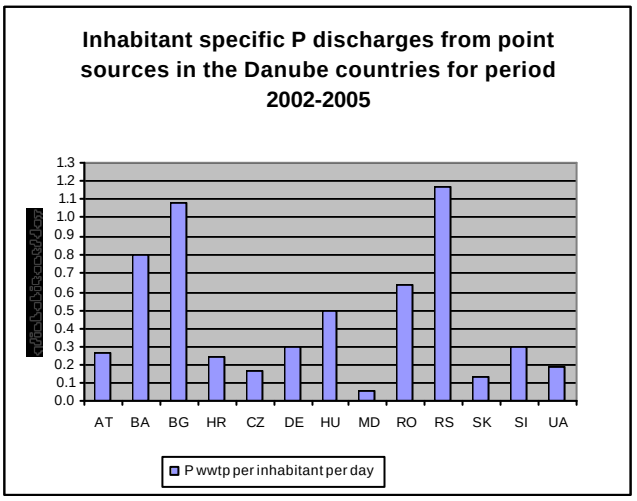
Figure 37: N and P sources apportionment, period 2002-2004



Based on the UWWTD reporting, the inhabitant specific N discharges from point sources in the Danube countries for period 2002-2005 (Figure 38) provides a range of values from 0.3 (Ukraine) to 3.9 kg.day/inh. (Slovenia).

Figure 38: Inhabitant specific N and P discharges from point sources





The consequences of certain targets for N and P can be calculated for total DRBD and individual Sub basin, Sub Unit (SU) or Analytical Unit (AU).

Results of possible scenarios for different targets of reducing N and P provide following results and conclusions.

Scenarios 1 Targets: TP = 0.1 mg/l; TN= 2mg/l for Danube outlet

Needed reduction of load at outlet:
TN: 22108 t/y or 5 %

TP: 5000 t/y or 18%

Scenarios 2 Targets: the level of 1960s: TP = 20 kt/y; TN: 300 kt/y

Needed reduction of load at outlet:
TN: 160000 t/y or 37 %

TP: 5000 t/y or 18%

For TP, the ecological target agrees with the state of the 1960s

For TN the state of 1960s would corresponds to a concentration of about 1.5 mg/l.

Scenario results:

UWWTD applied to all Danube countries.

Expected load:
TN: 420000 t/y or 1.9 mg/l (below 2 mg/l but larger than 1.5 mg/l

TN: for 1.5 mg/l a further reduction of 85000 t/y is necessary or 20 % is necessary

TP: 16000 t/y or 0.075 mg/l

For a target of 2mg/l TN only the concentrations in areas with high portion of tile drainage have to be reduced.

For P, the application of UWWTD it would be sufficient to reach the state of 1960s and to reach levels of TP concentrations below 0.08 mg/l.

For N, the level of further reduction is dependent on the target definition (for 2mg/l non-agricultural reduction would be necessary; for 1.5 mg/l reduction of agricultural and urban sources would be necessary.

5.2.1.3 Use of agricultural pesticides in the DRB

With regard to agricultural policies it is worth mentioning that the current low use of agricultural pesticides in the countries of the DRB presents a unique opportunity to develop and promote more sustainable agricultural systems before farmers become dependent again upon the use of agro-chemical inputs. It must also be taken into account that the levels of fertilizer and pesticide use in the central and lower DRB countries are still relatively low, although there are indications of increasing use again in those countries where the economic

circumstances of agriculture are improving most rapidly. There is concern that with EU enlargement and the expansion of the Common Agricultural Policy (CAP) into the DRB countries joining the EU there is a risk of increasing fertilizers and pesticide use due to (i) increasing areas cultivated with cereals and oilseeds due to the availability of EU direct payments for farmers growing these crops in the new Member States, (ii) increased intensification of crop production, including the greater use of mineral fertilizers and pesticides, particularly in the more favourable areas with better growing conditions, and (iii) a reduction in mixed cropping and an increase in large-scale cereal monocultures in some areas dependent upon agro-chemicals for crop protection.

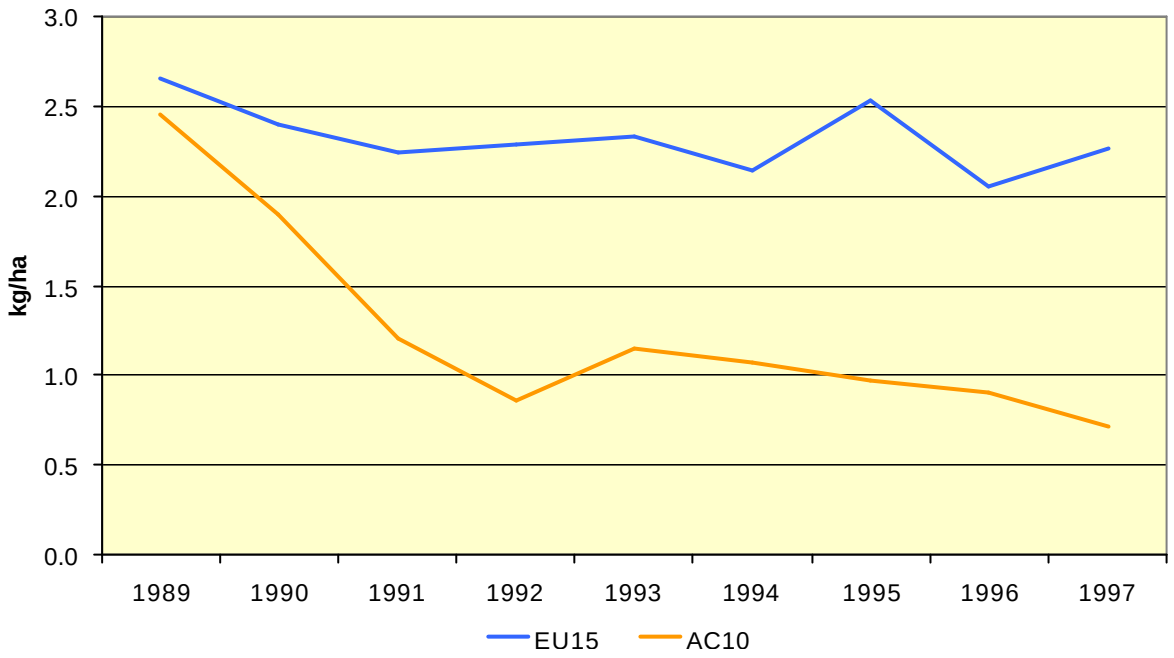
It is also widely acknowledged that there should be more emphasis upon a "farming systems" approach to agricultural pollution control rather than simply an "input reduction" approach – in other words, it is necessary to promote not only the reduced use of agrochemicals inputs etc., but also the re-design of farming systems to make them more environmentally sustainable. A good example of this approach is the promotion of organic farming which involves much more than prohibiting the use of pesticides and mineral fertilisers to include changes in crop rotation, soil manure, the storage and management of manure etc.

Reliable data on pesticide use in the CEE region are not available for the decades leading up to 1990. Data from the FAOSTAT database show a strong decline in pesticide use in the CEE countries to about 40% of 1989 levels compared to a relatively small decrease in EU Member States during the same period (Figure 39).

An additional source of information on pesticide use within the Danube countries is the report "Inventory of Agricultural Pesticide Use in the DRB Countries". The data collected presents a picture of the situation at the national level for eight countries (CZ, SK, HU, HR, BA, CS, MD and UA). An analysis has shown that 29 priority chemicals are used in the Danube River Basin in pesticide products. Of these only three priority pesticides are authorized for use in all of the DRB countries, while seven priority pesticides are not authorized in any of the countries.

Figure 39: Pesticide Consumption in CEE countries and the EU15[1]

Source: Data from the FAOSTAT database of the UN Food and Agriculture Organization.



Although pesticide use is currently relatively low in the DRB countries the risks of pesticide pollution remains:

- Priority pesticides, as well as other pesticides, are frequently detected in surface water and groundwater in the DRB and pose a serious hazard to the environment and human health.
- Seven priority pesticides are not authorized in the Danube countries; some of them continue to be of concern because of the existence of old stockpiles and residues in soils and sediments.
- The uncontrolled and illegal trade of pesticide products lead to the use of banned pesticides (e.g. DDT) by farmers.

An overall estimation of pesticide use in the Danube catchment is not possible. Large data limitations, however, impeded a realistic simulation of reality. Therefore, it expected that future MONERIS calculation would be based on an updated and complete set of data, distributed among river basins identified as in the overview map of the Danube RBM Plan.

The selection of the most appropriate policy instruments to control diffuse pollution coming from agricultural activities, including pesticide pollution for the DRB countries will depend upon the establishment of a clear policy strategy for controlling pollution, together with clear policy objectives in line with DRPC and JAP. There are many factors that are forcing much of agricultural sector to rethink the use of pesticides, as well as many opportunities to promote new management approaches to pesticide use by farmers and policy-makers: Pesticide use reduction, compulsory training, and financial incentives for pollution control.

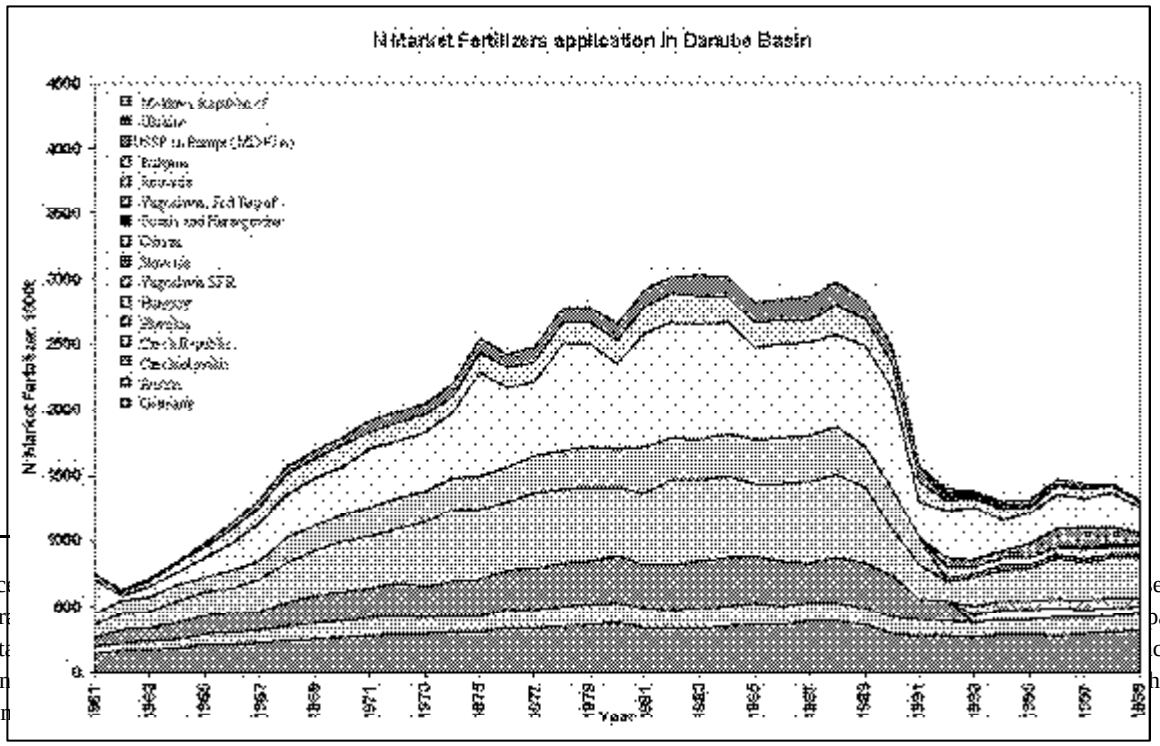
[1] The graph expresses mean consumption of pesticides (active ingredients classed as insecticides, herbicides, fungicides and others) per unit area agricultural land.

In response to this concern, the UNDP GEF DRP have assisted the DRB countries in providing guidance on the development of policies and legal and institutional instruments for the agricultural sector to assure reduction of nutrients and harmful substances with particular attention to the use of fertilizers and pesticides. Within this frame, for Danube River Basin countries, inventories of agricultural pesticide use and of fertilizer and manure use have been completed.

An increase of the application of nitrogen fertilisers in agriculture resulting in an increase in N-emissions is a real challenge Danube River countries are facing in the future. The usage of fertilisers dropped significantly after the collapse of the economic systems in almost all Danube countries in the early 1990s. However, fertiliser use in the two upper Danube countries, Germany and Austria, remained more or less constant over the last two decades meaning that all measures implemented under the EU Common Agricultural Policy (CAP) - and transposed into national legislation - have not influenced fertiliser use (see Figure 40). Therefore it can be assumed – with a rather high probability – that the current rather low use of mineral N-fertilisers in lower Danube countries will increase as the use is below the average (see for example van Gils et al., no date given, Annex 1 and daNUbs, 2005)[2]. A similar result is reported in the context of the numbers of livestock, which is also a major source of nutrient emissions from agriculture. The indicator of surface specific livestock shows that the numbers in lower Danube countries are also below the Danube average (see van Gils et al., no date given, Annex 1) and again it can be expected that the number of livestock will increase in due course leading to an increase in nutrient emissions.

Based on this appraisal it can be said that the future situation looks slightly grim with regard to keeping the nutrient emissions at the 1997 level considering that agricultural N-emissions are around 45 percent of all N-emissions at the DRB level. The share of agricultural emissions differs between countries significantly. Although the focus is solely on agricultural N-emissions the future development of other sources of N-emissions must be considered as further reduction of these emissions (resulting from an increase in wastewater treatment plants - including N and P removal - along the Danube) may offset any increase in agricultural emissions. This possibility clearly exists but the project should be seen as indicative as it examines only the potential policy measures aiming to reduce agricultural N-emissions.

Figure 40: N Market fertilisers application in Danube Basin (Source: NIRAS, 2005**)**



[2] A rec er to be in the r pared to the dat creased use can her low figure n

The political dimension of the study centres around the question whether policy measures implemented in concerted / joint action are cost-effective (i.e. reducing the overall costs necessary to achieve the common – Danube River Basin wide goal of reducing nutrient emissions) as compared to measures implemented unilaterally. As pointed out by NIRAS the concept of trading in water quality policies would be possible in the DRB. However, the necessary condition that such a system may be executed would be that (NIRAS, 2005):

- all involved parties (all riparian countries) agree on a clearly defined water quality level / goal in NWBS; and
- all involved parties (all riparian countries) agree on the principle for sharing the burden of meeting the political goal.

5.2.2 Programmes of non structural measures to control diffuse pollution in the Danube River Basin

The selection of the most appropriate policy instruments to control diffuse pollution coming from agricultural activities, including nutrient and pesticide pollution of the DRB countries depend upon the establishment of a clear policy strategy for controlling pollution, together with clear policy objectives in line with DRPC and JAP.

To ensure significant nutrient loads reduction from diffuse sources of pollution, the Danube countries have identified measures that address policy and legislation-related actions, institutional strengthening and capacity building, raising public awareness and strengthening public participation in nutrient reduction initiatives.

The Joint Program of Measures for the DRB will contain basic and supplementary measures to address diffuse sources of pollution. The information provided by the countries on the program of measures to control diffuse pollution would be used in the development of the Danube River Basin Management Plan. The countries proposed several measures to address diffuse source of pollution, which can be considered for the selection of the Supplementary measures of the JPM, in line with the WFD.

Most of the non-structural measures addressing diffuse pollution, implemented or under the implementation in the DRB include various legal, financial and economic instruments and policy measures to support and implement the WFD, compensation payments for changing land use management, wetland creation and restoration, economic instruments and ecological campaigns.

To facilitate the understanding of progress of implementing policy and regulatory measures at national level to the JAP requirements, various country measures to control diffuse pollution are presented below.

In accordance with EU-regulation 1257/99, **Austria** has elaborated the programme-planning document "Rural Development". A precondition for participation in the different subsidy-programmes is the fulfilment of minimum demands regarding environment, hygienic and animal protection and the integration of "good agricultural practice". The main part of this programme-planning document is the agro-environmental programme "ÖPUL". Austria applies ÖPUL not only in certain sensitive areas but as horizontal approach in the whole agricultural area. To promote progressive environmental practices in regions with intensive agricultural land use, various regional subsidy programmes against nitrates were included into the nation-wide programme "ÖPUL 2000". ÖPUL was carried out each year in the reporting time frame, with in terms of the number of farmers slightly decreasing participation as the number of farmers is steadily decreasing; however,

participation in terms of agricultural area has a slight increasing tendency, resulting in slightly increasing expenditures for the programme. In 2003 around 135.000 farmers (74 % of the total number of farmers) responsible for an agricultural area of 2,3 Mio ha (88 % of the total agricultural area) participated in ÖPUL. The measures of ÖPUL go beyond the legal regulations and include e.g.

- restriction of animal density to 2 LSU per ha, a provision which in principle has to be accepted by all farmers participating in ÖPUL
- tightened restrictions for the application of fertilizer on grassland and arable land
- organic farming which has been actively introduced by 10 % of the farmers thereby essentially abstaining from the use of mineral fertilisers and pesticides
- establishment of a winter coverage on arable land accepted by most farmers with arable land.
- special measures aiming for the prevention of erosion such as the undersowing of crops by grass.

A special part for water protection measures was introduced in ÖPUL in 2001 providing financial support for a predefined set of measures, first to mention the establishment of more special winter plant coverage to allow biological retention of Nitrogen residuals, record of precise Nitrogen-balances for differently cultivated areas and implementation of N-minimum investigations. The regional programmes and some co-operative agreements were negotiated between the Federal Government, the Länder, farmers associations and water suppliers. As a result, a first success of the preventive water protection programmes can be seen: the concentration of nitrate in groundwater is decreasing.

The main principles of the Austrian water protection programs in the framework of ÖPUL 2000 include: (i) interdisciplinary co-operation between representatives of water management and agriculture, (ii) the practicability of the measures, (iii) a fair financial compensation of the services of the farmers, (iv) appropriate conditions for farmers with high intensities of livestock, (v) an additional control of the farmers not participating in the programme, (vi) comprehensive public information and consultation, and (vii) permanent direct contact to the concerned communities and involved farmers through information, guidance and educational campaigns.

The local Sanitation Programmes emerging from the respective provisions of the Water Act were executed on a pilot scale and the farmer advising system continued The National Nitrate Action Programme emerging from the EU-Nitrate-Directive applied on the whole territory of Austria was tightened particularly in regard to the following core-elements:

- the minimum requirement for storage capacity for manure was enlarged to a minimum of 6 months
- the time frame where manure is not allowed to spread was raised from a period of 2 to 4 months (depending on the type of land and of manure)
- the requirement for nutrient application in line with the specific plant needs was introduced
- the nutrient application in areas inclined and around water bodies was bound on limitations.

The arable area is more than 66% of the total territory of **Hungary** and forests cover a further 19%. In Hungary, the main portion of diffuse pollution comes from agriculture. The most important pollutants are nitrogen and phosphorus, and out of the total inputs in the Danube Basin, about 60% of N and 40% of P originate from diffuse sources. The investigation of the sources and pathways of nitrogen has shown that on river basin level, the importance of agriculture for N emissions into surface waters is evident: about half of the input is from agriculture. The main existing national programs in connection with the reduction of diffuse pollution refer to the reduction of nutrient pollution, agro-environmental practices and environmental program of site remediation.

The Government Decree No. 49/2001 stipulates the rules of protection of water resources against agriculture-originated nitrate pollutions. Under the provisions of this degree the nitrate sensitive areas were designated. It covers more than 40 % of the territory of the country.

The implementation program of Nitrates Directive, aiming to the introduction of the best agriculture practices, was started in 2002. Financing needs of this program for next 10 years is estimated as 200 million EURO.

Almost half of the livestock farms subject to IPPC (245 farms) is located on nitrate sensitive area, 67 % of which use liquid manure technology. Considering data of 2005, 50 % of manure stores in farms with liquid manure technology generally meet the requirements. In compliance with the current legislation, it means insulation on nitrate sensitive areas and size of facility for storing manures during 4 months.

Support by SAPARD helped manure handling in 66 livestock farms. With the help of ARDOP supports, some 200 livestock farms could develop the available facilities to meet the requirements (livestock farms with more than 200 LU).

Comparing the data it is found that the resources available for supports made possible the operation of manure handling and storage for more than 500 livestock farms between 2002 and 2006 according to the provisions.

Hungary efficiently promoted coherent environment-friendly agriculture. As a result, several grants have become available since 2004. More than 25 thousand farmers received grants for a five-year period, several times greater in value before, i.e. amounting to 170 million EUR. Consequently the size of land cultivated in an environmentally and nature-friendly manner has risen from 153 thousand hectares to approximately 1.5 million hectares since 2001. From this, the extent of Sensitive Natural Territories has increased from 22 thousand to 120 thousand hectares during this period.

The government in **Romania** has introduced BAP, including erosion control and clean manure handling and Low Input Sustainable Agriculture (LISA) as to achieve an effective integration of ecological techniques, with lowest possible input levels. It is expected that in future the content of nutrients will continue to decrease.

Efforts are already taken in Romania to implement the following measures: (i) elaboration or improvement of national laws, regulations and normative regarding agricultural production in line with environmental requirements, (ii) organization of an informational and monitoring system concerning agricultural activities, (iii) organization of pilot demonstration farms, (iv) organisation of training courses, seminars and workshops for farmers, (v) development of the dry farming and irrigation within the areas affected by droughts, (vi) develop animal husbandry outside of villages and rural settlements, etc.

The most important non-point sources that affect **Slovenian** surface and ground waters are: agriculture, dispersed settlement and atmospheric depositions (mostly caused by transport & traffic). According to NEAP complex measures to reduce this are implemented or in preparation. Slovenia has introduced the Code of Good Agricultural Practice.

Some measures are: (i) since January the 1st 2003 the limit value for annual input of organic nitrogen disposed with animal manure is limited to 170 kg/ha, (ii) the whole Slovenian territory is claimed to be vulnerable area, (iii) annual input of phosphorus is limited to 120 kg per/ha while annual input of phosphorus is limited to 300 kg/ha, and each individual farm has to have a fertilisation plan made by Agricultural Advisory Office. Slovenian agricultural environmental program for period (2001-2006) was adopted in 2001 as a part of agricultural reform in Slovenia. The program is oriented to nature friendly methods of farming, so the harvest and food are safe for consumers. The program is divided to 3 groups of measures, such as: direct payment for reduction of agricultural negative impacts on environment (integrated production, reduction of agricultural load, ecological farming), preservation of nature goods, biotic variety, fertility and traditional cultural region,

and protection of protective areas, and education of farmers, employees, public institutions, and informing of public about the importance of agricultural environmental measures.

For **Czech Republic**, the main part of diffuse pollution comes from agriculture, atmospheric depositions and soil erosion. The increasing importance of non-point sources is connected with the decrease of pollution from point sources. The share on the total pollution is essential in nitrates and acidification, less in phosphorus, and is diverse in different regions of the Czech Republic, in dependence on population density, percentage of treated wastewaters disposal, intensity and farming practices and the level of atmospheric deposition.

Recent results of research on demarcation of vulnerable regions threatened by nitrates in compliance with the Council Directive 91/676 EEC show, that the area of surface and ground waters afflicted by nitrate pollution occupies 42,5 % of the total agricultural land, which represents 36% of the whole Czech Republic territory. For vulnerable regions special action programmes comprising measures for nitrate pollution reduction from the agricultural sources are under implementation.

The Ministry of regional development of the Czech Republic implements Rural Recovery Programme oriented on recovering of sound land use, traditional values of living in country, sustainable development of agriculture. The Programme for Subsidising of Extra-production Functions in Agriculture of the Ministry of Agriculture helps to changed structure of agricultural production to support lasting growth planting, to bring the soil in standstill and non-food agricultural products. The scope of Programme of Care for Landscape of the Ministry of Environment is broad and includes e.g. support for environmentally sound landscape management, rescue of protected species, measures for disposal of old chemical burdens etc.

The main source of diffuse pollution influencing water quality in **Slovakia** is agriculture. Studies have indicated that agriculture can contribute as much as 40% of the nitrate pollution of water bodies. The following three factors were found to be the major causes of agriculturally related diffuse pollution: (i) high, and often unnecessary, applications of mineral and organic fertilisers to the soil (especially before 1989), (ii) water erosion on arable land caused not only by unsuitable soil type and topography, but also by inappropriate choice of crops, plant rotation and soil cultivation, and (iii) incorrect crop choice and rotation in the vicinity of potable water sources. Three codes which embrace the current legislation have been produced by the Ministry of Soil Management (Agriculture) of the SR: Code of Soil Protection (1996), Code of Good Application of Fertilizers (2000), and Code of Good Agricultural Practice for the Protection of Water Resources (2002).

The economic transition process has caused significant reduction of industrial and agricultural production, thus temporarily reducing production-related pollution loads as well in **Croatia**. Besides the Strategic Development Framework, Croatia's basic development orientations have been defined in socio-economic development documents and sector strategies and plans. The sector strategy relevant to the agriculture is the Agriculture and Fishery Strategy (2002). Croatia started to implement in 2003 a World Bank project on Agricultural Pollution Control - under the Strategic Partnership Investment Fund for Nutrient Reduction in the Danube River and Black Sea. The development objective is to increase significantly the use of environmentally friendly agricultural practices by farmers in Croatia's Pannonian plain in order to reduce nutrient discharge from agricultural sources to the Danube River and Black Sea. In Croatia, the Danube river, as well as its tributaries, the Sava and Drava drain sixty percent of Croatia's territory (approximately 33,940 sq km out of a total of 56,538 sq km). The three rivers flow southeast, through the Pannonian plains that make up the bulk of Croatia's agricultural lands. These rivers are therefore of particular significance for the agricultural sector of Croatia and play a critical role in preserving the natural ecological conditions of the region. The impact of the intensive fertilizer and pesticide application in the most fertile lowland areas adjacent to surface water courses is manifesting itself in increasing water pollution and loss of biodiversity which has significant ramifications for national agricultural productivity and efficiency, soil fertility, and maintenance of the biological ecosystem. Agriculture accounts for 53% of the total nitrogen load in the surface water of the Croatian Danube basin. Public health repercussions of nutrient, agrochemical and bacterial groundwater pollution in an environment

where access to piped household water supply is scarce, is widely recognized by the rural population of the Pannonian plain to be the major threat to the wellbeing of the affected communities. Through the project several non-structural measures will be implemented aiming at mitigating nutrient loads to water bodies from diffuse source pollution: development and promotion of agro-environment measures which will assist with the implementation of the Code of Good Agricultural Practices (CGAP), and public awareness and replication strategy which will disseminate the benefits of proposed project activities.

Within the frame of the project "Protection of Waters from Pollution caused by nitrates from agricultural sources", financed by the Regional Environmental Approximation Programme (REAP), with the help of data from the National Water Monitoring System of the Bulgarian Ministry for Environment and Water, for 450 sampling points for surface and ground waters, the following results were achieved: (i) the polluted, threatened and vulnerable water sites were identified in relation to the impact of nitrates from agricultural sources through the use of nitrogen fertilizers and growing of animals, (ii) measures were identified for limitation and elimination of water pollution caused by nitrates from agricultural sources, and (iii) and rules for good agricultural practice were elaborated and published (part of the rules concern the facilities for appropriate storage of farm manure).

Agricultural activities cause serious pollution of water bodies with agro-chemicals (pesticides, herbicides and artificial fertilisers), nutrients and microbiological compounds in **Ukraine**. The agricultural sector is one of the largest consumers of water resources for farming purposes, irrigation, amelioration facilities, food processing and fisheries. Therefore agricultural policy oriented on best available technologies and practices of environmentally friendly food production is an important factor of prevention of pollution of water ecosystem. State Committee for Fisheries (branch of the Ministry of Agricultural Policy) has the responsibility of the development of policy and regulations in the field of fish farming and fisheries as well as for monitoring and control of compliance with quality criteria of water bodies designated for fisheries purposes. The development and keeping updated land survey data and Land Cadastre, assessment of soil quality and pollution, and state control of use and protection of lands (i.e., implementation of measures for land protection against erosion, landslides, high water tables, formation of wetlands, secondary salinization, pollution, littering, prevention of construction and other activities with high potential risk of deterioration of ecological conditions of lands, etc. represent the responsibility of the State Committee of Land Resources of Ukraine.

Based on the national contributions, both within the frame of the P&M EG work as well as for the UNDP GEF DRP, the list of agri-environmental measures currently used or under the implementation in selected Danube countries is presented in the Table 36.

Table 36: Policy instruments and practical measures addressing agricultural pollution in the DRB

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
CZECH REPUBLIC				
Government decree 505/2002 support - MoA		✓	Nutrients and silt in waters due to erosion and pesticides use	Arable land conversion to grassland on slopes, All practices associated to organic farming according EU and Czech rules
Program for Nature and Landscape - MoE		✓	Nutrients and silt in waters caused by erosion	Erosion prevention
Investment support – MoA and SAPARD		✓	Nutrients pollution	Manure storage facilities renewal
Law about fertilisers	✓		Nutrients pollution	Manure storage facilities renewal, record keeping, timing of fertilisers use and locations with restriction (into waters)
Directive about storage and use of fertilisers	✓		Nutrients pollution	Manure storage facilities renewal, record keeping, timing of fertilisers use and locations with restriction (into waters)
Government decree vulnerable zones	✓		Nutrients pollution	Manure storage facilities renewal, record keeping, timing of fertilisers use and locations with restriction (into waters), soil erosion practices-contour farming etc.
Law soil protection	✓		Any pollution, heavy soil erosion	Preventing any activities causing soil degradation
Law plant protection	✓		Pesticides	Proper storage, use only approved machinery and pesticides
HUNGARY				
Agri-environment measures		✓	Nutrient and pesticides pollution	Environmentally friendly farm management techniques
Government decree vulnerable zones	✓		Nutrients pollution	Manure storage facilities renewal, record keeping, timing of fertilisers use and locations with restriction (into waters), soil erosion practices-contour farming etc.
Investment support – MoA and SAPARD		✓	Nutrients pollution	Manure storage facilities renewal

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
Regulation on fertilisers	✓		Nutrients pollution	Manure storage facilities renewal, record keeping, timing of fertilisers use and locations with restriction (into waters)
Law plant protection	✓		Pesticides	Proper storage, use only approved machinery and pesticides
SLOVAKIA				
The Water Act 184/2002 Coll., set penalties in case of violation of regulations on protection of ground- and surface waters	✓		Pesticide nutrients, farm waste	Penalties are set in case of violation of Water Act, particularly: • Limits on wastewater discharge into ground and surface waters in all areas. • Limits on airplane application of fertilisers and building of large capacity farms in all areas. • Limits or prohibitions of agricultural practices in protection zones of water resources.
The Waste Act 223/2001 Coll., set penalties for violation of regulations of waste treatment	✓		Farm waste	Penalties for not keeping rules of the manipulation of farm waste according to Waste Management Plan (substances from pesticide processing, silage effluent, organic and mineral fertilisers and its liquid parts), which identify the waste products and how managed.
The Act on Agricultural Land Conservation 307/1992 Coll (am. 83/2000 Coll.), which set penalties for violation of the rules.	✓		Soil erosion, (nutrients, waste)	Penalties on change the land type, do not implement agricultural practices, which ensure general protection of soil and its functions and the prevention against invasive species. Act allowed to establish "special management" for agricultural land that is prone to risk: • measures for improvement of water regime and water quality • limits of fertilisers and pesticides • waste treatment measures • revitalisation of agricultural land (conversion of arable land to grasslands) • prohibition of agrotechnologies.
State Fund for protection and revitalisation of agricultural land.		✓	Soil erosion, farm waste.	Improvement of waste management, storage facilities for manure, silage, slurry, and investment into agrotechnologies, measures against soil erosion, revitalization of grasslands. The measures are provided through regular subsidy system which set priorities every year.

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
Decree on Rural and Agricultural Development Plans and 717/2002 - Agri-environmental programme SAPARD		✓	Nutrients, pesticides, soil erosion	Reduction of fertilizers and pesticides on arable land and on grasslands, maintenance of grasslands, conversion of arable land to grasslands, special measures for wetlands protection, measures against soil erosion
The implementation of The Act on Fertilisers 136/2000	✓		Nutrients	Penalties for use of unregistered fertilisers, application of fertilisers by the way that damage the environment. Application of all fertilisers and manure application in wet (drench), frozen or snow-covered land.
Act on Nature and Landscape Protection 543/2002 Coll., that set penalties for violation of the law and provide compensation of limited agricultural practices.	✓	✓	Nutrients, pesticides, sillage effluent.	Penalties for not allowed agricultural practices in all areas or in protected areas (application of fertilizers and pesticides, ploughing the grasslands, inappropriate use of wetlands, etc). Compensations for restricted agricultural practices (outside of terms of Act on Soil Conservation) or financial contribution to achieve good status of land that requires implementation of measures outside of obvious land management.
The Act on Organic Farming 224/1998 Coll., special subsidies for implementation of organic farming according to FAO.		✓	Pesticides, nutrients.	Rewards for limits or prohibition on pesticides and fertilisers use and crop rotation in areas of organic farming.
Programme for support of implementation of environmental measures (water pollution issues)		✓	Water protection and waste management.	The objective of improvement of water pollution is generally defined, however, it provides option for support of agricultural practices to improve water quality.
SLOVENIA				
Regulation on SAEP and introduction of direct payments for measures in 2002-2003 (EKO2, EKO 3)		✓	pesticides, nutrients, soil erosion	Measures encouraged: (1) Reduction of the negative impact of agriculture on the environment: • reduction of animal density/ha and excessive input of farm wastes into soil • suppress overgrowth of agric. land with forest

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
– the Slovenian agri-environment programme				• reduction of erosion in orchards and vineyards • maintenance of plant rotation to improve soil characteristics and fertility - • integrated fruit production integrated viticulture (vine growing) • organic farming (2) Maintenance of natural features, biodiversity, soil fertility and traditional cultural landscape: (3) Protection of the protected zones (nature and water protection zones): • maintenance of farmed and populated landscape on nature protection areas; • restructuring of animal breeding in the area of large wild animals (bear etc.); • maintenance of birds' habitats • plant cover on water protection zones • introduction of grass cover and of fallow All measures within (3) reduce pollution from agriculture. Obligation for the farmer: to implement the selected measures until 2006.
Local communities: refunding inspection costs		✓	pesticides, nutrients, soil erosion (indirectly)	Organic farming, integrated plant production
Local communities: higher % of grants		✓	pesticides, nutrients, soil erosion (indirectly)	Organic farming (50%) and integrated farming (30%)
Penalty (4.200 – 42.000 EUR); Water Act	✓		plant nutrients and pesticides	Use of fertilisers or pesticides on water protection zones
Penalty (630 – 5.100 EUR); Agricultural Land Act	✓		very general reference to pollution	Pollution of agricultural land
Penalty (630 – 5.100 EUR); Agricultural Land Act	✓		very general reference to the "good farmer /manager"	Good agricultural practice
Penalty (420 – 630 EUR); Phytopharmaceuticals Act	✓		pesticides	Misuse / overuse / improper use of pesticides

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
Penalty (minimum 840); Regulation on the input of plant nutrients and dangerous substances into soil	✓		plant nutrients	Violation of the Regulation
BULGARIA				
Water act	Fine (2500 - 7000 EURO)		Nutrients Pesticides Farm wastes	Fine, or sanction is imposed on natural or legal entity that pollutes the coastal areas, that could be potentially flooded and violates the following restrictions: 1. storage of pesticides, fertilizers pesticides, disposal and treatment of wastes 2. building of livestock farms; 3. construction of buildings
Act on protection of agricultural lands		Tax and credit preference	Erosion	The land owners and land users have the right to certain tax or credit preferences when the apply: 1. the obligatory restriction for the usage of the agricultural lands; 2.the recommendations for preservation of the surface layer and its ecological functions; 3. antierosion agrotechnics; 4. systems for organic agriculture and agriculture with low use of pesticides and fertilizers; 5. projects restoration and improvement of the fertility of agricultural lands
Act on protection of agricultural lands	Fine (60 - 1000 EURO for first violation; 120 to 2000 EURO for second)		Erosion	The fine is imposed when certain activity that leads to damaging, pollution or land degradation is performed
Water protection act	Fine			Everyone who is responsible for dangerous soil changes (including pollution with pesticides, manure and mineral fertilizers, as well as soil degradation from

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
				water and wind erosion with its anthropogenic aspects) is obliged to restore to previous functions of the soil
SAPARD measure Development of environmentally friendly practices and activities		Incentive direct payments		From 2006 the farmers are entitled to certain incentives for performing environmentally friendly practices and in certain regions. One condition is to comply with codes for Good farming practice
CROATIA				
Subsidies for ecological agriculture		✓	nutrients, pesticides	all ecologically based systems of agricultural production – crop production, livestock production, aquaculture
Water protection fee, penalties for non-observance the Law on water	✓		harmful substances over permitted marginal values	n.a.
Fines, charges and penalties for farmers applying slurry and liquid manure during winter and in quantities other than those prescribed by the Regulation on agricultural land protection from contamination with harmful substances	✓		nutrients	rarely enforced to small-size private farms, mostly to the big (ex-state) farms
ROMANIA				
Fines and penalties	✓		Nutrients Pesticides Farm wastes	a) Storage and using of pesticides, nutrients or other toxic and dangerous substances within protected areas; b) Storage of any types materials on river beds or banks of water flows, water channels, dams, lakes, ponds and see-wall or in their protected areas; c) Washing in water flows, lakes and their beds of animals disinfected with

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
				toxic substances by using of detergents and packages which contains pesticides or other dangerous substances; d) Grazing within protected areas of water flows;
BOSNIA & HERZEGOVINA: Federation of Bosnia & Herzegovina				
Water protection charge	✓		General water pollution	The water protection charge is not specifically focused to any farming practice. Buyers of fertilizers and chemical agents for plant protection are charged per unit of fertilizer and chemical agent sold: they are therefore encouraged to reduce the amount of these chemicals bought and used.
Penalties	✓		General water pollution	Penalties are not specifically focused to any farming practice
BOSNIA & HERZEGOVINA: Republic of Srpska				
Law Agricultural Land Punishment regulation Prohibition of use	✓		Harmful substances Fertilisers	Prohibition and punish discharges of manure and harmful waste in water and irrigation systems Prohibition of use fertilisers that does not meet the standards
Environment protection law *Official Bulletin* – SG of RS No. 53/2002, Payments for damages Responsibility	✓		Dangerous and harmful substances	Measures for strengthen of conscience of farmers. Directing on right disposal of waste and slurry.
Water protection law, *Official Bulletin* – SG of RS No. 53/2002, Punishment regulation	✓		Waste water Fertilisers and pesticides	Prohibition of application fertilizers and pesticides on waterside Prohibition of discharges farm waste
MOLDOVA				
The payments for the waste-water pollutants discharge into water bodies and waste disposal sites	✓		Farm wastes	Storage of farm wastes in permitted places and in limits of established specifications
The fines for soil pollution with pesticides and farm	✓		Farm wastes, pesticides, soil erosion	The prohibition of soil pollution with pesticides and farm wastes, annihilation of fertile layer of soil

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
wastes and causing erosion				
The fines for non-observance of the requirements on evidence, storage and use of pesticides	✓		Pesticides	The prohibition of infringement of the standards on evidence, storage and use of pesticides, application of pesticides in sanitary and water protection zones
The fines for infringement of the water protection rules	✓		Nutrients, farm wastes, pesticides, soil erosion	The prohibition of water pollution with nutrients, farm wastes, pesticides and provocation of soil erosion by the water
The fiscal facilities for the reduction of water pollution		✓	Nutrients, farm wastes, pesticides	The application of nutrient, manure and integrated pest management
SERBIA				
Law on plant protection (Off. G. FRZ no.24 1998)	✓		Pesticides	
Rules on pesticides and fertiliser packing and disposal (2001)	✓		Pesticides, fertilisers	Pesticides and fertilisers packing storing and disposal (protection soil and water)
Ordinance on banned and restricted use of plant protection products	✓		Pesticides	Legal instrument to harmonize our standards with international.
Law on the Fund for stimulation of development of agricultural regions 2001		✓	Nutrients, pesticides, fertilisers, erosion	Financially support to farmers, under favourable conditions, to introduce new agricultural technologies, switch to organic farming and similar.
Law on Environmental protection 1992 Chapter IV-Protection of soil	✓		Fertilizers, pesticides, Hazardous waste	Establish criteria for monitoring and planning documents for its realization.
UKRAINE				
KMU Directive “On Approval of Environmental Pollution Fees Procedures and Payment of such Fees”	✓		Pollution by all substances	Penalties for non-compliance with requirements of environmental protection legislation regarding water resources

Economic Instrument	Punish?	Reward?	Pollution Issue	Farming Practices Encouraged/ Discouraged by Economic Instrument
Law of Ukraine" Ratification of Convention on Cooperation on Protection and Proper Usage of Danube River"	✓		Pollution by all substances	Application of the "polluter-pays" principle in compliance with additional regulations elaborated in order to guarantee execution of the Convention requirements

5.2.3 Implementation of JAP national investment programs: land use sector

There is a significant lack of information at national, regional and local level on the causes of agricultural pollution and the practical measures available to farmers for reducing the risk of pollution from their farming activities. An urgent need exists for awareness raising and information to be targeted at all stakeholders levels from farmers to policy-makers. Since farmers are economically motivated it is important to link the promotion of more environmentally friendly farming methods to economic benefits such as improvements in yield and savings in the cost of agrochemical inputs. The development of appropriate agricultural advisory messages is therefore essential, including well-written and appropriate advisory materials, demonstration plots/farms, training for advisors and other capacity building of agricultural extension services.

In the lower DRB countries especially it is important to consider the pre-conditions or "framework factors" for the successful promotion of BAP – in particular how to overcome the obstacles to BAP that arise from the fragmentation of land ownership, lack of financial resources, lack of institutional capacity, lack of basic business skills amongst farmers (e.g. keeping records), poor standards of education and training etc.

The Member States in the DRB are already implementing national agri-environment programmes. For the new 2 Member States (Romania and Bulgaria) financial assistance has been available for developing and implementing "pilot" agri-environment measures with SAPARD co-funding – the Special Pre-accession Programme for Agriculture and Rural Development. According to the SAPARD Implementing Regulation No. 1268/1999, EU co-financing support may be provided for all the agri-environment actions described in the Rural Development Regulation No. 1257/1999.

The resources available for agri-environment measures, including those with a positive role in controlling diffuse pollution from agriculture like land use measures, are proposed to increase following the recent "mid-term review" of the CAP. Such a shift would provide a helpful foundation for other measures aimed at pollution abatement. However, there is no certainty that a significant change in farm management will occur.

There are some land use investments reported for the interim report that are listed below.

Ukraine reported a project on Improvement of land quality, minimization of land erosion and soil wash-out in Lower Danube Area started in 2002 and completed by 2005. The total investment cost is 3.4 MEUR, not yet secured.

In **Austria**, a total of 614 MEUR was spent 2003 for the promotion of environmentally benign production methods and partially to compensate income losses by reduced harvests and additional expenditures.

The tools within the CAP need to be investigated in support of WFD implementation, in particular for the development of program of measures. Specific measures like the introduction of Code of Good Farming Practice to control diffuse pollution, standards on fertilisation, environmental friendly investments (i.a. reduction of emissions) are to be considered in accordance with WFD requirements.

5.3 Wetland and floodplain restoration

5.3.1 Addressing the nutrient retention

Wetlands, in particular floodplains connected to rivers, act as nutrient filters and a significant proportion of the projected N and P removal in the Danube River Basin are assigned to this sector in the JAP (Table 37). According to the article 3.3. of the JAP, "*Contracting Parties have agreed to implement the proposed measures, during the implementation period* of the JAP, i.e. till 2005".

Table 37: Expected nutrient reduction from wetlands as planned by the JAP

Expected Nutrient Reduction in the Danube River Basin				
Sector	Nitrogen		Phosphorus	
	tons/year	%	tons/year	%
Wetlands	29,872	36,8	2,989	14,7

A precise quantification of N/P uptake by wetlands depends on many varying factors associated with the complex functioning of the ecosystems, and, thus, N and P reduction achieved through wetland restoration efforts can only be estimated in approximate terms. A WWF study for UNDP/GEF PRP (1999) concludes that a total of nearly 300,000 ha of potential wetland area restoration represent an approximate reduction of ca. 30,000 tons N and 3,000 tons P per year:

Table 38: Expected nutrient reductions from wetlands

Expected Nutrient Reduction in the Danube River Basin		
Potential Area for Restoration, ha min - max	Nitrogen, t/a min – max	Phosphorus, t/a min – max
214,045 – 298,693	21,405 – 29,869	2,140 – 2,987
Source: Report on "Evaluation of floodplain areas in the Danube River Basin", February 1999, WWF		

At the level of Danube countries many actions to protect wetlands are happening.

The updated assessment at the end of the implementation period of the JAP has found that among the 13 DRB countries, a total of 57 wetland restoration projects have been implemented. These projects encompass more than 250,000 ha, which represent an estimated potential nutrient reduction of ca. 25,000 tons N and 2,500 tons P per year.

The estimated nutrient reduction for the wetlands sector is quite comparable to the WWF estimations made in 1999, particularly considering that wetland restoration projects in Croatia are not yet included in the above compilation, and further data are being collected for the Ukraine projects. The one wetlands restoration project in the Ukraine has an estimated budget of 10 MEUR, but project details were unavailable.

There are four wetlands projects reported in 2006 by Ukraine, which were not planned in 2000.

Several wetlands projects in Austria, Germany, Hungary and Czech Republic and a few in Slovakia and Slovenia were completed by 2003. There are a number of projects finalised by 2005 in Austria, Germany, Hungary, Slovakia, Romania and 3 in Bosnia & Herzegovina.

It has to be stressed that these wetland restoration projects have different relevance for nutrient reduction and nutrient uptake is not always their (main) objective. In some cases, the nutrient reduction effect of restoration works can go much beyond the indicated project area (e.g. removal of a barrier that disconnected the wetland), while in other cases the nutrient load of the river or the specific project effect and therefore also the reduction effect is rather small. This is why in the ICPDR database of investments updated in 2005 based on the interim reports, an effort was made to attribute relevance levels for nutrient reduction to each project. This was not possible to be done for the final implementation report of JAP, as data were not sufficient for interpretation.

Further, the summing up of the nutrient reduction potential was difficult because the national information provided for some of the projects was unclear and insufficient. For example, some projects actually do not relate to nutrient removal while others refer to the same sites.

For all 57 reported projects, cost estimations were available: 220.80 MEUR, with Germany representing 60% of the total costs (135 MEUR). In addition to the fact that cost levels are considerably higher in Germany than in many of the Danube countries, there are several other possible explanations for the high proportion of total cost associated with the German projects. For example, land acquisition might be included in the project costs for Germany but not by the other countries. Thus, it is also possible that the costs indicated for some of the central and lower Danube projects are under-estimated.

A high percentage of the Austrian (7), Hungarian (7), and Czech (6) projects were also reported, whereas none is completed yet by Serbia and Croatia.

Compared to nutrient uptake attained through municipal wastewater treatment investments, the cost efficiency of the wetlands restoration efforts is quite high. This can be only discussed based on the interim reporting of the projects in 2004. Considering that 191 municipal projects (excluding AT and DE) are estimated to achieve N 9,070 tons/year and P 44,400 tons/year, respectively for a total investment of 3475 MEUR, in the wetland sector projects nearly 20,000 tons N and 2,000 P tons per year reduction will cost only 140 MEUR. The same analysis is not possible for the final report due to inconsistency and missing data.

It is important to note that unlike the other sectors, wetlands are not sources of pollution, but rather have an inherent capability to uptake nutrients. As a direct or indirect consequence of wetland restoration, considerable amounts of nutrient can potentially be taken up by wetland flora. Wetlands restoration, therefore, should not be considered as a comparable substitute compared to point and non-point source pollution reduction efforts.

Besides nutrient removal, municipal wastewater treatment projects achieve many other societal and environmental benefits, such as improved sanitation and decreased organic matter loading (BOD). But solely considering nutrient reduction, wetlands restoration is clearly an efficient measure. Realisation of investment projects in the wetlands sector will not only greatly contribute to reducing nutrient levels in the Danube River Basin but also significantly improve flood protection, biodiversity, groundwater supply, and biomass production (timber, hay, fish, etc.).

In **Germany** more than 100 million Euro estimated to realize watercourses development and floodplain projects. The projects were started in 2001 – 2002, one project is completed, and the other ones are schedule to be completed between 2005 and 2020. The Bavarian government is fully or partially financing the projects, and only 2 are co-financed with EU funds.

While the global "Ramsar Convention on Wetlands" with its basic principles, guidelines and recommendations delivers a certain technical and strategic background, for **Austria** and probably most other EU-member states it is more the European Natura 2000 network and its instrument that provide the legal and financial basis for effective wetland- and floodplain restoration.

In a cooperation network between representatives of water management and nature conservation administrative and technical service units of the Länder and of the Federal level as well as of NGOS a series of best-practice river restoration projects in Austria take place, which are funded by the EC LIFE-Nature Programme. Co-financing from EC amounts up to 50 % of the total project costs. The restoration-projects usually run for 4 – 7 years.

Generally a set of measures and purposes is aimed for, hereby addressing water management and river structure, forest management, land-use, nature conservation, public awareness raising and possibly also tourism. Also the maintenance and/or improvement of the situation of species of wild animals and plants and their habitats, according to the Habitats Directive (92/43/EWG) and Birds Directive (97/49/EG) may be intended. New partnerships, once established throughout LIFE projects, mostly create benefits for other water management projects.

By 2003, on rivers Danube, March/Morava and Drau/Drava three major wetland and floodplain restoration projects were finalized. On the rivers Danube, Lech, Mur and Lafnitz six major restoration projects were started.

All these projects were planned in coordination between Water Management and Nature Conservation and are co-financed by the European Commission throughout the LIFE-Nature Programme.

The network of wetlands accounts for a considerable part of the national ecological corridor system in **Hungary**. The water habitats have been restricted to small areas due to the flood control. The quality of these habitats and the quality network of wetlands have deteriorated significantly in the past decades due to drying out, eutrophication, constructions, reservoirs, dyke systems etc. For the protection of these sensitive ecosystems 21 areas are part of the Ramsar Convention.

Programmes have been launched for the protection of certain plant and animal species proposed in Annex II of the EU Habitat Protection Directive, coordinated by national park directorates. These programmes include the assessment of populations, monitoring in certain cases, development of protection programmes, definition of the conditions of protection and implementation. Total area of the wetland restoration projects is 11 340 hectare, with about 7.4 million Euro estimated cost. All project areas were designated as a part of Natura 2000 network. They are directly connected with the large rivers (Danube and Tisza), and many species and habitats of community importance occur on them. On the basis of the requirements of the Birds Protection Directive, a proposal has been made for the identification of special birds protection areas forming part of the Natura 2000 network and the development of a strategy and action plan required for their preservation. To implement the requirements of Habitat Directive the Hungarian Act LXXVI/2004 on Nature Protection was modified in second half of year 2004. Also, in the same time came into force the Government Decree No. 275/2004 on the Nature Protection Areas of European importance. The anticipated expenditures likely to be incurred in managing Natura 2000 sites in Hungary are cca. 15 MEUR/ year. (Consisting of cca. 11 MEUR investment costs of restoration projects, 3 MEUR/year for incremental operational and management costs and cca. 1 MEUR/year for compensations and institutional developments and monitoring).

According to the actual State Environmental Policy in **Czech Republic**, considerable attention is paid to wetland ecosystems, to rehabilitation of aquatic biotopes, to effective and sustainable protection of surface and groundwater bodies, to harmful contaminants, to integrated water protection and management. By way of river basin management plans, measures to protect wetlands and floodplains would be implemented. Use of wetlands and water resources should be sustainable in view of economic pressures and global changes, and this includes principles referring to landscape and environmentally sound agricultural practice, wetland and floodplain uniqueness, restoration, remediation and rehabilitation of damaged wetlands areas.

The Czech Republic manages 24-wetland rehabilitation or restoration projects with total area 120 km2 (12,000 ha) and with total cost about 6.2 million EUR. According to the updated time schedule some of projects will be finished till 2008.

The **Ukrainian** State Program on the National Environmental Network Development for years 2000-2015 is aiming at implementing the requirements of the Pan-European Biological and Landscape Diversity (1995) in respect of the issue of the development of a Pan-European Environmental Network as an integral spatial system. Lands of Water Fund, wetlands, and water protecting zones are considered as a component of Environmental Network. The Program includes financial estimation of funds needed for measures implementation but did not provided clear mechanisms of financial support.

According to the stipulations of the Convention on biodiversity (Rio de Janeiro, 1992) the Ministry of Ecology and Natural Resources of **Moldova** in collaboration with the specialists from other ministries, various institutions and organizations, elaborated the Strategy and Action Plan on Biodiversity Conservation in the Republic of Moldova in 2001. The major goal of the Strategy is the conservation, rehabilitation, reconstruction and efficient use of the biodiversity and landscape to ensure the sustainable social-economic development of the country. The objectives of the Strategy can be achieved through consequent well-targeted actions,

establishing deadlines and funding amount. The main objectives are: in-situ and ex-situ conservation of biodiversity, identification and social-economic evaluation of the biological resources and their sustainable use, reestablishment and maintenance of the genetic fund, ensure the bio security of the country, and creation of the national Environmental Network as a component for the integration of the protection measures of the biodiversity and landscape.

In 2002, the World Bank approved a Wetlands Restoration and Pollution Reduction Project for **Bulgaria**. The project is funded by a grant from the Global Environment Facility (GEF) Trust Fund of US$7.5 million, contributions from the Bulgarian government and local communities (US$3.05 million) and bilateral agencies (US$2.73 million). The project will support local communities in the Persina Nature Park and Kalimok/Brushlen Protected Site to adopt sustainable natural resources management and demonstrate how environmentally friendly agriculture can improve their livelihoods. In support of global environmental goals, the project seeks to replicate successful efforts to reduce transboundary nutrient loading and other agricultural pollution that flow through the Danube into the Black Sea.

The Wetlands Restoration and Pollution Reduction Project would provide financing to:

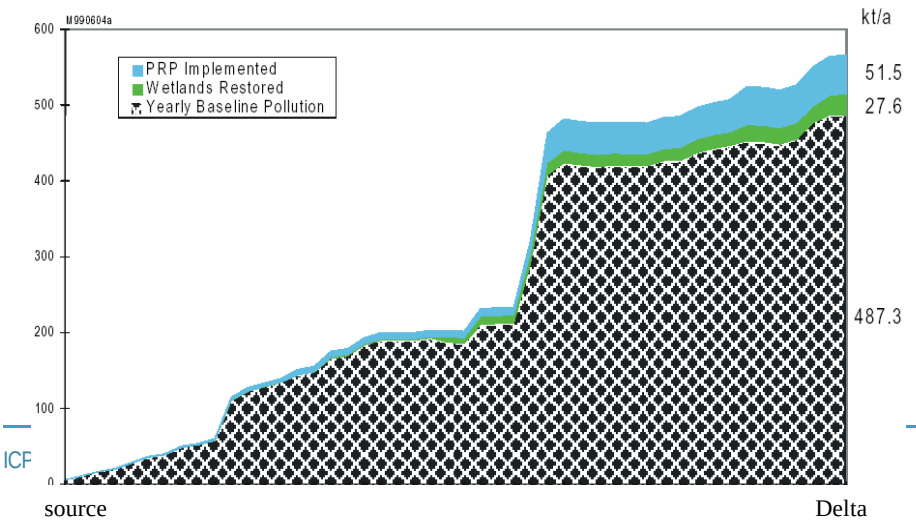
- Restore critical priority wetlands in the Danube River basin and pilot their use as nutrient traps;
- Establish a comprehensive monitoring system for water quality and ecosystem health;
- Maintain sustainable management of selected areas in the flood-plain of the Danube;
- Strengthen capacity to protect and manage biodiversity and natural resources; and
- Build public awareness of sustainable natural resources management and biodiversity conservation.

This is the first wetlands restoration project under the Strategic Partnership for Nutrient Reduction in the Black Sea and Danube Basin, which aims to help countries undertake investments to control or mitigate nutrient inflow to the Black Sea.

5.3.1.1 The potential role of riverine wetlands in removing nutrients from the Danube river: lessons from the UNDP GEF DRP investigations

The Danube Pollution Reduction Programme (DPRP) the DWQM was used to simulate the effect of 17 wetland restoration projects on nutrient loads in the Danube River. The results were compared to the total transported nutrient load and the effect of the implementation of the DPRP on point source emissions. Figure 41 and Figure 42 illustrate the results of this exercise.

Figure 41: DWQM simulation results for potential N load reduction in restored wetlands along the Danube River from its source to the Delta (van Gils, 1999)



Based on a total load of 566 kt N a^{-1} and 48 kt P a^{-1} transported in the Danube River, a reduction of about 52 kt N a^{-1} and 11 kt P a^{-1} might be reached by implementation of emission reduction from point sources considered in the DPRP.

Reductions of 28 kt N a^{-1} and 2.5 kt P a^{-1} might be reached by implementing the wetland restoration projects.

Thus, apart from the other socio-economic and biodiversity benefits that might be derived from a programme of wetland restoration, there could be a significant contribution to the reduction of pollution in the Danube.

Figure 42: DWQM simulation results for potential P-load reduction in restored wetlands along the Danube River from its source to the Delta (van Gils, 1999).

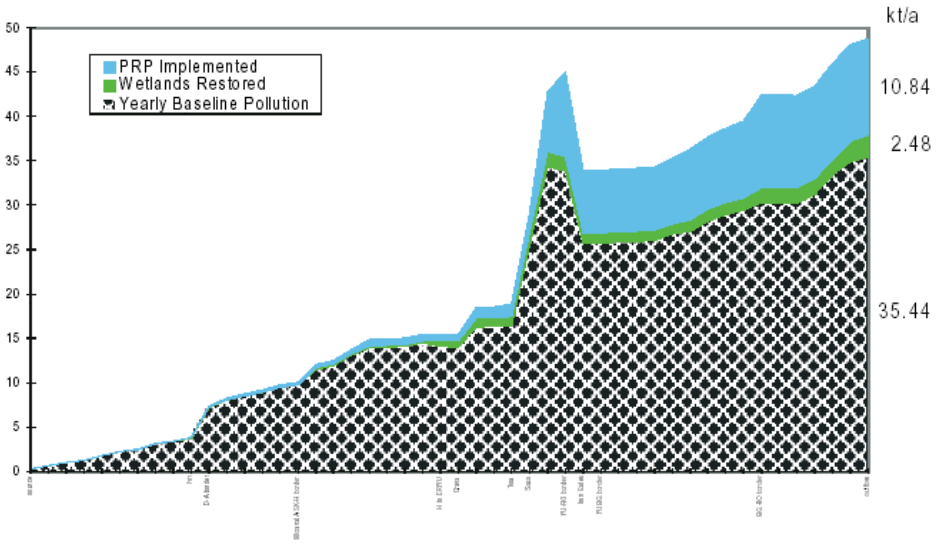


Table 39 summarises the recent estimates that have been suggested for the potential role of riverine wetlands with respect to nutrient load reductions.

Table 39: Comparison of order of nutrient loads and retention in the DRB (kt a^{-1})

	N (kt a^{-1})	P (kt a^{-1})
Emission loads 1996/97	900	110
Instream loads before the Danube Delta 1996/97	450	25
Retention in the whole river system	450	85
Retention in the Danube and its main tributaries (DWQM)	80	15 (3*)
Load reduction from 17 wetland restoration projects (DWQM)	28	2.5

* without Iron Gate dam

A case study of a Danube riverine wetland, Regelsbrunn, in Austria was thoroughly analysed by the DRP. Between Vienna and Bratislava lies perhaps the last more or less intact floodplain section along a free-flowing stretch of the upper Danube. Along this stretch there still are near-natural hydrological exchange conditions between the main channel and the adjacent floodplains. Because of this potential for natural hydrological exchange, the floodplain segment at Regelsbrunn, located 25km downstream of Vienna, was the

site of a major floodplain restoration project (Schiemer et al. 1999)[3]. The main aim of the project was to restore the surface connectivity between the main channel and the side-arm system at medium flows to approximately pre-regulatation levels.

Investigations before and after restoration estimated the impact on the nutrient and matter cycling of the riverine landscape (Tockner et al. 1999[1], Hein et al. 2003[4]). The floodplain segment of Regelsbrunn is 520 ha and is a discrete entity, clearly delineated by high terraces to the south and west. Therefore it offered the opportunity to calculate input-output fluxes (Tockner et al. 1999[1]).

Before restoration the Regelsbrunn floodplain (or side-arm system) was connected with the main channel only through groundwater and bank filtration. Hydrological exchange with the main channel occurred only during short high flow periods (transport phase approximately 4% of the year). After the first restoration phases were completed in 1997, surface connectivity was observed at mean water level. The proportion of total discharge from the main channel into the side-arm now ranges from less than 0.5 % at low water (< 6 $m^3 s^{-1}$) up to 12 % (about 650 $m^3 s^{-1}$) at high water.

Before restoration efforts began, the potential for the Regelsbrunn floodplain to act as a sink or source for matter was assessed for the period from September 1995 to November 1996 (Tockner et al. 1999[1]). The floodplain hydrology during that period was characterized by several flood events and long periods of low flow (mainly during winter). The mean flow level during the observation period was slightly below that of the long-term mean flow and the mean discharge was about 1,800 $m^3 s^{-1}$. It was found that Regelsbrunn served as a major sink for suspended solids (250 mt ha^{-1} $year^{-1}$), particulate organic carbon (POC 2.9 mt ha^{-1} $year^{-1}$) and nitrate (960 kg ha^{-1} $year^{-1}$) during this period, but was a source for dissolved organic carbon (240 kg ha^{-1} $year^{-1}$) and algal biomass (0.5 kg ha^{-1} $year^{-1}$). Based on the significant relationship (r^2=0.84, p<0.01, n=68) between suspended solid concentrations and total phosphorus concentrations, an amount of 160 kg ha^{-1} $year^{-1}$ was estimated for the phosphorus retention in the floodplain.

As a result of restoration, the surface connection between the main channel and the side-arm system at mean flow and bankfull flow increased and small-scale fluctuations in flow resulted in more frequent fluctuations between dry and wet periods close to the aquatic parts of the floodplain.RRes rejkl Restoration efforts have not affected the inundation area during flooding but, based on the assessment for the years 1997-99, the following tendencies are expected when this occurs:

- The Regelsbrunn floodplain should continue act as a sink for suspended solids because the restoration measures will not significantly alter transport into the floodplain during high flow years.
- Nitrate reduction in the main channel is expected to be of the same order of magnitude with a tendency towards a slight decrease due to reduced retention time at lower flows.
- The long-term effects on the nitrate reduction of increased hydrogeomorphological dynamics induced by restoration are uncertain and still need to be monitored.
- The export of aquatic biomass should increase significantly, mainly in the form of algal biomass (particulate organic carbon - POC) and dissolved organic carbon (DOC). For POC, Regelsbrunn should shift from being a sink to a source, mainly dominated by aquatic material. The estimation for the post-restoration period indicates an increase of 100% of algal biomass export.
- DOC, organic nitrogen and phosphorus export are all expected to increase during periods of mean and high water flow levels.

[3] Schiemer F, Baumgartner C, Tockner K. Restoration of floodplain rivers: The Danube restoration project. Reg. Rivers Res. & Manag. 1999;15: 231-244

[4] Hein T, Baranyi C, Herndl GJ, Wanek, Schiemer F. Allochthonous and autochonous particulate matter in floodplains of the River Danube: Importance of hydrological connectivity. Freshwater Biology 2003; 48 (2), 220-232

- The transformation of inorganic, mainly dissolved nutrients to aquatic biomass will be enhanced and export to the main channel will be intensified.

The example of Regelsbrunn points to the potential for nutrient retention within those riverine wetlands that still maintain surface hydrological exchange with the main channel. For the section of the upper Danube downstream of Vienna further projects are planned to restore the area to near-pristine conditions. In terms of nutrient dynamics the following ecosystem functions have already been re-initiated in this floodplain stretch of the Danube:

- The retention of nutrients during high flows;
- The removal of nitrogen through groundwater exchange;
- To some extent, the transformation of nutrients; and
- The provision of aquatic material to plant and animal communities within the main channel downstream.

5.3.2 Implementation of JAP national Investments program: wetlands

The JAP interim implementation report shows the assessment at the level of 2004 (Table 40).

Table 40: Completed Wetland projects 2001-2003

Name of Project	Area size [ha]	End of project [mo/yr]	Estimated costs EUR
Danube (1) Nationalpark Donauauen: LIFE Project "Restoration and management of the alluvial Danube floodplains"	1,500	I / 2003	2,800,000
MARCH / MORAVA 2.1 Droesing: 2.2 Marchegg White Stork Reservat (WWF)	200 1,200	1 / 2002 2003	70,000 200,000
DRAU / DRAVA	100	II / 2003	5,000,000

Table 41: Wetland Projects that have started in the period 2001-2003 and are finalised after 2004

Name of Project	Area size [ha]	End of project [mo/yr]	Estimated costs EUR
LECH (Total Project Volume: 7,800,000€)	3300	I / 2006	2,000,000
Mur 1st step Project "Muehlbach": Dotation of floodplain areas over 22 km	200	II / 2002	900,000
Danube / Donau (2) LIFE Project "Restoration of the Danube River Banks" between Vienna and Bratislava	2000	III/2006	1,800,000

Danube / Donau (3) Wachau	10.700	III/2008	5,255,000
Mur (2): River district management of the Upper Mur	878	III/2006	2,200,000
Lafnitz River Valley	1.045	III/2003	4,648,640

The total estimated investments for projects completed and in planning stage is 140 MEUR.

Table 42: Projects implemented and/or in planning stage (DABLAS 2004, ECO EG Country Reports)

Country		Wetlands Sector: Projects implemented and/or in planning				
		No. of Projects	Relevant Area ha	Est. Reduction N, t/a	Est. Reduction P, t/a	Cost MEUR
AT	Austria	0 + 10*	22,727	2,273	227	33.8
BA	Bosnia-Herzegovina	3	28,200	2,820	282	11.9
BG	Bulgaria	2	2,350	235	24	4.0
CS	Serbia-Montenegro[1]	0 + 3	15,041	1,504	150	1.9
CZ	Czech Republic	6	7,450	745	75	6.9
DE	Germany	0 + 13*	7,946	795	79	62
HR	Croatia	no projects indicated				
HU	Hungary[2]	6 +_1*	37,280	3,728	373	7.3
MD	Moldova	5	37,250	3,725	373	5.1
RO	Romania[3]	6	83,798	8,380	838	1.9
SI	Slovenia[4]	3	2,100	210	21	3.0
SK	Slovakia[5]	6	7,150	715	72	2.3
UA	Ukraine	5	data under review			
Totals (all identified sites):		**40 + 27***	**251,292**	**25,129**	**2,513**	**n/a**
Totals (projects with info):		**58**	**190,292**	**19,029**	**1,903**	**140**

*** Projects included in the ECO EG country reports – but not included in the DABLAS 2004 assessment.**

[1]The Zasavica Nature Reserve project in CS (0.78 MEUR) is not included; nutrient reduction not relevant.

[2]The 7.3 MEUR does not include Tisza-Bodrogzug (4,000 ha) wetland; incomplete project planning.

[3]The 1.9 MEUR does not include Potelu swamp (23,000 ha) and Graeca Swamp (34,000 ha); incomplete project planning.

[4]The Triglav peat bogs project in SI (0.47 MEUR) is not included; nutrient reduction not relevant.

[5]The Zohorie peatlands project in SK (0.005 MEUR) is not included; nutrient reduction not relevant.

The final implementation report provides information about the wetlands projects achieved during the JAP period.

The Figure 43 and Figure 44 provide information on the wetlands projects distribution in the basin, based on the countries reports. Germany achieved the largest number of projects and Austria, Bosnia and Herzegovina,

Slovenia and Ukraine reported wetlands ,measures that were realised within the JAP period, but not initially planned in 2000. The largest investments efforts has been taken by Germany.

Figure 43: Overview of wetlands projects in the DRB

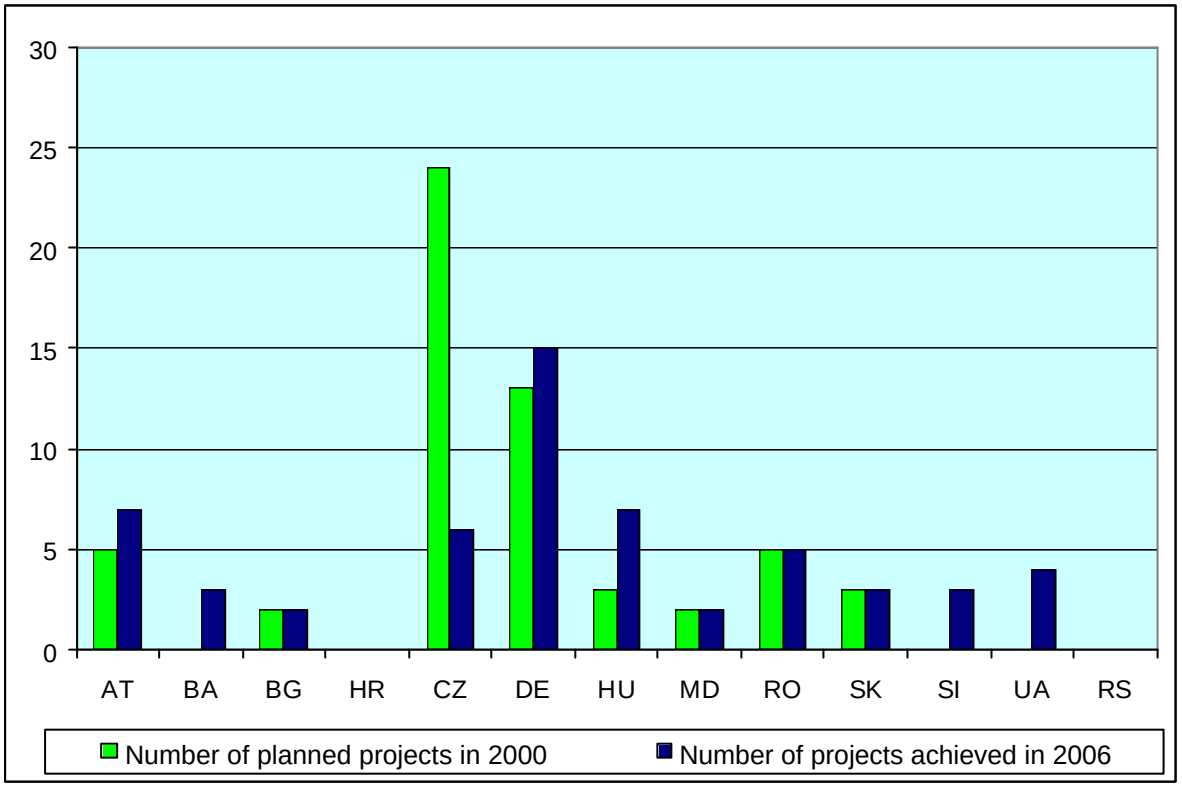
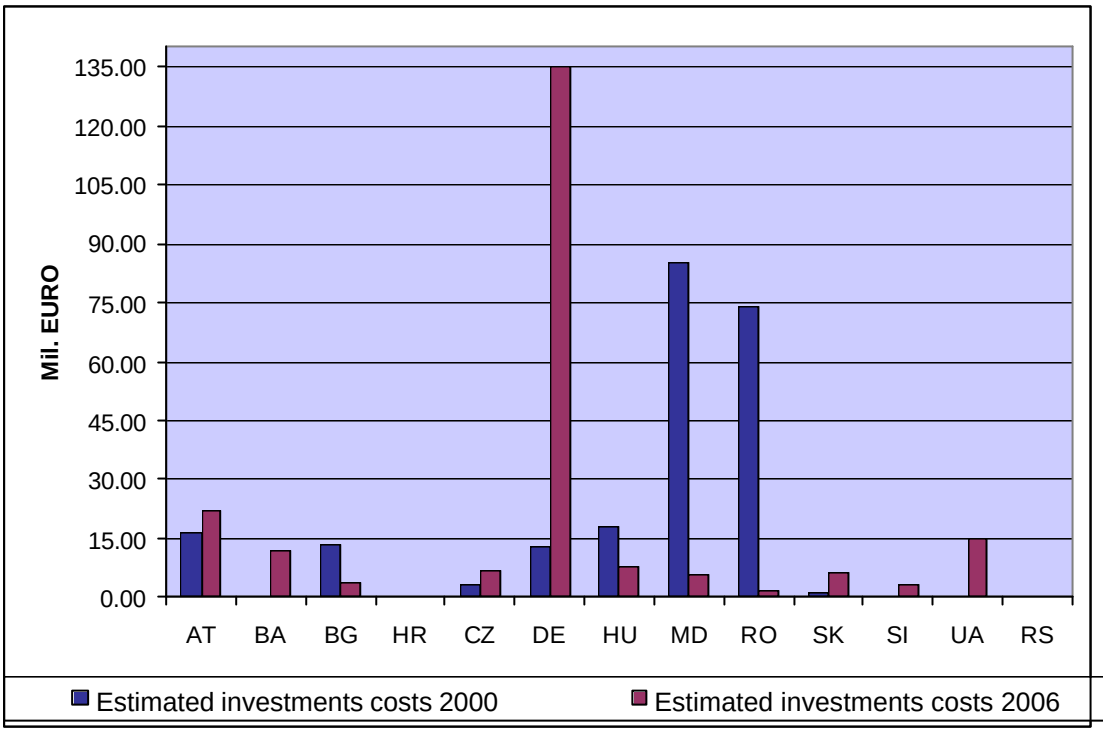


Figure 44: Investments in wetlands



5.4 Improving the scope of the TNMN, in order to get it in line with the EC Water Frame Directive and to enable its timely operation

5.4.1 Upgrading TNMN

According to the Article 3.6, *The States co-operating under the DRPC (Contracting Parties; Signatory; Observing States)*

- *"agree to orient the ICPDR's 'Transnational Monitoring Network (TNMN)' – in accordance with the prescriptions of the EC Water Framework Directive", and*
- *"promote the continuation and introduction of quality control procedures that will allow a validated representation of the in-stream water status (quality control schemes for chemical analyses and ecological determinands; representative site-specific sampling in 'space and time'), incl. a progress report about the results achieved (in 2006)".*

The Danube countries have decided to upgrade TNMN to reflect the requirements of the Article 8 of the WFD and to take into account the WFD CIS process. The TNMN has been revised to provide a coherent and comprehensive overview of ecological and chemical status within the Danube River Basin. Until 2007, for TNMN, the Danube countries have considered 78 sampling stations, 52 determinands in water and 33 in sediment. TNMN Strategy Paper was revised and in present it describes the design of future WFD compliant monitoring programmes for surface and ground waters in the Danube River Basin District

The major objective of the revised TNMN is to provide an overview of the overall status and long-term changes of surface water and – where necessary – groundwater status in a basin-wide context with a particular attention paid to the transboundary pollution load. In view of the link between the nutrient loads of the Danube and the eutrophication of the Black Sea, it is necessary to monitor the sources and pathways of

nutrients in the Danube River Basin District and the effects of measures taken to reduce the nutrient loads into the Black Sea.

Annex V of WFD indicates that monitoring information from surface waters is required for:

- The classification of status;
- Supplementing and validating the Annex II risk assessment;
- The efficient and effective design of future monitoring programmes;
- The assessment of long-term changes in natural conditions;
- The assessment of long-term changes resulting from widespread anthropogenic activity;
- Estimating pollutants loads transferred across international boundaries or discharging into seas;
- Assessing changes in status of those bodies identified as being at risk in response to the application of measures for improvement or prevention of deterioration;
- Ascertaining causes of water bodies failing to achieve environmental objectives where the reason for failure has not been identified;
- Ascertaining the magnitude and impacts of accident pollution;
- Use in the intercalibration exercise;
- Assessing compliance with the standards and objectives of protected areas; and, quantifying reference conditions (where they exist) for surface water bodies.

The objective of monitoring is to establish a coherent and comprehensive overview of water status within each River Basin District and must permit the classification of all surface water bodies into one of five classes. However, this does not mean that monitoring stations will be needed in each and every water body. Member States will have to ensure that enough individual water bodies of each water body type are monitored. They will also have to determine how many stations are required in each individual water body to determine its ecological and chemical status.

For surface water bodies, the Directive requires that sufficient surface water bodies are monitored in surveillance programmes to provide an assessment of the overall surface water status within each catchment and sub-catchment within the river basin district. For surveillance monitoring, parameters indicative of all the biological, hydromorphological and all general and specific physico-chemical quality elements are required to be monitored.

Operational monitoring is to establish the status of those water bodies identified as being at risk of failing their environmental objectives, and to assess any changes in their status resulting from specific measures. Operational monitoring programmes must use parameters indicative of the quality element or elements most sensitive to the pressure or pressures to which the body or group of bodies is subject. This means that fewer quality element values may be used in status classification.

The Directive also mentions investigative monitoring for situations where the reason of exceedances is unknown, where surveillance and operational monitoring are insufficient or to ascertain the magnitude and impacts of accident pollution.

Regarding surface waters, the future TNMN will focus on monitoring of rivers and coastal waters of basin-wide importance. The overview of surface water monitoring programmes in the Danube River Basin District and their use in fulfilling WFD monitoring requirements are shown below.

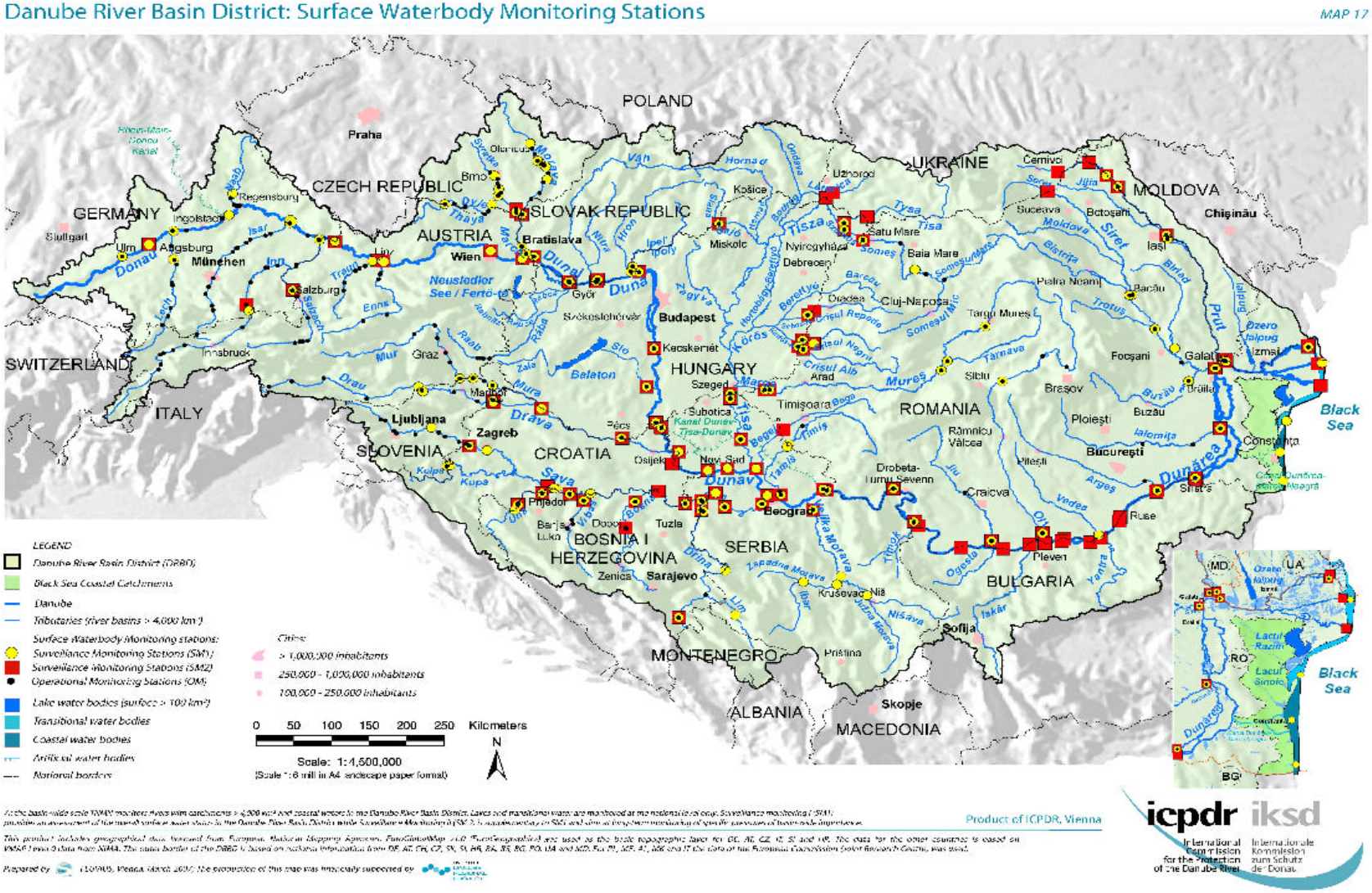
Table 43: Overview of surface water monitoring programmes in the Danube River Basin District and their use in fulfilling WFD monitoring requirements

	International Part A		National Part B
	TNMN	JDS	National monitoring schemes
Surveillance monitoring I - monitoring of surface water status	X	---	X
Surveillance monitoring II - monitoring of specific pressures	XX	XX	X
Operational monitoring of water bodies at risk	X	---	X)[5]
Investigative monitoring	---	XX	X

X = data collection on status; XX = joint monitoring

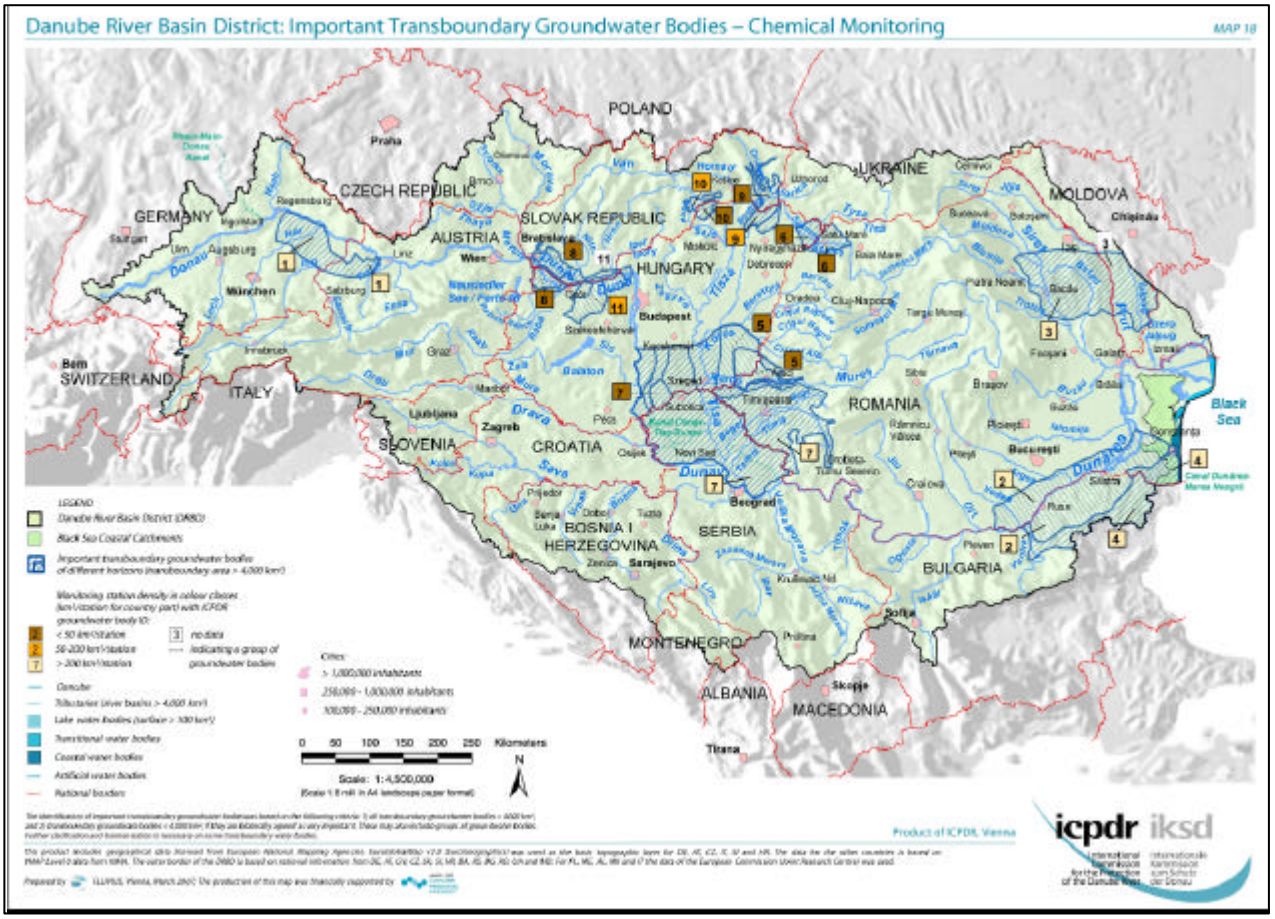
[5] Selected data are collected for Part A, on water bodies on the river network > 4000 km²: location of monitoring site, main acting pressure, ecological and chemical status.

Map 3: Surface waterbody monitoring network in DRB in line with WFD

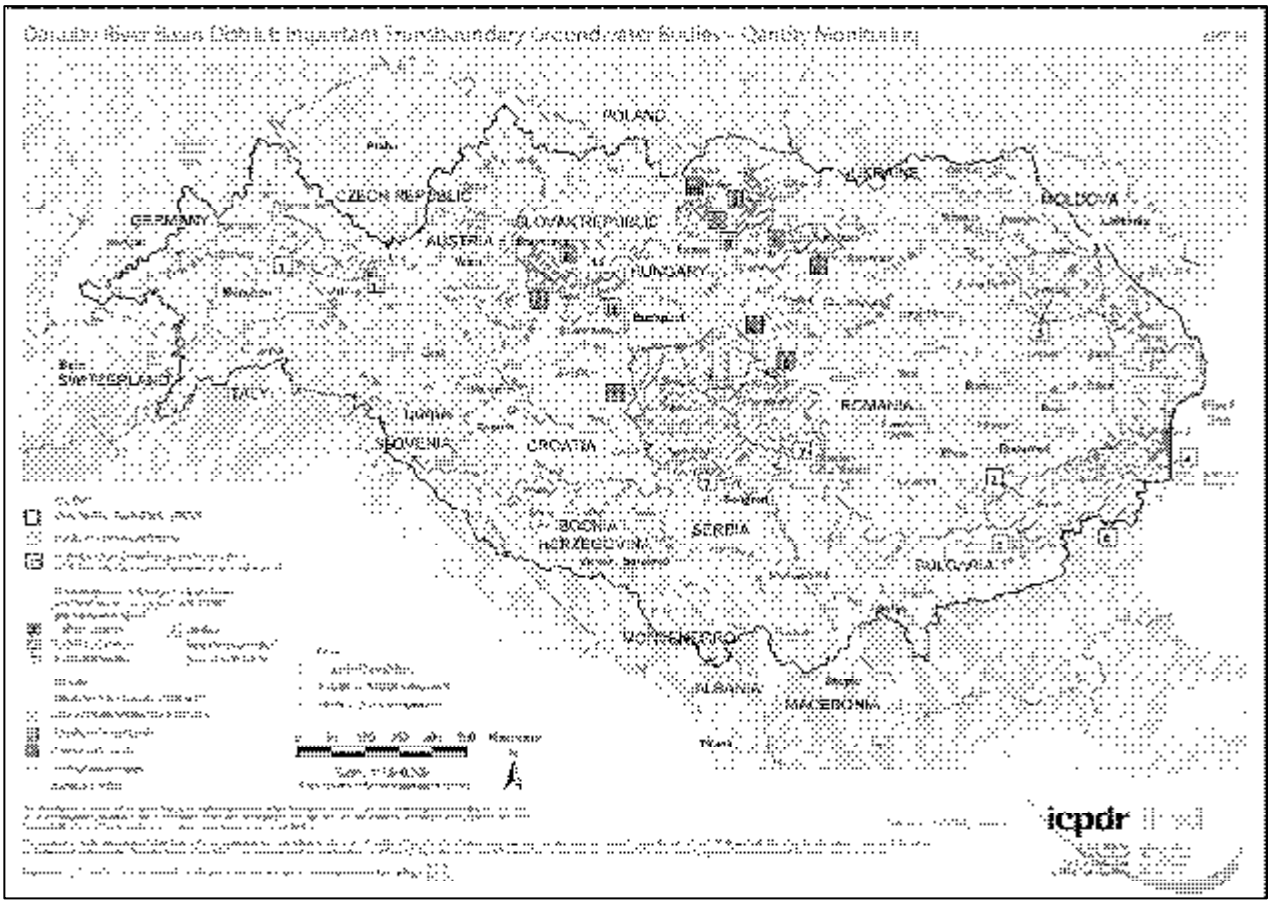


The design of the WFD compliant groundwater monitoring network in the Danube River Basin District covers 11 transboundary groundwater bodies of a basin-wide importance as specified in the Roof Report 2004. The monitoring network is in a preliminary stage and needs further development e.g. with respect to harmonizing the number of sites selected by the countries for the Transnational Monitoring Network as well as for the selection of determinands.

Map 4: Important transboundary Groundwater bodies: chemical monitoring



Map 5: Important transboundary Groundwater bodies: quantity monitoring



5.4.2 Joint Danube Survey

An expedition, referred to as Joint Danube Survey (JDS) was launched in August 2001 to investigate the quality of the Danube River along its 2,581-kilometer-long stretch from Regensburg in Germany to its mouth in the Black Sea. JDS was initiated by the ICPDR to improve the validity and comparability of water quality data received from its regular monitoring programme- TNMN. The mission of the ten scientists from Germany, Austria, Slovakia, Hungary, Yugoslavia, Bulgaria and Romania was to collect and analyse samples taken from the Danube River for 140 different parameters ranging from biological indices and chemical pollutant levels to indicators about the state of aquatic flora, fauna, and microorganisms. The main objectives of the JDS were to: (i) produce a homogenous data set for the Danube River based on a single laboratory analysis of selected determinands, (ii) identify and confirm specific pollution sources, (iii) screen the pollutants as specified in the EU Water Framework Directive, (iv) provide a forum for riparian/river basin country participation for sampling and inter-comparison exercises, (v) facilitate specific training needs and improve in-country experience, and (vi) promote public awareness.

During the JDS samples were collected from surface water, sediment, mussels and biological from 98 sampling sites. Suspended solids samples were collected from 63 sections of the Danube, and fifteen parameters (e.g., conductivity, dissolved oxygen, nitrites, nitrates, total coliforms, faecal coliforms) analysed

on-board. All samples were sent in regular intervals to the JDS Reference Laboratories for analyses of more than 80 additional determinands.

The Joint Danube Survey 2, known as 'JDS2', the new big river research expedition was launched on 14 August and ended on 28 September 2007. All experts for the JDS2 core team have been nominated and all WFD parameters (biology and chemistry) and beyond are covered for the assessments. The results of the survey data will serve the basin wide but also national improvement of water status knowledge.
Its main goal is to produce highly comparable and reliable information on water quality and pollution for the entire Danube River and many of its tributaries.

Similar to the first survey, JDS 2 had the following specific objectives:

- To produce a homogenous data set for the Danube River based on a single sampling procedure and laboratory analysis of specified determinands and biological quality elements;
- Screening of EU WFD priority pollutants and other relevant hazardous substances;
- Microbiological analysis
- To provide a forum for riparian/river basin country participation for sampling and intercomparison exercises;
- To facilitate specific training needs and improve in-country experience;
- To promote public awareness.

In addition to these aims, new objectives have been identified arising mostly from the implementation of the EU Water Framework Directive:

- Compare the results with JDS 1 results
- Biological validation of the Danube typology;
- Ecological assessment of the Danube River in line with the EU WFD
- Assessment and confirmation of the pressures and impacts as stated in the roof report 2004
- Contribution to the Danube Intercalibration Exercise
- General overview of the habitat morphology of the Danube River.

On the Danube River, there have been 95 sampling stations covering 10 countries. The following tributaries were also tested: Morava, Drava, Tisa, Sava, Velika Morava, Arges, Olt, Iskar, Rusenski Lom, Jantra and Prut. Sampling at JDS2 stations included different sampling types: water, sediment, biology, suspended solids, mussels, and fish, each taken from different sampling points (i.e. left, middle and right) at the station cross-sections.

The samples collected during the survey included water, sediment, suspended particulate material, macrozoobenthos, phytobenthos, phytoplankton, macrophytes, fish and mussels. A smaller part of the analytical work was performed on board and included physico-chemical analyses, microbiology and radon measurement. Laboratory analyses of chemical parameters included heavy metals and organic compounds primarily from the EU list of priority substances but several other groups of compounds such as pharmaceuticals were monitored as well. A special program of radioisotope analysis was focused on contamination by radionuclides and also on the application of isotopes for nitrate tracking and for better understanding of hydrological and biogeochemical cycles. A battery of ecotoxicological tests was part of the survey program to obtain a better understanding of negative impacts of hazardous substances on functioning of the water ecosystem.

All biological quality elements needed for characterization of the ecological status of water bodies as required by EU WFD were analyzed both on-board and in the laboratories after the survey. In support of the

assessment of the ecological status the first ever-continuous hydromorphological characterization of the Danube was executed. It included evaluations of the general platform and sinuosity, longitudinal and lateral continuum disruptions and the main river engineering structures.

The results of the survey provide the most comprehensive and homogeneous database on the quality of water ecosystem available for the Danube River. The results served as a basis for implementation of the European legislation, i.e., for the assessment of the ecological and chemical status of the river. Further, the extent of data collected and processed created an excellent information source for future studies of the interactions between the chemical, biological and microbiological processes in the aquatic system of a large river.

5.4.3 Introduction of quality control procedures: Analytical Quality Control (AQC) in the DRB

The quality of the TNMN data is regularly checked by a basin-wide analytical quality control programme The results of this programme are reported annually.

Efforts have been undertaken in order to harmonize analytical activities within the DRB countries related to TNMN, as well as implementation and operation of an Analytical Quality Control (AQC) programme to ensure quality and comparability of data (QUALCO-DANUBE). As a consequence, in 2006, 37 TNMN laboratories reported results that provided information on their analytical performance.

The revised design of ICPDR analytical quality control programme 2006 has proved to be viable providing the necessary quality assurance to the TNMN data.

Based on experiences of the previous interlaboratory comparison studies as well as on the new requirements of the EU Water Framework Directive (WFD), micropollutants became the focus of attention in 2005. At the AQC programme all determinands are covered during the first three quarterly distributions and the fourth distribution is reserved for repeating the analysis for those matrix/determinands, which showed more than 15 % rejected results.

The 2006 distribution programme is summarised below (Table 44).

Table 44: ICPDR analytical quality control programme

Sample	General parameters	Nutrients	Heavy metals	Organic pollutants
SW Surface water	Cl^-, SO_4^{2-} Na^+, K^+ Ca^{2+}, Mg^{2+} total hardness	NH_4^+-N NO_3^--N NO_2^--N Kjeldahl-N PO_4^{3-}-P Total-P	Fe, Mn Hg Cd, Cr, Cu Ni, Pb, Zn Al, As	COD_{Mn}, COD_{Cr} BOD_5, MBAS DOC, AOX phenol index petroleum hydrocarbons lindane atrazine 4,4'-DDT
SS Surface water sediment	Ca, Mg	Total-N Total-P	Fe, Mn Hg Cd, Cr, Cu Ni, Pb, Zn Al, As	TOC petroleum hydrocarbons PAHs, PCBs lindane atrazine 4,4'-DDT

As compared with previous years, performance in measuring general parameters even improved in case of certain parameters (chloride, sulphate, potassium). A slight positive change can be observed with nutrients as well (especially nitrate and nitrite), however this group of parameters in general is somewhat more affected by systematic error.

As regards to metals/heavy metals, determination definitely improved for most parameters (examples could be iron, manganese, mercury or arsenic), but in many case stagnation or even slight deterioration (chromium) is observable in comparison with previous years. In addition, effect of systematic or random error is still pronounced in case of several elements (e.g. aluminium, lead, copper).

Determination of organic pollutant is the most problematic analysis. Positive change is shown for two determinands (AOX and phenol index), but performance in case of other parameters remains poor (especially 4,4'-DDT, BOI5 and MBAS) and stagnated at best in comparison with previous years' data.

General parameters and metals/heavy metals were measured with success from solid samples. This is in accordance with experience from previous years, even positive change could be observed with some elements (lead, copper, magnesium).

Organic pollutants, as in case of liquid samples, are the most problematic of analyses in sediment samples as well. Pesticides and macropollutants (i.e. petroleum hydrocarbons and TOC) show poor performance, and no change can be observed when compared to previous years (it should be noted though that the number of reporting laboratories increased, e.g. TOC). On the other hand, results of PAHs were good or at least satisfactory, which is a remarkable improvement compared to 2005. PCBs show a less favourable picture, this determination remained rather problematic.

5.4.4 Load assessment program

The load assessment program, initiated in 2000, is integrated in the TNMN efforts with the view to produce reliable and consistent trend analysis of concentrations and loads of substances diluted in water or attached to sediments. Danube countries have agreed to use the Standard Operational Procedure (SOP) developed in the frame of EU Phare Project "Transboundary Assessment of Pollution Loads and Trends" (1998) for its operation in the Danube River Basin. Loads are calculated for BOD5, inorganic nitrogen, ortho-phosphate-phosphorus, dissolved phosphorus, total phosphorus, suspended solids and chlorides (voluntary). Minimum sampling frequency is at least 24 per year.

Table 45 shows TNMN monitoring locations selected for load assessment programme with information on hydrological stations used for obtaining flow data needed for load assessment in respective locations. Altogether 21 monitoring locations from nine countries are included in the list. Two locations – Danube-Jochenstein and Sava – Jesenice – have been included by two neighbouring countries, therefore actual number of locations is 19, with ten locations on the Danube River itself and nine locations on the tributaries.

Table 45: List of TNMN locations selected for load assessment program

Country	River	Water quality monitoring location			Hydrological station	
		Country Code	Location	Distance from mouth (Km)	Location	Distance from mouth (Km)
Germany	Danube	D02	Jochenstein	2204	Achleiten	2223
Germany	Inn	D03	Kirchdorf	195	Oberaudorf	211
Germany	Inn/Salzach	D04	Laufen	47	Laufen	47
Austria	Danube	A01	Jochenstein	2204	Aschach	2163
Austria	Danube	A04	Wolfsthal	1874	Hainburg (Danube) Angern (March)	1884 32
Czech Republic	Morava	CZ01	Lanzhot	79	Lanzhot	79
Czech Republic	Morava/Dyje	CZ02	Pohansko	17	Breclav-Ladná	32,3
Slovak Republic	Danube	SK01	Bratislava	1869	Bratislava	1869
Hungary	Danube	H03	Szob	1708	Nagymaros	1695
Hungary	Danube	H05	Hercegszántó	1435	Mohács	1447
Hungary	Tisza	H08	Tiszasziget	163	Szeged	174
Croatia	Danube	HR02	Borovo	1337	Borovo	1337
Croatia	Sava	HR06	Jesenice	729	Jesenice	729
Croatia	Sava	HR07	Una Jesenovac	525	Una Jesenovac	525
Croatia	Sava	HR08	Zupanja	254	Zupanja	254
Slovenia	Drava	SI01	Ormoz	300	Borl HE Formin Pesnica-Zamusani	325 311 10.1(to the Drava)
Slovenia	Sava	SI02	Jesenice	729	Catez Sotla -Rakovec	737 8.1 (to the Sotla)
Romania	Danube	RO 02	Pristol-Novo Selo	834	Gruia	858
Romania	Danube	RO 04	Chiciu-Silistra	375	Chiciu	379
Romania	Danube	RO 05	Reni-Chilia arm	132	Isaccea	101
Ukraine	Danube	UA02	Vilkova-Kilia arm	18		

The monitoring frequency is an important factor for the assessment of pollution loads in watercourses.

Table 46 below shows the number of measurements of flow and water quality determinands in the TNMN load assessment sites.

Table 46: Number of measurements in TNMN locations selected for assessment of pollution load

Country Code	River	Location	Location in profile	River km	Number of measurements in 2004								
					Q	SS	N_{inorg}	$P\text{-}PO_4$	P_{total}	BOD_5	Cl	P_{diss}	SiO_2
D02	Danube	Jochenstein	M	2204	366	26	26	26	26	26	26	12	0
D03	Inn	Kirchdorf	M	195	366	24	26	26	26	25	26	13	0
D04	Inn/Salzach	Laufen	L	47	366	26	26	26	26	26	26	26	0
A01	Danube	Jochenstein	M	2204	366	12	12	12	12	12	12	12	0
A04	Danube	Wolfsthal	R	1874	366	24	24	24	24	24	24	24	0
CZ01	Morava	Lanzhot	M	79	366	12	12	12	12	12	12	0	0
CZ02	Morava/Dyje	Pohansko	M	17	366	12	12	12	12	12	12	0	0
SK01	Danube	Bratislava	M	1869	366	24	24	12	24	24	24	12	0
H03	Danube	Szob	L	1708		21	21	21	21	21	21	0	0
			M		366	21	21	21	21	21	21	0	0
			R			21	21	21	21	21	21	0	0
H05	Danube	Hercegszántó	M	1435	366	13	26	26	26	26	13	0	0
H08	Tisza	Tiszasziget	L	163		12	26	26	26	26	12	0	0
			M		366	11	22	22	24	24	11	0	0
			R			12	23	23	25	25	12	0	0
HR02	Danube	Borovo	R	1337	0	26	26	26	26	26	0	0	0
HR06	Sava	Jesenice/D	L	729	0	26	26	26	26	26	12	0	0
HR07	Sava	us Una Jesenovac	L	525	366	26	26	26	26	26	12	0	0
HR08	Sava	ds Zupanja	R	254	366	26	26	26	26	26	12	0	0
SI01	Drava	Ormoz	L	300	366	24	24	24	24	0	24	0	0
SI02	Sava	Jesenice	R	729	366	25	25	25	25	25	25	0	0
RO02	Danube	Pristol-Novo Selo	L	834		24	24	24	24	20	24	0	24
			M		366	23	23	23	23	19	23	0	23
			R			24	24	24	24	24	22	0	23
RO04	Danube	Chiciu-Silistra	L	375		24	24	24	23	24	22	0	20
			M		366	24	24	24	23	24	22	0	20
			R			24	24	24	22	24	20	0	21
RO05	Danube	Reni-Chilia arm	L	132		24	24	24	22	24	24	0	22
			M		366	24	24	24	22	24	24	0	22
			R			23	24	24	22	24	24	0	23
UA02	Danube	Vilkova-Kilia arm	M	18	366	0	8	8	8	8	8	0	0

5.5 List of Priority Substances

In line with Article 3.7 of the JAP, the Danube countries will:

- *Establish a "List of Priority Substances for the Danube River Basin", based on ongoing developments at EU level".*
- *Introduce subsequently the substances on such a list into the monitoring programmes for discharges and the in-stream chemical status*
- *Introduce such substances into national permits or to regulate their use via other relevant national legislation*
- *Introduce such priority substances into 'Recommendations on Best Available Techniques' in industrial sectors and any 'Recommendation on Best Environmental Practice', thus addressing the prevention or reduction of those substances.*

In 2003, the EMIS EG prepared and agreed with MLIM EG a proposal for the preliminary ICPDR List of Priority Substances consisting of 2 separate annexes: Annex A, 33 substances, in accordance with the Annex X of the EU WFD (Article 16 of the WFD requires the Commission to establish a list of priority substances and to identify the priority hazardous substances) and Annex B, divided into two groups – B1: General Parameters (COD, NH4-N, Total N, Total P) and B2: Danube Specific Priority Substances (As, Co, Zn, Cr).

In line with WFD, for priority substances, the 'combined approach' has to be applied, i.e. harmonized European emission controls and water quality standards will be elaborated for all substances.

The top down, which addresses the pressures, starts with identifying potential pollutants discharged by point and diffuse sources. Bottom up approach, which addresses the impacts, starts with identifying the reason why good ecological quality is not achieved.

The Community first adopted legislation regarding chemical pollution of waters in 1976 (Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community). Subsequently, several "Daughter Directives" were adopted from 1982 until 1990 laying down emission limit values and environmental quality objectives for 18 specific pollutants.

The WFD introduced an updated, comprehensive and effective strategy for chemical pollution of surface waters. Under the WFD, Directive 76/464/EEC is to be repealed within a transition period but no provision is made for the repeal of the related "Daughter Directives". Article 16 requests the Commission to present a proposal with specific measures against pollution of water by individual or groups of pollutants presenting a significant risk to or via the aquatic environment. As a first step, Decision 2455/2001/EC was adopted which replaces the previous list communicated by the Commission in 1982. As a next step, the Commission was required to come forward with EQS (see Art. 16 (7)) and emission controls (see Art. 16 (6) and (8)) for these priority substances. This proposal implements this obligation with the exception of introducing additional emission controls. At the same time, this new document proposal (Directive of the European Parliament and of the Council on environmental quality standards in the field of water policy and amending Directive 2000/60/EC (presented by the Commission) {COM (2006) 398 final}{SEC (2006) 947, in 2006, includes the repeal of the existing "Daughter" Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC as amended by Directive 88/347/EEC and 90/415/EEC.

Article 16 WFD sets out a strategy against the pollution of water and outlines the steps to be taken. Art 11 of WFD provides programme of measures for river basin specific pollutants by 2009/2012 (measures shall become operational 2012, but be in place in the 2009 as part of the programme of measures). WFD makes a distinction between priority substances of Annex X and specific pollutants of Annex V. WFD Annex 10 specifies 33 priority substances, which need to be taken into account when assessing the chemical status of surface waters. The WFD requests that the priority hazardous substances are phased out in the next 20 years

after adoption of appropriate measures. The Directive also requests to identify additional chemical pollutants if they are of specific concern in the river basin district. For the Danube River Basin District four heavy metals have been identified in addition to the 33: Arsenic, Chromium, Copper and Zinc.

Article 7 of the Dangerous Substances Directive, which will remain in force for 13 years from the adoption of the WFD, also requires the identification of specific pollutants (List II), for which Pollution Reduction Programmes have to be prepared.

The final outcome will be a final ICPDR List of specific substances requiring measures to meet the WFD objectives. Additionally, a list of substances for which further data are required, and a list of substances unlikely to have an effect on water quality will be prepared for the DRB. Finally, the work of the ICPDR will be directed to identification of harmonized emission control strategies as well as the development of quality standards for priority substances. In accordance with on going EU developments, and based on the results of screening at the national level and JDS 2 results, the ICPDR will elaborate a final list of priority substances.

Results of on going screening at the national level show progress and efforts of the countries to establish comprehensive inventories of all relevant substances from the groups and families of dangerous substances in List II to the Annex of the Directive 76/464/EEC, as amended by WFD. The results will be further used in the development of legally binding pollution reduction programme that need to be collectively implemented by the installations operating in the specific water basin district in accordance with the timetable specified in WFD.

5.6 Water Quality Standards

Article 3.8 of the JAP states:

- *"ICPDR will establish in-stream Water Quality Standards for the Danube priority list(s) of substances, in order to protect aquatic life in the Danube River Basin by the end of the year 2004".*
- *"ICPDR will publish in 2004 progress reports on the steps achieved for a consistent definition of the good status of waters".*

In 1999 the EU PHARE Programme contributed to the EPDRB by initiating the project "Danube River Basin Water Quality Enhancement". One of the objectives was to make a proposal for a unified water quality classification for the entire Danube River basin region based on:

- review of existing water quality and sediment quality classification methods in Danube countries
- review of EU legislation
- experience within the different countries

To enable evaluation of the TNMN data an interim water quality classification scheme was developed that serves exclusively for the presentation of current status and assessment of trends of the Danube River water quality (i.e., it is not considered as a tool for the implementation of national water policies)

In this classification scheme (Table 47) five classes are used for the assessment, with target value being the limit value of class II. The class I should represent reference conditions or background concentrations. For number of determinands it was not possible to establish real reference values due to existence of many types of water bodies in Danube river basin differing in physico-chemical characteristics naturally. For synthetic substances the detection limit or minimal likely level of interest was chosen as limit value for class I. The classes III – V are on the "non-complying" side of the classification scheme and their limit values are usually 2 to 5-times the target values. They should indicate the extent of the exceedence of the target value and help

to recognise the positive tendency in water quality development. For compliance testing the 90-percentile value of at least 11 measurements in a particular year should be used.

Table 47: Water Quality Classification used for TNMN purposes

Determinand	Unit	Class				
		I	II TV	III	IV	V
		Class limit values				
Oxygen/Nutrient regime						
Dissolved oxygen *	$mg.l^{-1}$	7	6	5	4	< 4
BOD_5	$mg.l^{-1}$	3	5	10	25	> 25
COD_{Mn}	$mg.l^{-1}$	5	10	20	50	> 50
COD_{Cr}	$mg.l^{-1}$	10	25	50	125	> 125
pH	-		> 6.5* and < 8.5			
Ammonium-N	$mg.l^{-1}$	0.2	0.3	0.6	1.5	> 1.5
Nitrite-N	$mg.l^{-1}$	0.01	0.06	0.12	0.3	> 0.3
Nitrate-N	$mg.l^{-1}$	1	3	6	15	> 15
Total-N	$mg.l^{-1}$	1.5	4	8	20	> 20
Ortho-phosphate-P	$mg.l^{-1}$	0.05	0.1	0.2	0.5	> 0.5
Total-P	$mg.l^{-1}$	0.1	0.2	0.4	1	> 1
Chlorophyll-a	$\mu g.l^{-1}$	25	50	100	250	> 250
Metals (dissolved) **						
Zinc	$\mu g.l^{-1}$	-	5	-	-	-
Copper	$\mu g.l^{-1}$	-	2	-	-	-
Chromium (Cr-III+ VI)	$\mu g.l^{-1}$	-	2	-	-	-
Lead	$\mu g.l^{-1}$	-	1	-	-	-
Cadmium	$\mu g.l^{-1}$	-	0.1	-	-	-
Mercury	$\mu g.l^{-1}$	-	0.1	-	-	-
Nickel	$\mu g.l^{-1}$	-	1	-	-	-
Arsenic	$\mu g.l^{-1}$	-	1	-	-	-
Metals (total)						
Zinc	$\mu g.l^{-1}$	bg	100	200	500	> 500
Copper	$\mu g.l^{-1}$	bg	20	40	100	> 100
Chromium (Cr-III+VI)	$\mu g.l^{-1}$	bg	50	100	250	> 250

Determinand	Unit	Class				
Lead	µg.l^{-1}	bg	5	10	25	> 25
Cadmium	µg.l^{-1}	bg	1	2	5	> 5
Mercury	µg.l^{-1}	bg	0.1	0.2	0.5	> 0.5
Nickel	µg.l^{-1}	bg	50	100	250	> 250
Arsenic	µg.l^{-1}	bg	5	10	25	> 25
Toxic substances						
AOX	µg.l^{-1}	10	50	100	250	> 250
Lindane	µg.l^{-1}	0.05	0.1	0.2	0.5	> 0.5
p,p´-DDT	µg.l^{-1}	0.001	0.01	0.02	0.05	> 0.05
Atrazine	µg.l^{-1}	0.02	0.1	0.2	0.5	> 0.5
Trichloromethane	µg.l^{-1}	0.02	0.6	1.2	1.8	> 1.8
Tetrachloromethane	µg.l^{-1}	0.02	1	2	5	> 5
Trichloroethene	µg.l^{-1}	0.02	1	2	5	> 5
Tetrachloroethene	µg.l^{-1}	0.02	1	2	5	> 5
Biology						
Saprobic index of macrozoobenthos	-	= 1.8	1.81 – 2.3	2.31 – 2.7	2.71 – 3.2	> 3.2

* values concern 10-percentile value
** for dissolved metals only guideline values are indicated
bg background values
TV target value

5.7 Prevention of accidental pollution events and maintenance of the accident emergency warning system

5.7.1 Inventory of accident risk spots in the Danube River Basin

Experiences with consequences due to several accidental spills has shown that inadequate application of precautionary measures at accident risk spots (ARS) could lead to harmful effects to humans as well as to the environment. For this reason the ICPDR APC EG elaborated in 2001 a basin-wide inventory of potential accident risk spots (ARS Inventory). For estimation of a real risk at a particular site a set of checklists was elaborated and made available to the Danube countries. In 2003 the existing potential ARS Inventory was supplemented by data from Austria and Bosnia and Herzegovina.

For the classification of potential risk spots, a common procedure was elaborated considering actual European regulations and findings:

- The findings of the ICPE
- the EU „Seveso II“ directive

- the „UN/ECE agreement on the effects of industrial accidents (Industrial accident convention)

Objective of this inventory was the identification and preliminary ranking of potential accidental risk spots based on estimated water risk equivalents (WRC 3-equivalents) and calculated water risk indices. After the upgrade of the ARS inventory ín 2003, where also the additional data from Austria was considered, about 650 risk spots were recorded and 620 were evaluated. As a result it could be identified a hazardous equivalent of about 6,6 Mio tons in the Danube catchment area. Emphasis was to point out the potential danger and not the actual danger.

In consequence to this purpose the inventory led to results, that countries with industries comprising large amounts of water hazardous substances were automatically prioritised risk spots regardless, if safety measures were performed or not.

A high percentage of the hazardous substance and consequently the risk was located in Germany and also Romania, where the amount of hazard equivalents is significantly determined by one mining industry. According to the results of this proceeding Germany and Romania should be given the highest priority in safety measures, if potential danger would approximate the actual danger. Thus the elaborated ranking of the risk spots could not give information to set priorities in actual needs for safety measure performance in these countries.

The findings of this investigation led to new proposals of evaluation criteria for the actual risk assessment of ARS and the risk potential of contaminated sites (CS). The criteria were the following:

- Present safety level in comparison to demanded safety level in installations
- Present information in comparison to demanded information level in industries and authorities
- State of the art in safety techniques and operational requirements in the country
- Present legal requirements in the country

These criteria should be verified in a pilot project, which was proposed to be performed in 2004 and 2005 on exemplary factories of the same industry sector in three countries with different present safety standards. The suggested industrial sector for this pilot project is refinery and oil processing. The two testing were done in Germany (2005), and in Romania (2006).

5.7.2 Inventory of Contaminated Sites

In addition to the ARS inventory, the experts of the Danube countries performed in 2002 a compilation of abandoned sites supposed to be contaminated by former industrial activities or waste disposal.

Based on these data a methodology for the pre assessment was elaborated, which can be used as a screening tool for suspected contaminated sites with regard to their risk potential. Sites with a high risk potential should be investigated further in view to a more concrete risk estimation and ranking. Based on that estimation it is possible to elaborate a list of necessary immediate measures to enhance the safety level of the site.

Sites contaminated as a result of industrial activities represent a potential danger for the environment. This is especially true of those sites contaminated by hazardous substances which could be mobilised and enter water bodies in the event of a flood.

During heavy rainfall, floods can create pollution and health risks, if precautions are not taken to minimize them. Nitrogen and other non - point-source pollutants may leach from agricultural lands, and the resulting nutrient load may severely stress aquatic ecosystems. It is extremely important to determine the actual risks of polluted floodplain sediments and to predict changes in this ecological risk when sediment is displaced. The

2002 severe flood events in the DRB countries have led to re-examinations of traditional approaches to flood management.

The response of the ICPDR to this problem was elaboration of an inventory of contaminated sites in flood-risk areas in the Danube River Basin, which was finalised in 2003 (261 contaminated sites). The first survey of potentially contaminated sites in the Danube catchment has shown the relevance of this problem for the Danube river basin and has emphasized the need for further action.

In addition a recommendation on safety requirements for contaminated sites in flood-risk areas was prepared as a guideline. The ICPDR 6th Ordinary Meeting in December 2003 approved the Safety Requirements for Contaminated Sites in Flood-risk Areas and recommended their application at national level. In addition to the adoption of the Safety Requirements and taking into account the relevance of a general precautionary principle, the ICPDR also encouraged the Danube countries to establish the policy framework and take the necessary measures to prevent any future contamination of sites in flood-risk areas.

For an initial risk assessment of all submitted "candidate" sites a so-called M1 methodology was developed. This methodology is based on assessment of toxic potentials of soil or waste taking into consideration harmful substances to be expected in a certain type of waste or in a specific industrial branch, correlated with the size of the contaminated area. The M1 methodology also served to rank the contaminated sites identified in the national inventories. The results of this evaluation provide the final list of contaminated sites, which are considered that passed through the M1 methodology. The selected M1 methodology for risk identification considers the properties of substances used or stored at a site and the quantity of the given substances. The properties of the substances determines the Water Risk Class (WRC) which – in combination with the amount of the used, stored substances – determines the Water Risk Index (WRI), the quantitative indicator of the risk.

Also a draft of a questionnaire and checklist was elaborated, which should serve as a basis for the first risk assessment to be performed at site by the country experts. The checklist contains also a screening of properties, which are consisting of several suspected contaminated sites, with regard to the aspects substantial hazard, flooding potential, mobility of contaminated volume or of the contaminant itself and the information level about the site. The drafted checklist should be seen as a "living document", which should be optimised during the updates. All the findings of the experts were introduced to enhance the practicability and the conclusiveness of the checklist methodology.

The UNDP GEF DRP supported the development of a methodology to assess contaminated sites. To enable pre-assessment of contaminated sites a special so-called M2-Methodology was elaborated. This methodology is used as a tool for a screening and ranking of suspected contaminated sites with regard to their risk potential, taking into account the floods.

The existing ICPDR inventory of contaminated sites (CS), susceptible to flooding, with both its parts - former industrial sites and former waste deposits, is currently supplemented with data by the countries.

The information received from 7 countries shows a total of 163 accident risk spots (ARS).

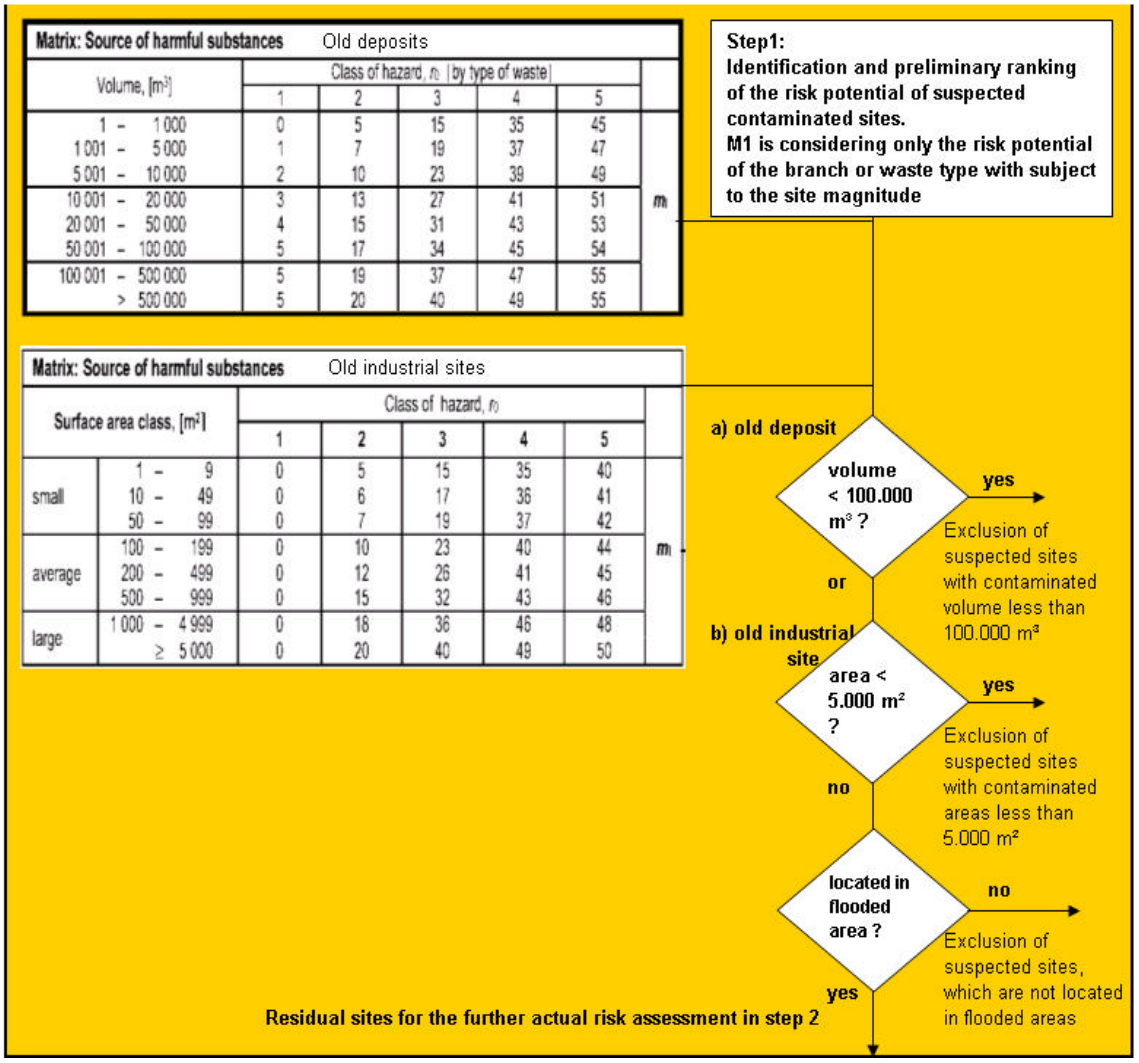
The ARS criteria are listed beneath:

- old industrial sites with an area smaller than 5.000 m²
- old deposits with a contaminated volume smaller than 100.000 m³
- sites outside of flood risk areas

The criteria aimed at focussing on those sites, which represent the potential risk in the Danube river basin. The Danube countries were requested to adapt their lists according to the modified criteria and to apply for the preliminary risk assessment of CS. They were also asked to list more abandoned industrial sites with potential hazards and to focus on sites endangered by floods.

For the ranked sites suitable tools for the risk assessment and formulation of safety measures (in form of recommendation and check lists) were developed (Figure 45).

Figure 45: Illustration of the first step of the risk assessment



The Checklist method for checking and assessing the technical safety of industrial plant with relevance to water pollution control is available through the UNDP GEF DRP assistance. The recommendations provide guidance on how to deal with (i) in plant pipeline safety, (ii) sealing systems, (iii) fire prevention, (iv) storage facilities, and (v) equipments of tanks. The Recommendation for Refineries is available, which also covers requirements on the wastewater treatment plant. The AP Task Group needs further to test the methodology. The M2 methodology is ready to be implemented by the countries, while the methodology/checklist for industrial units and refineries has to be firstly tested at the national level before being presented for approval and implementation.

A draft-reporting format will be prepared and attached to the Recommendation for using M2 methodology (Table 48).

5.7.2.1 Quantification of real risk

An important component of the work on ARS is the developing of the methodology on the "Quantification of real risk", which covered methodology on the determination of the potential danger risk, calculation of the modified Water Risk Index (WRI), and the plant assessment.

Additional work is required by PM EG and Flood EG for ensuring (i) a link between the WRI and the index of the flood map risks through the flood prevention and control action plans, (ii) integration of the safety measures into the program of measures of the WFD, and (iii) correlation between the risk assessed and the level of the safety measures, considering that the safety measures should have different intensity, priority, etc.

For both, the CS and for Potential Risk Spots compiled from ongoing industrial activities and contained in the existing ICPDR-Inventory, further work will be needed to consider the inclusion of the safety measures to prevent accidental pollution as a contribution to future programme of measures in line with the WFD.

The updated inventories may provide a clear picture on the potential risk sites as well of the possible targets to reduce and control accidental pollution.

To enable a feedback concerning the progress in the implementation of the ICPDR accident prevention policy at the national level, there is an agreement on the reporting period of three years. At present, the reporting obligations applies to following three documents:

- "Basic Requirements for Installations Handling the Water Endangering Substances" approved at the 5th Ordinary Meeting of the ICPDR on the 28-29 November 2002
- "Safety Requirements for Contaminated Sites in Flood-risk Areas" approved at the 6th Ordinary Meeting of the ICPDR on 01-02 December 2003
- 'Recommendations on requirements for industrial plants containing water-polluting substances in areas with a risk of flooding' approved at the 7th Ordinary Meeting of the ICPDR was held in Vienna/Austria, on 13-14 December 2004.

The reporting schedule is proposed:

Table 48: Overview of reporting obligations on ARS Inventories

Document	Adoption date	First reporting	Second reporting
Basic Requirements	November 2002	Q1/Q2 2006	Q3/Q4 2008
Safety Requirements	December 2003	Q3/Q4 2006	Q3/Q4 2009
Recommendations	December 2004	Q3/Q4 2007	Q3/Q4 2010

5.7.3 Operation and upgrade of the Danube Accident Emergency Warning System

A substantial upgrade in terms of effectiveness and cost-efficiency of the AEWS was carried out in 2003 with support of the UNDP GEF Danube Regional Project. The satellite-based communication was replaced by a web-based communication using Internet and SMS messages to become an integral part of the ICPDR information system (Danubis). The AEWS supporting tools (Danube Basin Alarm Model and database of dangerous substances) are continuously improved. A series of tests of the web-based system were performed in summer/autumn 2003 in all Danube countries to debug the software, to check the technical set-

up of national GSM operators and to train staff of Principle International Alert Centres. The final test of the upgraded system performed on 14 June 2004 proved that the system is perfectly working. The implementation of the new system necessitated a revision of basic AEWS documents.

At present, the system deals only with accident spills but it is planned to extend the system activities in the future to ice and flood warning.

To respond to a pollution accident, downstream users need critical information to put environmental protection and public safety measures into action – and they need it fast.

In 2006, the Danube Accident and Emergency Warning System (AEWS) was activated for eight accidents. An overview of the events is given below:

Table 49: Overview of 2006 AEWS events

Site of accident Date	Affected River	Primary Pollutant	Routing of International messages
Petronell 14.01.2006	Danube, rkm 1891 to 1889	Mineral oil	PIAC-02 ➔ PIAC-04, PIAC-05 “ Warning-Pollution”
Danube upstream Melk 03.03.2006	Danube, rkm 2072 to 2042	Mineral oil	PIAC-02 ➔ PIAC-04, PIAC-05 “ Warning-Pollution”
Smederevo 03.04.2006	Danube, rkm 1112.2 to 1112	Mineral oil	PIAC-13 ➔ PIAC-08, PIAC-09 “ Standard Message” PIAC-13 ➔ PIAC-08, PIAC-09 “ End of alert”
Jamena 17.06.2006	Sava, rkm 196 to 176	Atrazine	PIAC13➔PIAC07, PIAC14 “ Warning-Pollution” PIAC07? PIAC13, PIAC14 “ Standard Message”
Bratislava 28.06.2006	Danube at Bratislava	Mineral oil	PIAC-04 ➔ PIAC-05 “ Warning-Pollution” PIAC-04 ➔ PIAC-05 “ End of alert”
Prahovo 02.10.2006	Danube, rkm 849 to 855	Mineral oil	PIAC-08 ➔ PIAC-09 “ Standard Message” PIAC-08 ➔ PIAC-13 “ Request for Information” PIAC-08 ➔ PIAC09, PIAC10, PIAC12 “ Standard Message” PIAC-08 ➔ PIAC09, PIAC10, PIAC12, PIAC 13 “ End of alert” ICPDR/PS ➔ PIAC08, PIAC09, PIAC12, PIAC13 “ Request for Information”
Bulgarian Danube 07.12.2006	Danube, rkm 824 to 817	Mineral oil	ICPDR/PS➔ PIAC09, PIAC13, PIAC08 “ Request for Information” PIAC08➔ICPDR/PS

Site of accident Date	Affected River	Primary Pollutant	Routing of International messages
			" End of alert" PIAC09➔ICPDR/PS, PIAC08, PIAC13 " Warning-Pollution"
Bulgarian Danube 22.12.2006	Danube, rkm 790	Mineral oil	PIAC09➔PIAC08 " Warning-Pollution"

The overview table shows that mineral oil was the most common polluting substance released by accidents. Navigation was the major cause of these accidental spills, although leaks from on-shore installations occur as well.

A test of AEWS, organized in November 2006, as well as the performance of the warning system during the accidents showed that from the technical point of view, the internet-based system is performing well and is fully capable of distributing warning messages in time and according to the Operational Manual.

One issue, which still requires attention, is ensuring the preparedness of the staff of the Principal International Alert Centres (PIAC) to trigger the system promptly at the national level. The lessons learned from the oil spills on the lower Danube from October to December 2006 show the necessity of having sustainable emergency procedures in place in the Danube countries to ensure timely and concerted actions of all stakeholders at the national level (river authorities, river inspectorates, civil protection, police, fire brigades, etc.) to respond to accidental water pollution. These procedures must include the timely activation of AEWS.

5.8 Reduction of pollution from inland navigation

According to the Article 3.10 of the JAP, *"ICPDR will evaluate the situation concerning such polluting discharges, including the needed cooperation with the Danube Commission"*.

The economic development within the European Union over the last years – enforced through the Eastern enlargement – has lead to the increase and strengthening of economic ties. Due to the intensification of trade the amount of traffic in the Danube corridor – defined as Pan-European Corridor VII in the Community's transport network – has been rising rapidly. Commercial transport along the Danube corridor has soared by 85 percent from 1994 to 2002. The accession of new Member States has also accelerated the traffic.

On the **Austrian** Danube compared to 2002 the transport volume for inland navigation is expected to double until 2015. Within this period an increase up to a doubling is estimated for the oily and greasy ship waste. Up to 4 million litres of bilge water, 140.000 litres of used oil and 19.000 kg of other oily and greasy waste could be expected on the Austrian stretch of the Danube for collection, treatment and disposal. It will be a great challenge for inland navigation to cope with these prospects and developments, keeping and/or strengthening its position as an environmentally friendly and clean transport mode.

Results of previous studies and other actions have shown partly significant differences of the currently existing framework conditions, organisational and technical implementations as well as accounting and financing options for the collection and disposal of ship waste in the Danube riparian countries.

To meet these challenges for inland navigation and to secure the future protection of the multifaceted river ecosystem Danube not only an environmentally sound but also a regionally coordinated waste management system for Danube navigation is required.

In the past, the ICPDR cooperated with Danube Commission in reviewing the guidelines of managing shipping wastes. The EMIS EG has evaluated existing sources of water pollution basin-wide, including those originating from inland navigation, the current procedures of collecting and treating solid and liquid wastes (e.g. bilge water) in countries in the Danube River Basin. Relevant for the future actions for the Danube countries is considered to be the initiative taken by the Austrian Ministry of Transport in 2001 to establish a more effective and harmonized system (Germany, Austria, Slovakia, Hungary) of waste reception and treatment at the Danube River.

The discharges of wastes and bilge water are forbidden. A number of 1100 ships are registered at the Danube River. This is ten times less than in the Rhine River. Based on the provisions of Convention on Wastes from Shipping at the Rhine River in the framework of the Zentralkommission Rheinschifffahrt (ZKR), bilge waters from the ships are collected by special boats (bilge de-oiling boats), treated on the boat or brought to municipal waste water treatment plants. In Germany 8 boats of the Bilgenentölungsverband (BEV) are treating the bilge waters by ultrafiltration and discharging them after treatment into the Rhine River (residual oil content: 1 – 2 mg/l). The BEV is paid (total amount: 2.6 MEUR) by the Länder (regions) while according to polluter-pays-principle, the charge on the fuel (gas-oil) which is bought is paid by the ship owners.

In Austria the harbour companies take over the bilge water without any costs for the ship owner. The further handling and treatment of the bilge water has to be paid by the harbour companies from the harbour charges. Shipping companies would like the government to pay the treatment of the bilge water; the authorities would like to have a more polluter-pays-principle oriented approach with an indirect payment by the ship owner) for the fuel (gas-oil).

In the harbour of Bratislava (Slovakia) an infrastructure pontoon for all services (fuel supply, waste disposal) has been constructed. This pontoon was financed by the harbour and shipping company of Bratislava. It is planned to centrifugate the bilge waters in future (final oil content: 1 mg/l). The aim of the Hungarian authorities is the construction of future installations for treatment of bilge waters, with funding of investment costs by the government. The only reception facility for bilge waters in Budapest, which is run by a private shipping company, accepts only their own ships. No waste reception facilities exist in Romania and Bulgaria.

In 2001 the Austrian Ministry of Transport took the lead in organizing first steps to establish a more effective and harmonized system (DE, AT, SK, HU) of waste reception and treatment at the Danube River. In 2003 the Austrian Federal Ministry for Transport, Innovation and Technology, the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management and the Community of Public Danube Ports in Austria (IGÖD) jointly contracted the Austrian Consultant VIA DONAU to carry out the project 'Sustainable and EU compliant collection and treatment of ship waste on the upper Danube'. The aim of this project was – based on the results of previous national and regional activities – to develop an EU compliant and with the states of the upper Danube (Germany, Slovakia and Hungary) regionally agreed collection and treatment system for ship waste in Austria.

In a first phase of the project, a plan for ship waste management has been developed for Austria. The conceptual work was focussed on oily and greasy and other dangerous ship waste. Technical operative aspects of the service implementation and financing aspects have been examined. Necessary measures for all types of ship waste as well as supportive measures have been evaluated. The result is a proposal for a collection and treatment system for waste of Danube navigation, which has been accorded with relevant parties from Germany, Slovakia and Hungary.

To minimize potential evasion reactions of shippers a strong need is seen for the implementation of a regional coordinated technical solution for a ship waste collection and treatment system. Alongside a future-orientated funding model – especially for the oily and greasy waste – following the polluter-pays-principle will need to be set up. The Austrian ship waste management plan has been tested in a pilot phase on the Austrian stretch of the Danube.

In addition to the Austrian pilot action the other states of the upper Danube shall be enabled to set actions towards an implementation and the development of pilot actions shall be coordinated among the Danube riparian countries. A funding model – especially for oily and greasy waste related operating services – based on the polluter pays principle as well as on indirect payment structures shall be developed for the states of the upper Danube with the intention to integrate further Danube riparian countries in future.

5.8.1 Inland navigation process

Navigation has significant influence on river ecosystems, jeopardizing the goals of the EU Water Framework Directive, which aims for the "good ecological status" of all waters by 2015. Recognising this potential conflict, the ICPDR has linked up with the Danube Commission, and the International Commission for the Protection of the Sava River Basin and initiated an intense, cross-sectoral discussion process, which led to the development of the "Joint Statement on Inland Navigation and Environmental Sustainability in the Danube River Basin". It summarise principles and criteria for environmentally sustainable inland navigation on the Danube and its tributaries, including the maintenance of existing waterways and the development of future waterway infrastructure. The document is under development with meetings of the partners and will be presented for approval at the 10th Ordinary Meeting of the ICPDR, December 2007.

The Joint Statement on Inland Navigation and Environmental Sustainability in the Danube River Basin will be a guiding document for the development of the Joint Programme of Measures, in line with the EU Water Framework Directive, for the maintenance of the current inland navigation, as well as for the planning and the investments in future infrastructure and environmental protection projects.

5.9 Product controls

The prohibition of polyphosphate-based detergents throughout the Danube basin is seen as a priority objective.

According to the JAP, actions were to be taken on:
- *Accomplishing of a self-binding (voluntary agreement) by the Detergent Industry either towards ICPDR or to the Danube Basin States, in order to put only phosphate-free detergents for household and industrial use to the market in the Danube Basin.*

Identified by several investigations of the ICPDR as a major environmental problem across Danube, eutrophication is the excessive enrichment of waters with nutrients (nitrogen and phosphorus – N and P) and subsequent adverse ecological consequences. The presence of nutrients in the Danube Basin has led to severe ecological problems: the deterioration of groundwater resources and the eutrophication of rivers, lakes and especially the Black Sea (daNUbs, 2005).

Other projects, which have clearly shown the need for phosphate input reduction in the DRB include the DABLAS project (ICPDR DABLAS, 2004) and targets for phosphorus input reductions are included in the ICPDR Joint Action Programme (ICPDR JAP, 2001-2005).

The environmental policy of the past can be described as source, substance, and media - orientated. Recent approaches try to connect isolated instruments such as directive based regulations - by integrating existing measures into a comprehensive framework for sustainable development (market – based instruments and/or voluntary agreements). The main instruments used in the DRB countries today are often grouped into three main clusters: (i) directive based regulations, (ii) market – based instruments and (iii) voluntary agreements.

ICPDR has investigated the use of phosphorus within the countries of the Danube basin using data delivered by the detergent industry. In the case of detergents, the increase in phosphorus input due to the introduction of synthetic detergents was seen as a major contributor to the eutrophication (process of nutrient enrichment of water bodies). Control of the level of phosphates in water, such as lakes, rivers and reservoirs, has become desirable in some areas where conditions in the water can lead to excessive growth of algae. The cost of introduction of phosphate-free detergents is much less compared with the cost for improvement of sewage treatment.

Phosphorus has two main impacts:

- As a nutrient in treated effluent that can contribute to eutrophication
- In sludge, where it contributes to the quantity and is partly available to plants.

The effect of P-replacement in detergents is estimated to realize a 24 % reduction for point sources and for the total P-emissions a reduction of 12 %.

At the Ordinary Meeting of the ICPDR (1-2 December 2003), the Contracting Parties have agreed: "The ICPDR reiterates its commitment expressed in the JAP that reducing phosphates in the Danube river basin is an important issue to be addressed and welcomes the preparedness of the German Delegation to take the lead in coordinating the process in developing options for a voluntary agreement for phosphorous reductions". A Task Force was created with the mandate approved by the OM to design policies options and legal procedures in dealing with the phosphate industry and moving towards a phosphate reduction or ban.

During the ICPDR Standing Working Group Meeting on 14/15 June 2007 in Snagov/Romania, the urgency for actions at the national level in Danube countries towards reducing nutrients in the Danube River Basin through controls on phosphate levels in detergents was discussed. The report of the UNDP Danube Regional Project on Recommendations for the Reduction of Phosphorous in Detergents, the Declaration of Danube and Black Sea Environment Ministers, and the deliberations of the ICPDR Pressures and Measures Expert Group have reinforced this urgency and the opportunity that exists to address phosphate pollution through this mechanism. The conclusion of the European Commission report to Council and the European Parliament on detergents and the use of phosphates, further reinforced both the urgency and the need for action. The report concluded:

"The policy recommendation to countries of the Danube River Basin is therefore to proceed with national legislation and/or further voluntary agreements to replace phosphate-based detergents to protect the Danube and Black Sea from eutrophication while awaiting the outcome of the Commission's evaluation of the need for measures at the EU level".
The report goes on to state, *"in the absence of harmonized Community action, this approach appears to be justified and proportionate."*

The ICPDR Standing Working Group has therefore recommended, that the priority countries identified in the UNDP project report on Recommendations for the Reduction of Phosphorous in Detergents, (Romania, Hungary, Serbia, Slovakia, Bulgaria, and Croatia) as having the highest population and high phosphate detergent use, should examine mechanisms to reduce the use of phosphates in detergents through either legislative action or voluntary agreements with industry. Harmonization of the measures and processes to achieve this are needed.

The continued use of phosphates in detergents in the Danube River basin could undermine the substantial investments in pollution control, particularly in the short term before all countries have built a complete network of sewers and wastewater treatment.

5.9.1 Mechanisms for the reduction of detergent phosphates

The main mechanisms for significantly reducing phosphate entry into waters of the Danube river basin have been described as follows:

1. Reduce the amount of sodium tripolyphosphate (STPP) used in detergent builders and switch to "alternative" non-phosphate-based builders, such as Zeolite A;
2. Improve wastewater treatment through implementation of the Urban Wastewater Treatment Directive (UWWTD).

Legal bans on phosphate in detergents are in place in Germany, Italy (ban 1989), the Netherlands, Switzerland (ban 1986), Japan (ban limited to areas containing sensitive lakes but in effect no STPP-based detergents sold in Japan), Canada (ban 1973) and the USA (different dates in different states from the 1970s onwards) (Glennie, et al., 2004).

The Czech Republic has introduced legislation because of failure of a voluntary agreement. Moreover, the Swedish Government has announced that it intends to legislate to provide for a national ban on the use of phosphates in laundry detergents and other cleaning agents. The move is in line with the recommendations of an earlier report by a panel of international experts on measures to counter eutrophication in the Baltic Sea (ENDS Europe Daily, 2006). In addition, France intends to ban phosphates in detergents in the near future (2007) (ENDS Europe Daily, 2006a).

There are several voluntary agreements between governments and industry to limit the use of phosphates in detergents by the detergent industry. In some countries, such as Germany, Austria, and more recently Ireland, the voluntary agreement is in effect equivalent to a "ban" of phosphates in household laundry detergents.

The WRc study (Glennie et al., 2002) to address the current use of phosphates in detergents throughout the EU recommends measures to reduce phosphorus concentrations in surface waters below levels that cause eutrophication, through either improving wastewater treatment, banning the use of phosphates as detergent builders, or a combination of the two approaches. The study suggests that banning phosphorus from household detergents can achieve a phosphorus load reduction of up to 40% entering surface water bodies, which is substantial but not sufficient in isolation to result in any significant improvement. Furthermore, improvements in wastewater treatment to fully comply with the Urban Waste Water Treatment Directive (UWWTD) (Council Directive 91/271/EEC) would only result in typical phosphorus reductions of around 30%. This is because centres with less than 10 000 residents would not be required to eliminate phosphorus from their wastewater. As demonstrated by Switzerland, the USA and Italy, the greatest improvements in lakes and rivers were observed where a combination of reduced detergent phosphorus and improved wastewater treatment were implemented, thereby achieving the required 70-90% reduction in external load.

5.9.1.1 Advantages, limitations and costs involved in implementation of voluntary agreements in DRB

Most of the RBD countries do not at present use voluntary agreements as a tool of co-regulation. Some have reported on obstacles/difficulties to implementing voluntary agreements. These include:

- Poor economic status of the country and, consequently, the main priorities focus on economic development, rather than environmental protection;
- Current legislation does not promote voluntary commitments;
- Institutional constraints and inadequate financial resources to implementing such agreements;
- Lack of knowledge and understanding of such instruments among producers and governmental bodies;

- Lack of encouraging incentives from relevant governmental institutions; and
- Industry is waiting for EU action on the phosphate situation.

Possible measures to promote the feasibility of voluntary agreements have been proposed by RBD countries, as follows:

- Establishing national institutions responsible for implementing and monitoring voluntary agreements;
- Improving communication and establishing mutually beneficial (or at least working) relations between producers and relevant ministries;
- Appropriate information campaign to raise awareness, share knowledge and increasing the understanding of the benefits from such instruments for both sides (including producers and governmental regulating institutions).
- Revision of appropriate regulations and legal acts in order to provide legal support of voluntary incentives.

Concerning information campaigns, assistance from experienced institutions of EU countries (in the form of training, workshops etc.) would be considered helpful (e.g. Ukraine).

Table 50 summarises the available information on the use of phosphate-free laundry detergents in the Danube River Basin countries, including population figures (total and those in DRB). The information is provided by the national reports delivered for the UNDP GEF DRP component on the Recommendations for the reduction of phosphorus in detergents Phosphate- detergent, carried out by the WRc in 2006 (Horth, 2006). It has been difficult to obtain information and the information on the use of phosphate-free detergents must be considered approximate.

Table 50: Detergent usage, populations & phosphate-free detergents by country

% Detergent that is Phosphate-free	Country	Total laundry detergent usage (tonnes/year)	Total population (million inh)[1]	Total population in Danube Basin (million inh)[2]
>98%	Austria	55 197	8.1	7.7
	Germany	643 000	82.0	9.1
>~50%	Czech Republic		9.9	2.7
	Hungary	126 300	10.3	10.3
	Slovenia		2.0	1.7
	Serbia-Montenegro[3]	89 057	9.3	9.1
<10%	Bosnia-Herzegovina	7 485	4.4	2.5
	Bulgaria		7.9	4.4
	Croatia	16 516	4.7	3.2
	Moldova		4.3	1.1
	Slovak Republic		5.4	5.2
	Ukraine	219 873	49.1	3.1
Not known [4]	Romania	154 584	22.4	21.8

Note 1. Information from Whitaker's Almanack 2005

Note 2. From Joint Action Programme, 2000-2005

Note 3. Data for 'phosphate-free' in Serbia-Montenegro may include low phosphate detergents (i.e. up to 5% phosphate)

Note 4. Data for products indicates no phosphate-free detergents on the market in 2005

In many cases the information is incomplete and problems with the definition of 'phosphate-free' and different approaches to product labeling have given rise to uncertainties. Therefore, the definition of 'phosphate-free' as <0.2% phosphate according to the EU Regulation on detergents (EC/648/2004) according to which a phosphate content of 0.2% or higher has to be declared on the label has been used.

However, in some cases, the 'phosphate-free' component may include 'low phosphate' products, e.g. up to 5% phosphate content. The Czech voluntary agreement, for example, allowed up to about 2% phosphate in 'phosphate-free' detergents. Another difficulty was the contradictory information at times between product labels (as examined on supermarket shelves) and manufacturers' information (e.g. Hungary): whilst manufacturers claimed their products were phosphate-free, information from the survey of products on the market was unclear or contradictory this could have been due to a variety of factors, for example changes in product formulations or differences in products with the same name but produced in different countries, such as Germany and Hungary.

The situation can be broadly summarized as follows.
Austria and **Germany** have virtually no phosphate containing laundry detergents and need not be considered for voluntary agreements or other measures. Austria has achieved this through a voluntary agreement, whilst Germany has used a combination of legislative and voluntary measures with the full co-operation of the detergent industry and involvement of the public. Legislative actions to reduce the quantities of phosphates in laundry detergents have been already introduced in 1985 in Austria. The use of phosphate free-detergents was a voluntary development coming from the industry itself, encouraged by public debate on the eutrophication of the aquatic environment.

Slovenia has a high proportion of phosphate-free laundry detergents (about 75%). However, it seems that there has been an increase in the use of phosphate detergents in recent years (it was virtually phosphate-free in 2000), and it may still be rising. Consequently, whilst it should not receive priority for action, the situation may need to be monitored.

The **Czech Republic** has recently replaced a voluntary agreement to reduce phosphorus in laundry detergents, which was a partial success, with legislation; it will therefore not need to be considered for further action either.

The above four countries together account for about a quarter, or 26%, of the total population in the DRB.
Of the remaining countries, only **Hungary** and **Serbia** use significant proportions of phosphate-free laundry detergents and together account for about another quarter (24%) of the DRB population.

The other seven countries use little or no phosphate-free detergents and make up almost half the population; of these **Romania** is the most significant in terms of DRB population (about 27% of total). No figure was given for phosphate-free detergents in Romania, although the available product data (incomplete) indicated an absence of phosphate-free detergents. In Romania, DERO Unilever does not produce phosphate-free detergent. In **Bulgaria** 95% of household detergents are STPP based.

It is worth noting that **Moldova** intends to legislate and to use a combination of subsidies (from donors) and tax incentives to promote the use of phosphate-free detergents.

The work undertaken has demonstrated that a high proportion of phosphate-based detergents is used in Danube River Basin countries, except in Germany and Austria, where virtually all domestic laundry detergents are phosphate-free. The proportion of phosphate-free detergents used in the remainder varies from negligible to about 75%, with the majority of countries using less than 10% P-free.

Consequently there is considerable scope for reducing phosphate inputs into DRB waters by reducing the amount used in detergents in DRB countries.

The following countries, together accounting for about three quarters of the DRB population, must be considered for action to achieve reductions in phosphate-based detergents:

- Bosnia-Herzegovina
- Bulgaria
- Croatia
- Hungary
- Moldova
- Romania
- Serbia
- Slovakia
- Ukraine.

Among these countries, Romania should receive priority because it currently has virtually no phosphate-free detergents on the market and yet constitutes the biggest single contribution to the DRB in terms of its population (about 26%). In contrast, Hungary and Serbia already have a significant proportion of P-free detergents (>50%), but they are significant in terms of their population and, hence, detergent usage.

Information on production costs of phosphate-free detergents is not available. However, Zeolite A has previously been shown to be a viable alternative to phosphate and is used successfully in many countries, including the DRB countries, Germany and Austria. The main adverse effect of abandoning the use of phosphates in detergents is expected to be on the phosphate industry, but not on the detergent industry, which should be able to adjust detergent formulation and production.

Similarly, the information gathered on costs to consumers was inadequate for a thorough statistical assessment, but has not indicated any evidence of higher costs of phosphate-free detergents.

Voluntary agreements without legislative backing are unlikely to be successfully established, and in particular, to be maintained in the Danube River Basin (RBD) countries where action is needed. This is partly because these countries have little experience in the field of voluntary agreements, but would be likely to follow EU legislation, if this were to be put in place. Large multinational detergent manufacturers also seem to prefer to wait for legislation, rather than enter into voluntary agreements. Moreover, there is a considerable risk of other manufacturers or suppliers, not having signed up to the agreement, expanding their market position with P-based detergents, either through production or imports.

These difficulties have been exemplified by the Czech experience, where a voluntary agreement has recently been replaced by legislation, because of failure of the voluntary agreement due to the emergence of 'free-riders'. Similarly, Slovenia has recently seen significant increases in P-based detergents (the market was virtually P-free in 2000, although no voluntary agreement was in place).

It is therefore quite clear that the best way forward would be to introduce a ban or restrictions on phosphate in detergents through EU legislation. The current Regulation on detergents (EC/648/2004) provides an opportunity through Article 16, to review the need and to propose legislation if considered appropriate. The review is under the responsibility of EC Directorate General Enterprise and Industry and a report (funded by the phosphate industry) has been published.

The objective of the EC Recommendation concerning good environmental practice for household laundry detergents (98/480/EC), 2007 is to encourage manufacturers and users of detergents to use household laundry detergents in an environmentally friendly way.

Whilst it is recognised that other actions, such as improved urban waste water collection and treatment, as well as 'good agricultural practices' are necessary complementary actions, the WRc study has shown clearly

that there is ample scope for contributing to a successful resolution of the problem of eutrophication, by replacing phosphate detergents with phosphate-free detergents, thereby reducing the total phosphate burden in the DRB.

5.9.1.2 Scenario calculations on the effects of different consumption of P-containing detergents on the P-emissions

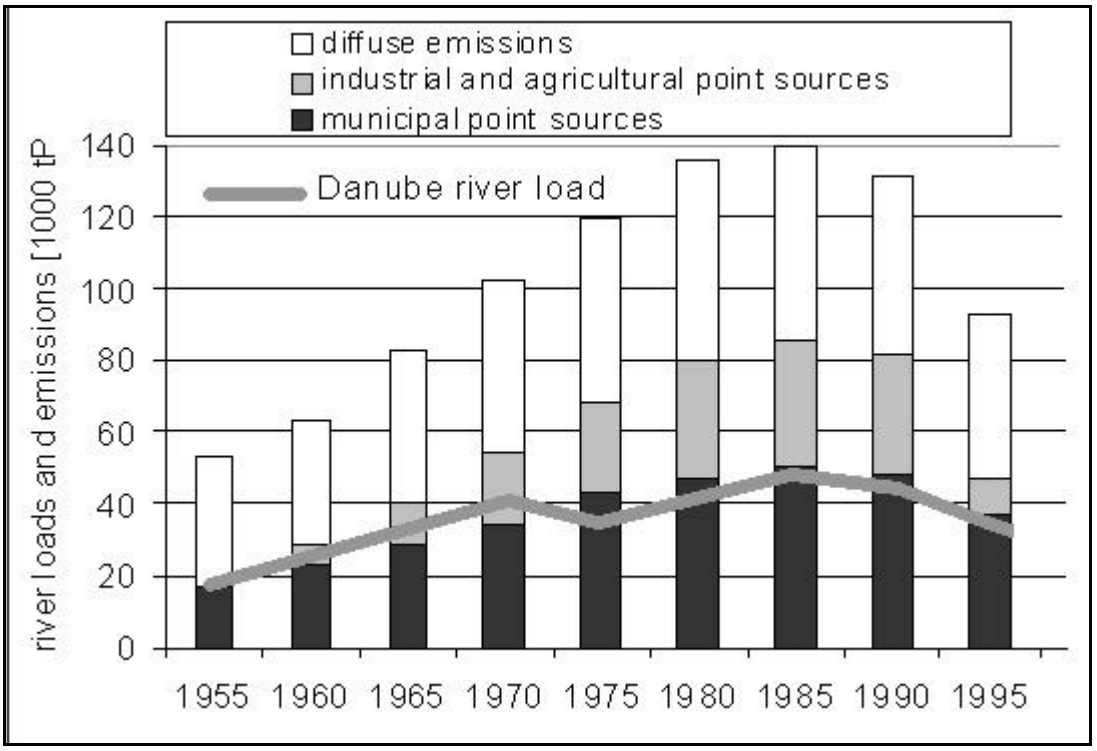
Eutrophication is of major concern in the Danube Region and especially in the receiving Sea, the Western Black Sea. The ecological situation in the Black Sea has improved considerably in the last decade (reduced eutrophication, disappearance of anoxic conditions, regeneration of zoo-benthos and phytoplankton). However the improvement was only partly due to the effect of measures of environmental policy, like nutrient removal at waste water treatment plants (WWTPs) or the ban of P-containing laundry detergents. To a considerable part the reduction is caused by the economic crises in several countries in Central and Eastern Europe (figure 40).

There are two major developments that endanger the improvements in the Western Black Sea observed, i.e. which will lead to an increase of nutrient emissions:

- The economy in these countries will redevelop in the coming years
- The (full) implementation of the Urban Waste Water Treatment Directive (UWWTD).

The challenge towards policy nowadays is to enable economic development without increasing nutrient emissions again (as in the 70ies and 80ies) above “critical loads” for the Western Black Sea. This means: efforts have to be taken to provide space for the anticipated increase of nutrient emissions. Otherwise the ecology of the Black Sea will deteriorate again.

Figure 46: Phosphorus loads discharge by the Danube into the Black Sea



An investigation has been carried out within the UNDP GEF DRP based on the countries reporting on the UWWTD and the results of the MONERIS of few scenario calculations on the effects of different consumption of P-containing detergents on the P-emissions from wastewater treatment plants assuming full implementation of the Urban Waste Water Directive and the whole Danube Basin is considered as sensitive area.

The scenarios were based on the following basic assumptions:

- Connection to sewer systems: All areas except those below 2000 inhabitants are completely (100%) connected to sewer system and corresponding wastewater treatment plants. For Germany in addition 77% and for Austria 36% of these areas (reflecting the situation in 2004) are connected.
- All areas connected to WWTPs are considered to be “sensitive” areas according the UWWTD. This means if some regions would be declared as non-sensitive areas, the P-loads emitted by the treatment plants in these regions would be considerably higher.
- The P-removal efficiency of treatment plants is according the UWWTD:
- 100.000 pe: effluent concentration 1 mgP/l
- 10.000 – 100.000 pe: effluent concentration 2 mgP/l
- Optional for both categories mentioned: 80% reduction in relation to the inflow load
- Less than 10.000 pe: secondary treatment;
- For secondary treatment a removal of 0.6 gP/pe was assumed.
- The amount of sewer infiltration water influences the P-concentration in the raw waste water and as a consequence the efforts required to meet the effluent quality standards differ; calculation were carried out with 100 l (low) and 200 l (high) sewer infiltration water per inhabitant.

- The amount of detergents consumed per inhabitant and day were varied as follows: In Western countries like Austria, Germany, the maximum consumption of P-containing laundry detergents amounted up to 3 g P/inh.d. It has to be recognized that the composition of detergents has changed in the last decades. For instance the total amount of Sodium tripolyphosphate (STPP) contained in washing powders has been reduced from 50% to about 25% (or even less). Therefore "modern" P-containing laundry washing powders use less STPP per washing. Depending on the hardness of the washing water 4 to 13 kg of washing powders are consumed per inhabitant. Assuming a consumption of 4 – 13 kg washing powder with an STPP concentration of 25% per inhabitant would mean a specific P-emission of 0.7 – 2.2 gP/inh.d.

The following assumptions have been made:

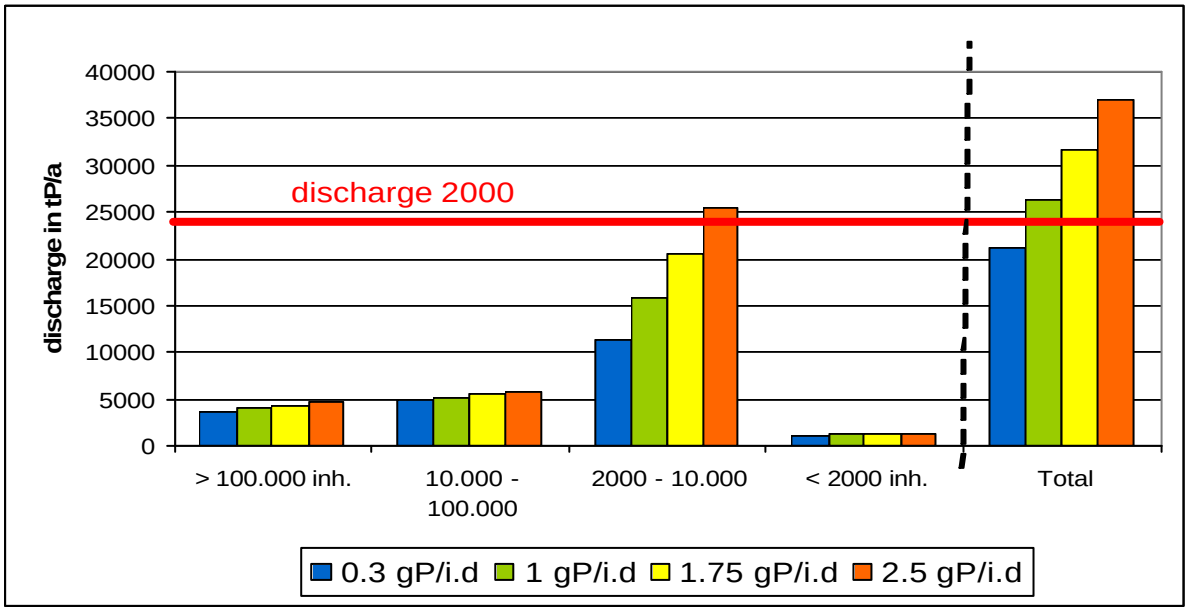
- 0.3 gPdet/inh.d: this is the amount used in Germany or Austria in dish washing products etc., but no P-containing laundry detergents
- 1.0 gPdet/inh.d: 0.7 gP/inh.d in laundry detergents + 0.3 gP/inh.d dish washing products; for D and A the amounts of 0.3 gP/inh.d were used
- 1.75 gPdet/inh.d; 1.45 gP/inh.d in laundry detergents + 0.3 gP/inh.d dish washing products; for D and A the amounts of 0.3 gP/inh.d were used
- 2.5 gPdet/inh.d: 2.2 gP/inh.d in laundry detergents + 0.3 gP/inh.d dish washing products; for D and A, the amounts of 0.3 gP/inh.d were used.

Scenario calculations have been carried out to show the effects of different consumption of P-containing detergents on the P-emissions from wastewater treatment plants assuming full implementation of the Urban Waste Water Directive and the whole Danube Basin is considered as sensitive area.

If the average consumption of P-containing detergents exceeds 0.65 gP/inh.d (including automatic dish washing detergents) the emission will be higher as in the year 2004.

55 to 70% of the P-emission will stem from settlements between 2.000 and 10.000 inhabitants as for these areas no P-removal is required by the UWWTD (Figure 47).

Figure 47: Mean P-discharge in different scenarios in tP/a.



Sewage sludge represents a considerable source of P.

The amounts of additional sludge production due to the replacement of P containing detergents by e.g Zeolites or due to the precipitation of P are similar (increase by 10 - 20%).

The costs of precipitants for P-removal compared to the total costs (investment costs plus operation costs) for sewer development and wastewater treatment are very small.

The introduction of P-free laundry detergents is considered to be a fast and efficient measure to reduce nutrient emissions into surface waters.

The results of scenarios calculation are:

- If the average consumption of P-containing detergents exceeds 0.65 gP/inh.d (including automatic dish washing detergents) the emission of P from WWTPs after full implementation of the Urban Waste Water Treatment Directive will be higher as in the year 2004 (emission in 2004: ca. 24 ktP).
- 54 to 69% of the P-emission will stem from settlements between 2.000 and 10.000 inhabitants as for these areas no P-removal is required by the UWWTD.
- The introduction of P-free laundry detergents in the Danube countries would save 5 kt P/a compared to the 1gP/inh.d Scenario and 10.5 kt P/a compared to the 1.75 gP/inh.d Scenario.
- For treatment plants with > 100.000 pe the emissions increase with increasing consumption of P-containing detergents by up to 4 kt P.
- In total 2 to 3 kt P will be discharged untreated into the receiving waters via storm water overflow.
- The amounts of additional sludge production due to the replacement of P containing detergents by e.g. Zeolites or due to the precipitation of P are similar (increase by 10-20%). This means that the costs for sludge management would be similar for these two options.
- The costs of precipitants for P-removal compared to the total costs (investment costs plus operation costs) for sewer development and wastewater treatment are very small.

5.10 Minimizing the impacts of floods

Article 3.12 of the Danube Convention stated the obligation of the countries consider the *application of UN-ECE-Guidelines on 'Sustainable Flood Prevention' on concrete terms, e.g. via an 'Action Programme for sustainable Flood Prevention' adapted to the specific situation of the overall Danube Basin. In case the overall Danube Basin proves to be too 'wide spanned' for such Programme a setting-up of 'Action Programmes for sustainable Flood Prevention for selected parts of the Basin'* should be considered.

Historically, disastrous flood events have occurred in the Danube River basin. In response to the damages after disastrous floods in 2002, the ICPDR decided to establish the long-term Action Programme for Sustainable Flood Prevention in the Danube River Basin, adopted at the ICPDR Ministerial Meeting on 13 December 2004.

- The first step is the development of a framework Action Programme that is based on the sustainable flood protection programmes developed in the various Danube countries as well as on networking existing structures and using the future-oriented knowledge base accumulated through a wide range of activities over the past decade. The overall goal of the Action Programme is to achieve a long term and sustainable approach for managing the risks of floods to protect human life and property, while encouraging conservation and improvement of water related ecosystems.

- Given the area, the complexity and the internal differences in the Danube River Basin, the Action Programme represents an overall framework, which needs to be specified in further detail for sub-basins.
- The Action Programme is based on UN-ECE Guidelines on Sustainable Flood Prevention, EU Best Practices on Flood Prevention, Protection and Mitigation and on EU Communication on flood risk management, COM(2004)472. The major principles advocated are: (i) the shift from defensive action against hazards to management of the risk and living with floods (ii) the river basin approach taking into account the Water Framework Directive, (iii) joint action of government, municipalities and stakeholders towards flood risk management and awareness raising, (iv) reduction of flood risks via natural retention, structural flood protection and hazard reduction, and (v) solidarity.

Targets of the Action Programme are set on a basin-wide and a sub-basin level taking into account the above-mentioned principles.

There are four major basin-wide targets, which are currently under implementation.

(i) Improvement of flood forecasting and early flood warning system

Interlinking of the national and/or regional systems aims to improve the overall coordination and transboundary coherence of flood monitoring and forecasting systems. A Danube Flood Alert System based on the LISFLOOD model, prepared by the EC JRC will be launched in December 2007.

(ii) Support for the preparation of and coordination between sub-basin-wide flood action plans

The ICPDR is a coordination platform for preparation of flood action plans for the river sub-basins. Steps towards linking of flood risk management with the river basin management have been done in cooperation with RBM EG.

(iii) Creating forums for exchange of expert knowledge

Measures should be taken towards sharing of experience and the coordinated development and promotion of best practices on flood risk management. Exchange of relevant information on flood protection, prevention and mitigation with the other international river commissions is foreseen.

(iv) Recommendation for a common approach in assessment of flood-prone areas and evaluation of flood risk.

The overall approach of the proposed EU Flood Directive to flood risk mapping is coherent with the basic principles described in the ICPDR Flood Action Programme. The status report on flood mapping and flood risk evaluation in the Danube River Basin was prepared in cooperation with the EEA. The ICPDR Flood Risk Mapping Workshop held on 12-13 September 2007 in Budapest provided substantial input in the form of Common Position on the minimum recommendations for flood risk mapping in the Danube River Basin. The common approach for flood risk mapping will be developed utilizing also the outcomes of the research cooperation at the EU level (EXCIMAP). Establishing of a Flood Mapping Task Group to agree in technical details of flood mapping is under consideration.

The adoption of the EU Directive on the assessment and management of flood risks (EFD) has its impact also on the implementation of the ICPDR Action Programme on Sustainable Flood Protection in the Danube River Basin both in terms of technical content and the implementation time plan, given that the ICPDR Action Programme itself foresees *incorporating the future developments of the EU initiative on flood risk management planning*. Discussions on harmonization of the implementation processes within the ICPDR is organised by the FP EG.

The FP EG of ICPDR agreed that it is necessary to prepare an analysis containing:

- Assessment of the differences between the current version of the EU Flood Directive and the ICPDR Flood Action Programme
- Comparison of the implementation deadlines in both documents
- Review of the availability of the components of the flood risk management cycle in the ICPDR Flood Action Programme
- First draft of a transformation scenario for convergence of the ICPDR Flood Action Programme with the EU Directive.

At the sub-basin level, six targets have been identified in the Action Programme:

- To reduce the adverse impact and the likelihood of floods in each sub-basin through the development and implementation of a long-term flood protection and retention strategy based on the enhancement of natural retention as far as possible
- To improve flood forecasting and warning suited to local and regional needs as necessary.
- To increase the capacity building and raise the level of preparedness of the organizations responsible for flood mitigation
- To develop flood risk maps
- To harmonize design criteria and safety regulations along and across border sections.
- To prevent and mitigate pollution of water caused by floods.

For sub-basin measures, the Action Programme provides a recommended structure of the flood action plans and gives an overview of activities to be considered during their preparation.

Decisions on the framework of implementation of the sub-basin Action Plans is the task and responsibility of the countries affected, according to their national legislation as well as their bilateral and multilateral agreements. Financial resources necessary for the implementation of the Action Programme should be based on the national budgets and other national sources, on EU funds, including new cohesion policy funds, and on the loans from International Financing Institutions.

5.11 Water Balance

According to Article 9 (3) of the DRPC the „*Contracting Parties shall establish on the basis of a harmonized methodology, domestic water balances, as well as the general water balance of the Danube River Basin. As an input for this purpose the Contracting parties to the extent necessary shall provide connecting data, which are sufficiently comparable through the application of the harmonised methodology. On the same data base water balances can also be compiled for the main tributaries of the Danube River.*"

Action to be taken in line with Article 3.13 of the Joint Action Program is: *"the ICPDR will develop a harmonised methodology for establishing domestic water balances and will present a first general water balance for the whole Danube River Basin including water balances for the main tributaries till the end of 2005"*.

Taking into account the experience resulting from the regional co-operation of the Danube countries in hydrology within the framework of IHP UNESCO which developed the Hydrological Monograph of the Danube River in its first phase and a series of follow-up volumes of the monograph on specific hydrologic

themes in the Danube basin in the following two phases of cooperative research sharing knowledge and data, the IHP National Committees of the Danube countries offered to contribute to and co-operate on the objectives of the ICPDR Joint Action Plan, point 3.13 Water Balance.

At the occasion of 6th Steering Group meeting of the ICPDR, a resolution was approved on acceptance of the ICPDR to cooperate with IHP/UNESCO on hydrological issues, for the update of water balance.

The joint research was focused on the basin wide water balance in the DRB, and included several components with different responsibilities: WatBal Modeling (WRI Bratislava); GIS and balance regions (WRI Bratislava); and GIS and mapping of precipitations (IH-SAS).

The following set of goals has been identified for the water balance of the DRB:

- Elaboration of spatially distributed water balance for the whole Danube basin to provide the basis for transboundary water management and decision support.
- The development of a standardised database in digital format to assist water related decision making at the national and the basin wide scale.
- Creation of conditions for further harmonisation and unification of methodologies and use of more sophisticated approach at the domestic and/or sub-regional level.
- Assembling of the base for further impact analysis of ongoing global and climate change.

The outcomes of the joint research include:

1. CD ROM with complete results containing the digital information for the whole Danube river basin enabling to extract relevant information for the water balance in sub-basins;
2. Maps of general geography, mean annual precipitation, evapotranspiration and runoff displaying the gridded information and isolines for the whole Danube river basin
3. Report describing the most relevant results and conclusions including the major learning from the cooperative research and indications for further developments in establishing the basis for a knowledge-based management of the Danube River Basin.

Completed material can be used for preparing and publishing an improved and enlarged Hydrological Monograph of the Danube River Basin.

The WatBal will be applied in all selected balance regions within the Danube River Basin.

The national water balance model considers balance components: corrected precipitation, evaporation, runoff depth and snow equivalent. Additionally presentations available are the runoff figures Q95 (Low flow), Q5 (Flood Flow) and the runoff components surface runoff, interflow and base flow.

Specific issues addressed in the final report for DRB countries include:

- Precipitation trends in the Danube River Basin
- Inventory of hydraulic structures
- Statistics on runoff regime
- Updating the Water Balance
- Geometrical features of the riverbed
- Regionalization of maximum flood discharge estimation
- Flood conditions in the DRB
- Hydrological meta-database of the DRB
- Stability of runoff regime in the DRB.

The final report is available as of July 2007. It includes general water balance assessment of 109 balance regions in the DRB.

5.12 River Basin Management

On December 22, 2000 the Water Framework Directive 2000/60/EC (WFD) came into force. The EU Member States are obliged to fulfil this Directive. The WFD brings major changes in water management practices. Most importantly, it:

- sets uniform standards in water policy throughout the European Union and integrates different policy areas involving water issues,
- introduces the river basin approach for the development of integrated and coordinated river basin management for all European river systems,
- stipulates a defined time-frame for the achievement of the good status of surface water and groundwater,
- introduces the economic analysis of water use in order to estimate the most cost-effective combination of measures in respect to water uses,
- includes public participation in the development of river basin management plans encouraging active involvement of interested parties including stakeholders, non-governmental organizations and citizens.

The Water Framework Directive, which is the most substantial piece of EC water legislation to date, is focused on delivering the integrated approach for the protection and sustainable use of the water environment. The WFD places obligations on member states to implement measures to achieve specific environmental objectives for water bodies including rivers, lakes, groundwater and estuaries.

The WFD requires that for most surface water bodies, the target of "good ecological status" should be achieved within 15 years of adoption of the Directive. For water bodies that already achieve this status and those at "high ecological status" the objective is to maintain this. Some water bodies may not be capable of achieving "good", simply because they have been heavily physically modified, for example, in the case of engineered river channels or flood defence measures. If so, a more appropriate ecological quality objective may be set – "good ecological potential".

An exemption of the timetable and/or target could be allowed under certain circumstances – if measures to achieve the target are "disproportionately expensive." These exemptions range from small-scale temporary exemptions to mid- and long-term deviations from the rule "good status by 2015."

"River Basin Management Plans" (RBMPs) will provide the context for setting out a comprehensive programme of measures designed to achieve the objectives that have been set for water bodies. One of the key features of the Directive is its incorporation of economic considerations. For example, adequate cost recovery for water services, and economic analysis of water use and review of the environmental impact of human activity to support the development of the River Basin Management Plans. Consequently, public consultation plays an important part in their preparation.

The 'river basin district' is the main unit for the management of river basins and means "the area of land and sea together with their associated groundwaters and coastal waters" (Art. 2 (15) WFD). 'Coastal water' are defined as "surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters measured" (Art. 2 (7) WFD).

The Danube river basin district will include the coastal waters of Romania along the full length of its coastline as well as the Ukrainian coastal waters extending along the hydrological boundaries of the Danube river basin. The coastal waters of Bulgaria have been assigned to another district.

The EU as well as ICPDR member countries have agreed that the ICPDR will provide the platform for the coordination necessary to develop and establish the River Basin Management Plan for the Danube Basin as well as its implementation.

What makes the implementation process in the Danube River Basin a particular challenge is the fact that not all countries are EU Members and therefore obliged to fulfil the EU WFD. Besides Austria and Germany, four additional Danube countries have become EU Members States on May 1, 2004 and Romania and Bulgaria on January 1, 2007. One more Danube country – Croatia - is in the process of accession while the remaining four countries have not yet initiated a formal process to join the EU.

With the adoption of the EU Water Framework Directive the ICPDR has been nominated as the platform to develop the Danube River Basin Management Plan. The national governments are the competent authorities that must report directly to the EU but the ICPDR serves as the forum under which an international river basin plan is prepared. This role is especially important in providing coordination of actions, information exchange, development of joint strategies and the harmonization of methods and mechanisms of analysis.

The ICPDR RBM EG is responsible for coordinating the technical work amongst the 13 participating countries and according to the implementation time frame as set by the EU. All Contracting Parties have agreed to make all efforts to arrive at a coordinated international River Basin Management Plan for the Danube River Basin.

The work of the International Commission for the Protection of the Danube River is concentrated on the development of a joint basin management plan and a harmonization of methodologies and approaches for conducting the analysis needed. The first major step in that work – the characterization of the basin – is completed and forms the basis for identifying the problems and additional efforts and actions needed to reduce pollution, and minimize other pressures negatively influencing the quality of water in the basin.

5.12.1 Danube River Basin Analysis

The first main output of the joint efforts to implement the WFD in the Danube River Basin is the “Danube River Basin Analysis”- the Roof Report 2004, which has been prepared in line with Art. 5, 6 and Annexes II, III, IV of the WFD. It is the first comprehensive description of the basin’s transboundary surface and ground waters, and significant human pressures, which impact them. It also represents the basis for the development of the Danube River Basin Management Plan (DRBMP) by 2009.

The Water Framework Directive ensures integrated water resources management on river basins. River basin authorities will be required to monitor water quality and quantity, set quality standards, establish rules for water abstraction and waste water discharge permits, and develop action plans to ensure that agreed quality objectives will be met. Public participation in the process is essential. The Directive is particularly demanding in requiring Member States to achieve "good ecological status" and "good chemical status" for all surface and ground water, by 2010. Implementing the water policy legislation will be very demanding and costly for all new members, in administrative, financial and political terms.

The first main outputs of the joint efforts to implement the EU Water Framework Directive in the Danube River Basin are the Roof Reports 2003 and 2004. The WFD Roof report 2003 (Art. 3.8 and Annex I) was finalized on April 16, 2004 and sent to the European Commission as an informal information on June 22, 2004. In addition, the national reports of Bosnia and Herzegovina, Croatia, Serbia and Montenegro, Bulgaria, Romania and Moldova were sent to the Commission. Ukraine was not in a position to report on WFD implementation.

The WFD Roof report 2004 has been prepared in line with Art. 5, 6 and Annexes II, III, IV of the WFD. The report having reporting deadline at March 22, 2005 deals with the characterization of surface waters and groundwater, with the assessment of significant pressures and impacts, and with the economic analysis of water uses.

Each state delivered the roof report (Part A) together with its own national report (Part B). The final report was presented at the Ministerial Meeting in December 2004.

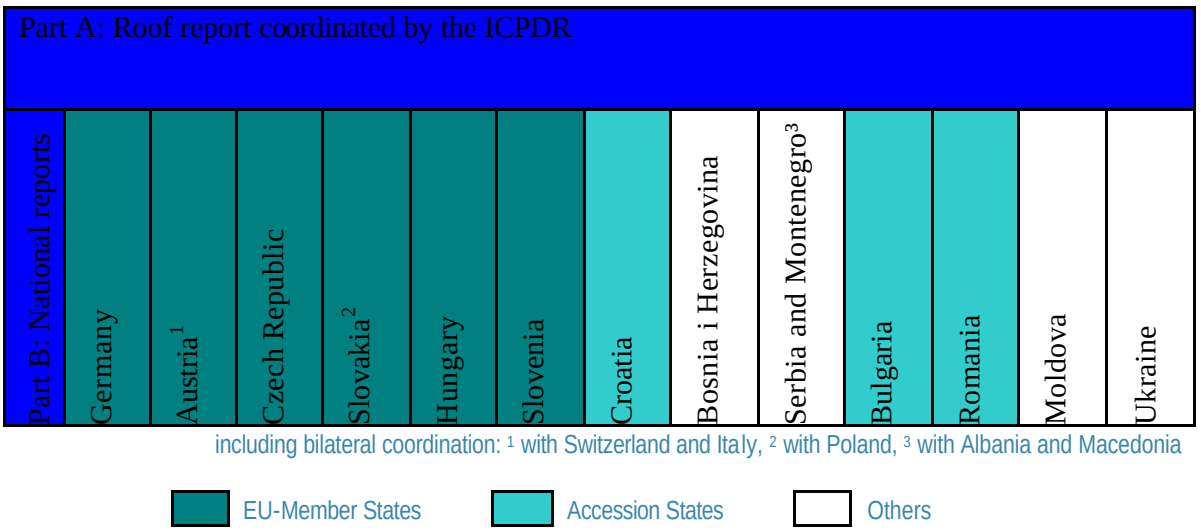
One of the objectives of the Water Framework Directive is specifically to make sure that different objectives are achieved through a cost effective and comprehensive decision-making process.

The Danube River Basin Management Plan has been divided into two parts. Part A (roof of the DRBMP) gives relevant information of multilateral or basin-wide importance, whereas Part B (national input to DRBMP) gives all relevant further information on the national level as well as information coordinated on the bilateral level (Figure 48).

Part A – Roof report

The Roof report deals with information of basin-wide importance. This includes, in particular, an overview of the main driving forces of multilateral or basin-wide relevance and the related pressures exerted on the environment. The analysis is based on available data resulting from past and ongoing programmes and projects. The overview included effects on coastal waters of the Black Sea as far as they are part of the DRBD, since their status could be a reason for designating the whole DRBD as a sensitive area.

Figure 48: Structure of the report for the Danube River Basin District



Part B – National reports

The National reports give all relevant further information on the national level as well as information coordinated on the bilateral level. Transboundary issues not covered by the ICPDR are solved at the appropriate level of cooperation e.g. in the frame of bilateral/multilateral river commissions.

The Danube states cooperating under the DRPC reported regularly to the ICPDR on the progress of WFD implementation in their own states. These national reports serve as a means for exchanging information between the states and for streamlining the implementation activities on the national level.

5.12.1.1 Characterization of surface waters types and harmonized system for reference conditions

According to Annex II 1.1 WFD "Member States shall identify the location and boundaries of bodies of surface water and shall carry out an initial characterisation of all such bodies …".

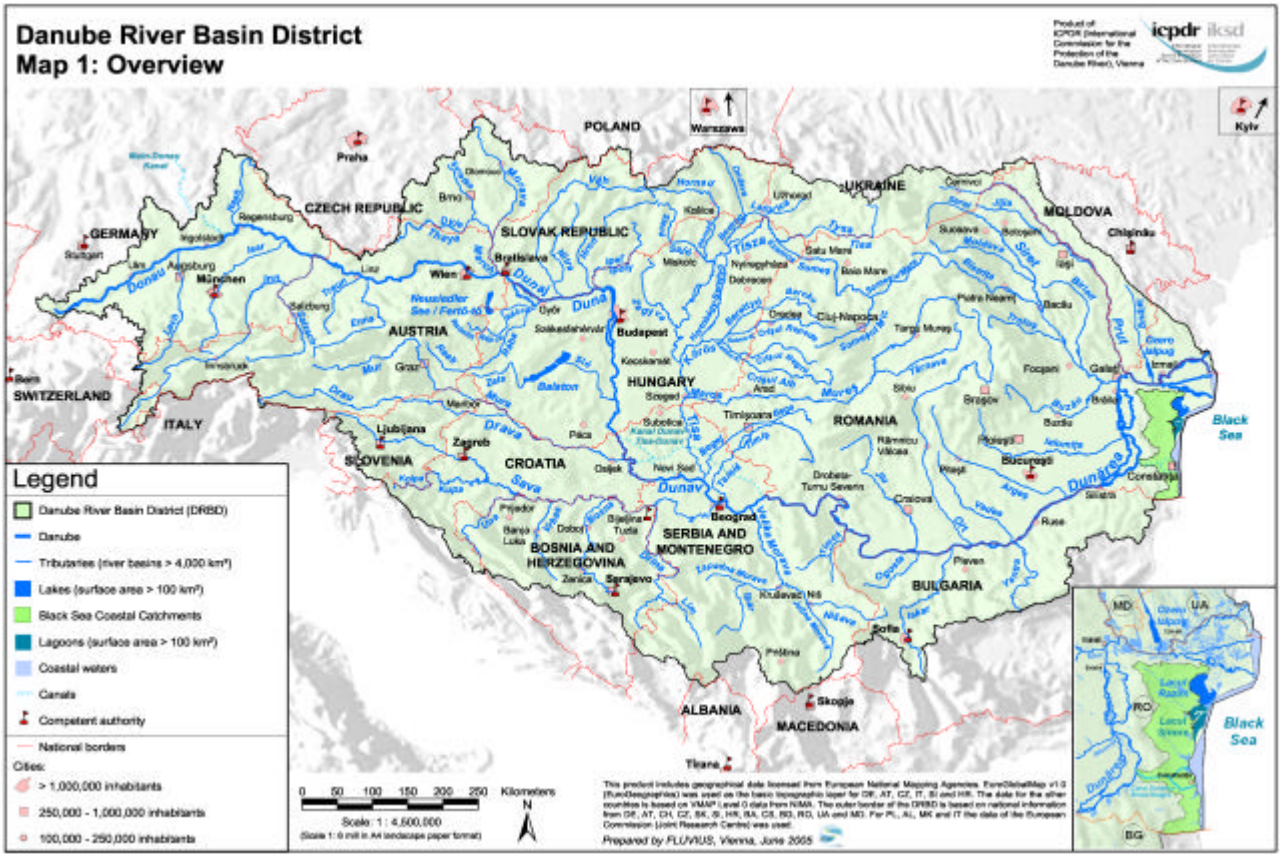
The first step in the analysis is the identification of the surface water categories. It has been agreed that the following surface waters are potentially of basin-wide importance and are therefore dealt with in the Roof report:

- all rivers with a catchment size of > 4 000 km²
- all lakes and lagoons with an area of > 100 km²
- the main canals.

These surface waters are shown on the Danube River Basin District overview map (Map 6).

The surface water body categories have been identified on the national level. For each surface water category, the relevant surface water bodies within the river basin district need to be differentiated according to type (Annex II 1.1 (ii) WFD). The state of implementation of WFD varies strongly between the countries in the Danube River Basin, especially for the development of surface water typologies and the definition of their reference conditions.

Map 6: Overview map of the Danube River Basin District



With support from UNDP GEF DRP, the typology of the Danube River has been developed in a joint activity by the countries sharing the Danube River. The Danube typology therefore constitutes a harmonised system used by all Danube countries. On the basin-wide level, the Danube countries have agreed on general criteria as a common base for the definition of reference conditions. These have then been further developed on the national level into type-specific reference conditions. The Danube flows through or borders on territories of 10 countries (Germany, Austria, Slovakia, Hungary, Croatia, Serbia and Montenegro, Bulgaria, Romania, Moldova and Ukraine) and crosses four ecoregions (9 – Central Highlands, 11 – Hungarian Lowlands, 10 – Carpathians, and 12 – Pontic Province). The Danube typology was based on a combination of abiotic factors of System A and System B. The most important factors are ecoregion, mean water slope, substratum composition, geomorphology and water temperature. The countries developed the typologies of the Danube tributaries individually. Workshops enhanced the exchange of information between the countries and allowed for a streamlining of approaches. In addition, stream types relevant on transboundary watercourses were bilaterally harmonised with the neighbours. The common factors used in all DRB typologies are ecoregion, altitude, catchment area and geology.

5.12.1.2 Identification of significant pressures

The WFD requires information to be collected and maintained on the type and magnitude of significant anthropogenic pressures, and indicates a broad categorisation of the pressures into:

- point sources of pollution,
- diffuse sources of pollution,
- effects of modifying the flow regime through abstraction or regulation, and
- morphological alterations.

In addition, there is a requirement to consider land use patterns (e.g. urban, industrial, agricultural, forestry) as these may be useful to indicate areas, in which specific pressures are located.

The pressures and impacts assessment follows a four-step process:

1. describing the driving forces, especially land use, urban development, industry, agriculture and other activities which lead to pressures, without regard to their actual impacts;
2. identifiying pressures with possible impacts on the water body and on water uses, by considering the magnitude of the pressures and the susceptibility of the water body;
3. assessing the impacts resulting from the pressures; and
4. evaluating the likelihood of failing to meet the objective.

The analysis was based on screening of emissions (pressures) according to certain criteria, which determine what 'significant pressure' means (Table 51).

The ICPDR Emission inventory is the key database for the assessment of emissions from point sources on the basin-wide level. It includes the major municipal, industrial and agricultural point sources and identifies the total population equivalents of the municipal wastewater treatment plants, the industrial sectors of the industrial wastewater treatment plants, and the types of animal farms for the agricultural point sources. In addition, it includes information on the receiving water and data on some key parameters of the effluent such as BOD, COD, P and N.

The criteria defined by the ICPDR EMIS EG consider pressures from point sources, especially from substances referred to in Annex VIII WFD, to the Urban Waste Water Treatment Directive (91/271/EEC), to the Integrated Pollution Prevention and Control Directive (96/61/EC) and to the Dangerous Substances Directive (76/464/EEC).

Table 51: Definition of significant point source pollution on the basin-wide level

Discharge of	Assessment of significance
Municipal waste water	
any municipal waste water from • agglomerations with < 10,000 PE • WWTPs with < 10,000 PE	Not significant
untreated municipal waste water from • agglomerations with > 10,000 PE	Significant
only mechanically treated municipal waste water from • WWTPs with > 10,000 PE	Significant
mechanically and biologically treated municipal waste water without tertiary treatment from • WWTPs with > 100,000 PE	Significant if at least one parameter is exceeded: – BOD[1] > 25 mg/l O_2 – COD[1] > 125 mg/l O_2 – N_{total}[2] > 10 mg/l N** – P_{total}[2] > 1 mg/l P
Industrial waste water	Significant if at least one parameter is exceeded: – COD[3] > 2 t/d – pesticides[4] > 1 kg/a – Heavy metals and compounds[5]: • As_{total} > 5 kg/a • Cd_{total} > 5 kg/a • Cr_{total} > 50 kg/a • Cu_{total} > 50 kg/a • Hg_{total} > 1 kg/a • Ni_{total} > 20 kg/a • Pb_{total} > 20 kg/a • Zn_{total} > 100 kg/a
Waste water from agricultural point sources (animal farms)	Significant if at least one parameter is exceeded: N_{total}[5] > 50,000 kg/a P_{total}[5] > 5,000 kg/a

WWTP = waste water treatment plant

[1] according to Table 1 of the EU Urban Wastewater Treatment Directive, 91/271/EEC

[2] according to Table 2 of the EU Urban Wastewater Treatment Directive, 91/271/EEC

**) Equivalent of 13 mg/l N in Germany, due to 2h-composite sample monitoring

[3] threshold as in the EMIS inventory for industrial discharges 2000

[4] thresholds water in kg/year as in the EPER

[5] threshold as in the EPER (EMIS inventory for point agricultural sources 2002)

5.12.1.3 Definition of significant point source pollution on the basin-wide level

A comparison of the significant point source emissions with the complete list of point sources in the emission inventory illustrates that only few point sources are responsible for about half of the point discharges into the Danube River system. From this it can be concluded that reduction of emissions (organic substances and nutrients) from these sources would lead to a remarkable reduction of the total point source pollution.

Table 52: Discharges from significant point source according to the criteria, per sub basins

	COD t/a	**BOD** t/a	**N** t/a	**P** t/a

Municipal sources				
01 Upper Danube	11584	1741	7756	313
02 Inn	1316	206	474	33
03 Austrian Danube	604	130	248	14
04 Morava	898	100	189	20
05 Váh-Hron	14899	4248	2102	349
06 Pannonian Central Danube	94759	32304	11618	1495
07 Drava-Mura	14970	5802	2291	418
08 Sava	83649	37102	6005	1358
09 Tisza	37507	14327	4883	1029
10 Banat-Eastern Serbia	13261	4247	2679	619
11 Velika Morava	0	0	0	0
12 Mizia-Dobrudzha	64057	29149	5064	1254
13 Muntenia	59917	29861	15602	1844
14 Prut-Siret	25314	9869	2751	215
15 Delta-Liman	744	272	50	4
16 Romanian Black Sea Coast	10297	2801	910	87
Total Danube river basin district	**433775**	**172159**	**62622**	**9053**
Industrial sources				
01 Upper Danube	7346	49	20	8
02 Inn	8469	375	305	20
03 Austrian Danube	4825	196	12	9
04 Morava	1911	136	130	19
05 Váh-Hron	8294	2681	96	4
06 Pannonian Central Danube	16424	3515	352	13
07 Drava-Mura	29718	6083	185	52
08 Sava	33965	6772	310	374
09 Tisza	16622	3315	331	32
10 Banat-Eastern Serbia	1158	120	20	2
11 Velika Morava	0	0	0	0
12 Mizia-Dobrudzha	9244		0	0
13 Muntenia	16173	5166	2312	5
14 Prut-Siret	4456	903	136	1
15 Delta-Liman	982	0	24	15
16 Romanian Black Sea Coast	842	242	390	
Total Danube river basin district	**160427**	**29555**	**4625**	**555**
Agricultural sources				
07 Drava-Mura	2	1		1
08 Sava	191	41	107	3
09 Tisza	2263	579	749	
10 Banat-Eastern Serbia	357	104	57	16
13 Muntenia	2040	1085	881	57
14 Prut-Siret	285	1074	326	5
15 Delta-Liman	901	206		
Total Danube river basin district	**6039**	**3089**	**2121**	**82**

In 2000, the total nutrient point discharge into the Danube was about 163 kt/a nitrogen and 28.1 kt/a phosphorus. Figure 49 and Figure 50 show the difference in the present state of the nutrient point source discharges within the Danube countries. For nitrogen it is shown that the lowest point N discharges are in Germany with 4 g/(Inh.·d) per connected inhabitant followed by Austria, Ukraine and Moldova. The picture for phosphorus presented in Figure 50 is similar to that for nitrogen Figure 49, but the differences between the countries are much larger. This is due to the fact that the specific P point discharges reflect, not only the state of the P elimination in waste water treatment plants, but also the existing use of phosphorus in detergents, and discharges from direct industrial sources. For this reason the specific P emissions are above 4 g/(Inh.·d) for

Bosnia i Herzegovina, Croatia and Serbia. The medium level P emissions for Czech Republic and Slovakia result from the fact that some WWTPs have additional P elimination.

Figure 49: Inhabitant specific N discharges from point sources 1998 to 2000 (2004).

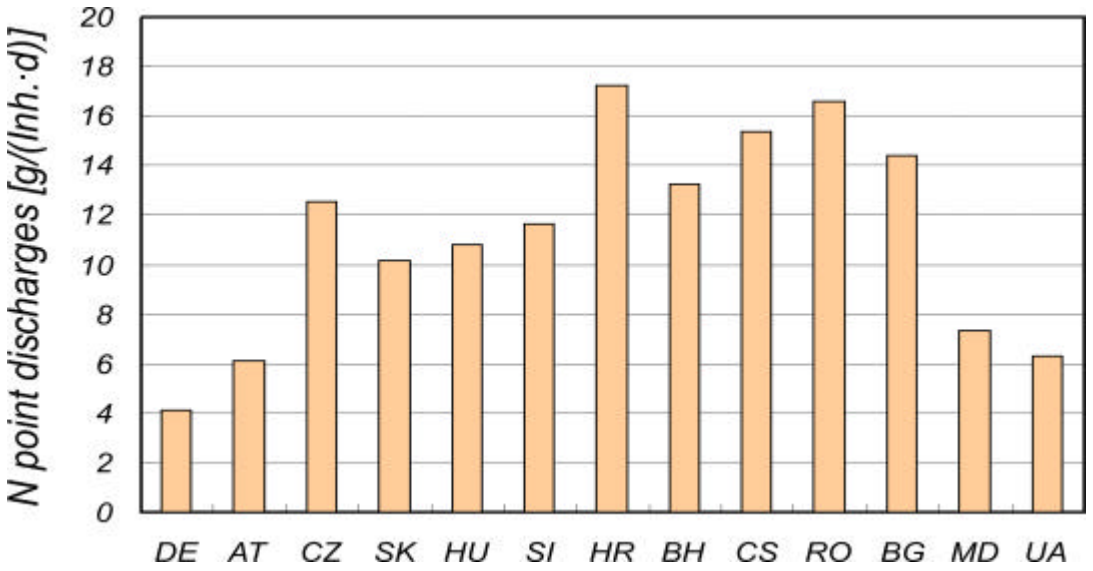
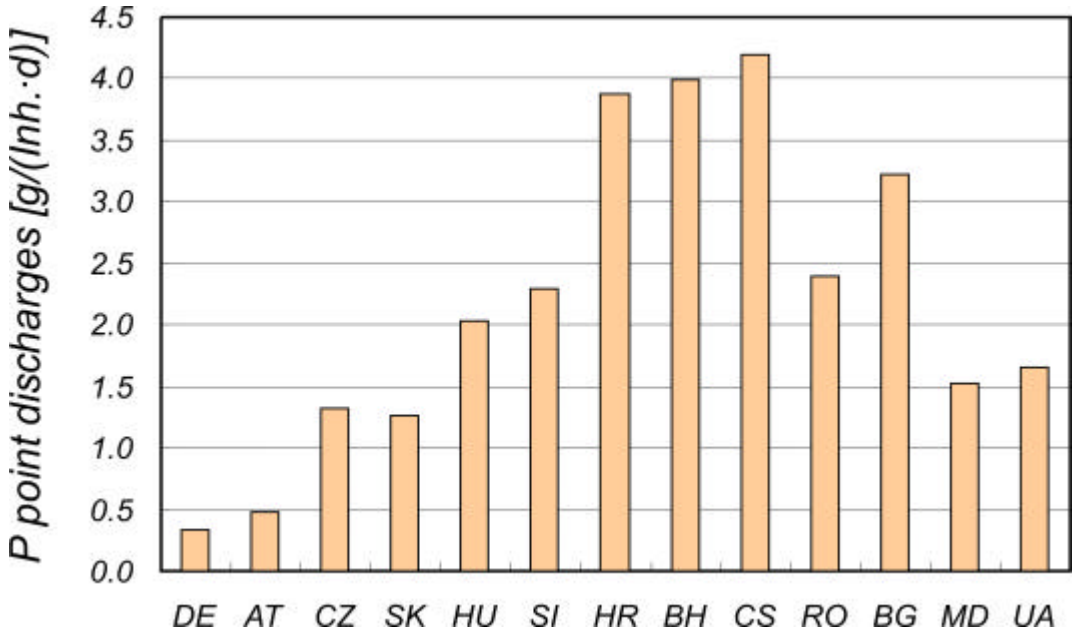


Figure 50: Inhabitant specific P discharges from point sources 1998 to 2000 (2004).



5.12.2 Significant key water management issues

The work carried out on characterization of water bodies for the Water Framework Directive suggests that across the Danube Basin a high proportion of water bodies will be at risk of failing to meet the Water Framework Directive's 'good ecological status' objectives.

The results of the first analysis in the DRB are reasons for concern (Figure 51). Across the Danube Basin a high proportion of water bodies will be at risk of failing to meet the Water Framework Directive's 'good ecological status' objectives, due to the impact of pollution caused by organic substances, nutrients and hazardous substances, as well by hydromorphological alterations.

These four key water management issues (organic pollution, nutrient pollution, pollution resulting from hazardous substances, and hydromorphological alterations) will be in focus for the further management steps within the WFD implementation to develop the final Danube River Basin Management Plan by 2009. It will be a considerable shared challenge in the next years to address these issues and ensure sustainable water management through a correct and timely implementation of the WFD.

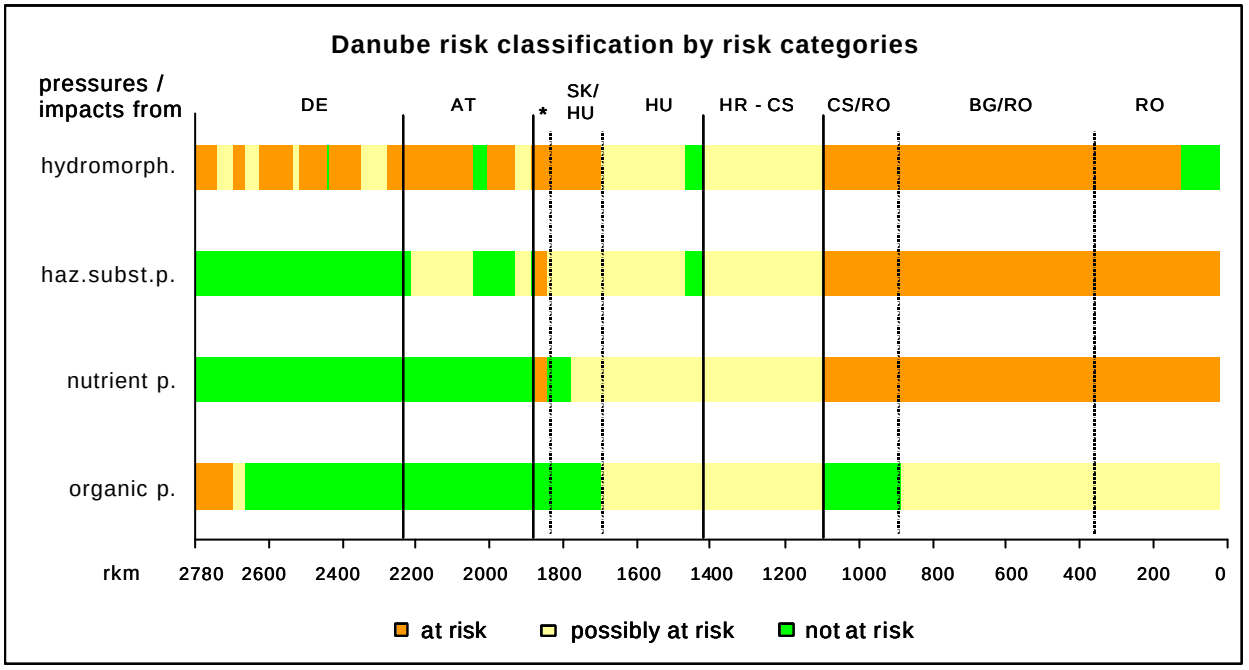
Future measures within the DRB will built on these four identified management issues and for each of them a relevant strategy will be developed to enable the achievement of good ecological status in all affected surface waters.

Therefore, the key water management issues of the DRB are:

- organic pollution
- nutrient pollution
- pollution resulting from hazardous substances
- hydromorphological alterations

These four key water management issues will be in focus for the further management steps within the WFD implementation to develop the final Danube River Basin Management Plan by 2010. Measures within the DRB will be built on these four identified management issues and for each of them a relevant strategy has been developed to enable the achievement of good ecological status in all affected surface waters.

Figure 51: Risk classification of the Danube, disaggregated into risk categories. Each full band represents the assessment for one risk category (hydromorphological alterations, hazardous substances, nutrient pollution, organic pollution). Colours indicate the risk classes. * SK territory



5.12.3 Development of DRBD Overview map and preparation of thematic maps

The main objective of WFD implementation is the development of a Danube River Basin Management Plan. The Danube River Basin covers 801,463 km² and territories of 19 states including EU-Member States, Accession States and other states that have not applied for EU Membership (Table 53).

The Danube also has a number of sub-basins that are comparable in size to other important international river basins in Europe. The Tisza River Basin, for example, is the largest sub-basin in the Danube River Basin (157,186 km²) and is a slightly larger than the Elbe River Basin (148,268 km²). Five countries (Hungary, Romania, Serbia, Slovakia and Ukraine) have territory within the Tisza River Basin. In addition, the Sava River is the largest Danube tributary by discharge (average 1,564 m³/sec) and the second largest by catchment area (95,419 km²). The Sava River Basin includes territories of Bosnia and Herzegovina, Croatia, Serbia and Slovenia. According to Article 3.3 of the WFD "Member States shall ensure that a river basin covering the territory of more than one Member State is assigned to an international river basin district".

In addition to the Danube River Basin, the small coastal basins of the Black Sea tributaries lying on Romanian territory between the eastern boundary of the DRB and the coastal waters of the Black Sea have been included in the Danube River Basin District.

Table 53: Area of the Danube River Basin District

	Territory	**Official area** (km^2)	**Digitally determined area** (km2)
Danube River Basin (DRB)	19 countries		801,463
Black Sea coastal river basins	Romania	5,198	5,122
Black Sea coastal waters	Romania and Ukraine		1,242

Danube River Basin District (DRBD)			807,827

The Danube River Basin District covers: the Danube River Basin, the Black Sea coastal catchments on Romanian territory, and the Black Sea coastal waters along the Romanian and partly the Ukrainian coast.

5.12.4 Development of economic indicators

According to Article 5 and Annex III of the WFD, an economic analysis of water uses has to be carried out with the aim of assessing the importance of water use for the economy and assessing the socio-economic development of the river basin.

The Roof report deals with (i) the assessment of the economic importance of water uses, and (ii) projection of trends of key economic indicators and drivers up to 2015. The report contains basic information regarding the characteristics of water services and illustrates the differences in terms of the connection rates of the population to public water supply. Discussions on the characteristics of water uses were based on the economic structure of the Danube countries, which show differences mainly aroused from the varied importance of the agricultural sector. While in Bulgaria, Croatia and Romania around 10 percent of GDP is generated from agriculture, this share is between 1 and 3.7 percent in the remaining countries. The share of industry and electricity generation is more consistent between the countries, which reported these data. To facilitate understanding of the projecting trends in key economic indicators and drivers up to 2015, assessment of key economic variables for developing baseline scenario was concluded. The UNDP GEF DRP offered support for the Danube countries in undertaking the economic analysis for the WFD.

The ICPDR serves as the platform for coordination in the implementation of the WFD in the Danube River Basin District on issues of basin-wide importance. Transboundary issues not covered by the ICPDR are solved at the appropriate level of cooperation e.g. in the frame of bilateral/multilateral river commissions.

5.12.5 Progress in developing the Danube River Basin Management Plan in line with the WFD

The process of river basin management in the Danube Basin will be guided by two documents:

1. The Strategic Paper for the Danube River Basin District Management Plan (DOC 101), which includes general issues of the Danube River Basin District, an overview of the river basin characteristics, the pressures and impacts assessment, in particular those of transboundary nature, the programme of measures as well as the public information and consultation process.
2. The Road Map including a corresponding Work Plan and an Operational Plan for Public Participation (DOC 110).

Most sub-basins in the Danube river basin cover the territories of several countries, since the hydrographical boundaries of sub-basins generally do not correspond to national or administrative borders. Furthermore, some sub-basins are very large and therefore entail a great deal of coordination for the development of the river basin management plan. In order to facilitate the management of data for the presentation of results in national and bilateral coordination processes, so-called "sub-units" are introduced as manageable units.

According to Art. 2, 14. WFD, Sub basin:
"means the area of land from which all surface run-off flows through a series of streams, rivers and, possibly, lakes to a particular point in a water course (normally a lake or a river confluence)."

For the use in the prepration of the Danube RBMP, the Sub-unit:

"means an area located on national territory consisting of

a) a sub-basin,

b) a part of a sub-basin,

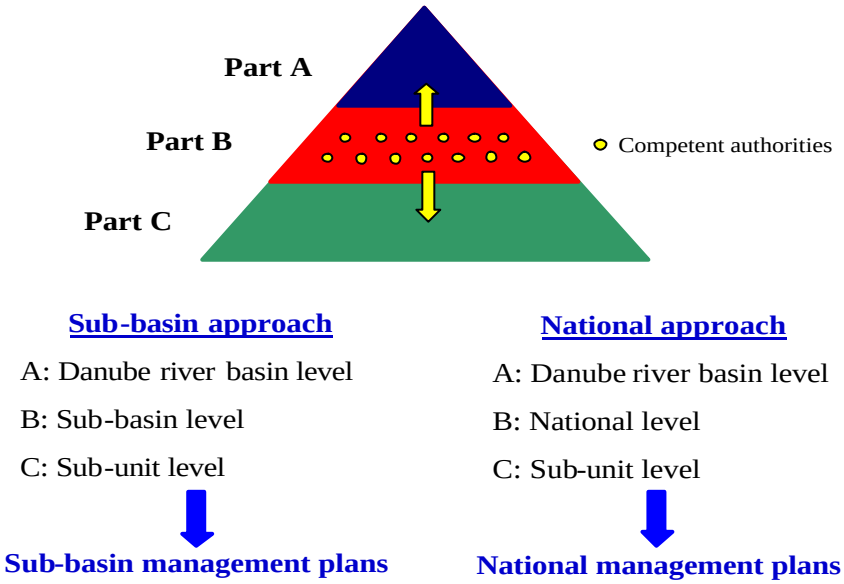
c) a group of sub-basins, or

d) a group of parts of sub-basins".

There has been an agreement between the Danube countries to use the sub-unit as the basic unit to prepare the DRBMP. These sub-units have been harmonised with those used in the ICPDR Flood Action Programme.

The Danube River Basin Management Plan will consist of three parts with Part A being the roof level and the level of detail increasing from Part A down to Part C (Figure 52). All three parts have a common structure. The competent authorities jointly coordinate Part A. Part C is coordinated by the competent authorities on the national level. Part B can be the sub-basin for larger transboundary sub-basins – or Part B can be the national level. In both cases the information on Part C (sub-units) is an integral part of the national plans or sub-basin plans (Part B).

Figure 52: Basic approaches for structuring the river basin management plan



For the following sub-basins the countries concerned have agreed to prepare coordinated sub-basin management plans:

Table 54: The sub-basins and correspondent coordination platform

Sub-basin	Coordination platform
Tisza River Basin (SK, UA, RO, HU and Serbia)	Tisza MoU

Sava River Basin (SI, HR, BA and Serbia)	Sava River Basin Commission
Prut River Basin (RO, MD and UA)	Trilateral cooperation
Danube Delta (RO and UA)	Bilateral cooperation

The Work Plan is the operational plan, required for the development of the RBM Plan according to WFD requirements, which includes:

- Monitoring Networks and Programmes
- Programme Measures – Joint Programme of Measures
- Compilation of all parts of the RBM Plan
- List of Environmental Objectives and Exemptions

The DRBM Plan will follow the principle of the basin wide approach, as the added value for an international RBM Plan is manifold:

- Environmental issues can be addressed that individual countries would not necessarily address (e.g. nutrient pollution of the Black Sea).
- Coordination of actions can increase effectiveness and efficiency.
- Sharing of experiences, information and transformation of relevant issues to the basin-wide scale as contribution to the DRBM Plan (e.g. topic of exemptions).
- Sharing of national approaches and improvement of their comparability (e.g. criteria for final HMWB designation, sampling and assessment methods, etc.).
- Communication and information flow is improved (in particular relevant for early warning in case of floods and accidents).
- Enabling the joint assessment of the nature and extent of transboundary problems in relation to water.
- Creating solidarity between the countries sharing the same river basin.

At the same time, the basin wide approach will take the different conditions in the Danube countries (e.g. natural conditions, socio-economic aspects, different EU MS status) into account. As starting point, the collection of national measures for the JPM on the basin wide scale will focus on

- rivers with catchment areas >4000 km^2, [6]
- lakes >100 km^2,
- rivers and lakes of important international sub-basins (catchment areas >1000 km^2) and
- transboundary groundwater water bodies > 4000 km^2.

However, the implementation scale of the national as well as the sub-basin Programmes of Measures is more detailed than for the basin-wide overview (JPM) and it is expected that most of the measures will be necessary in catchment areas <4000 km^2. In order to highlight additional efforts in the DRBM Plan - if considered of importance for the basin wide level - the Danube countries

- can report national measures for catchment areas <4000 km^2 and/or
- will provide a description of measures (number of measures, finances), which will be undertaken in the catchment areas <4000 km^2.

[6] The scale for measure collection related to pint source pollution is smaller and therefore more detailed.

For each of the identified significant issue, issue papers were developed which provide an overall strategy and guidance on how to address the respective management issue, how to develop a relevant management approach regarding measures and how an improvement of status can be achieved - all on a basin-wide scale. The issue papers include management objectives for the basin-wide scale, which are based on visions and which will guide the Danube countries towards a common environmental aim. The RBM EG had the responsibility to prepare the Issue Paper on the Hydromorphological alterations and P&M EG was responsible for three Issue papers, specifically on organic pollution, nutrient pollution, and hazardous substances pollution.

The ICPDR River Basin Management Expert Group – in cooperation with the other ICPDR EGs - is responsible for the preparation of the document on Significant Water Management Issues in the DRB. According to WFD Article 14, this document will be made available to the public in order to inform about the preparation of the Danube River Basin Management Plan and the Joint Programme of Measures. The document will be published on the ICPDR website including an invitation for comments.

The document also includes crosscutting issues that are presented to set a common basis for understanding the basin-wide context. It highlights four specific significant water management issues for surface waters, and in addition two transboundary groundwater issues, each with one accompanying vision and a number of management objectives to be achieved by 2015. Also included are a timeline for completing the Plan and an explanation of the related public consultation process.

There are four significant water management issues in the Danube Basin for surface waters: pollution by (1) organic substances, (2) nutrients and (3) hazardous substances, and alterations to (4) hydromorphology (i.e. the structural characteristics of the shape, boundaries and content of rivers and lakes); and two transboundary groundwater issues including alterations to (1) quality and (2) quantity.

Management objectives are defined separately for EU Member States, EU Accession Countries and Non-EU Member States. In many cases, a management objective for the EU Member States is equivalent to implementing other water-related EU Directives.

For each significant issue, more detailed sets of measures will be compiled, to be implemented by 2015 as part of the RBM Plan. Other relevant issues and their basin wide significance are also being investigated such as changes in water quantity (e.g. floods and droughts), climate and sediment transport. Another important goal for the Plan is to inter-link flood management, flood protection measures and measures to achieve the WFD objectives.

Surface water: Organic pollution

Vision: Zero emission of untreated waste waters.

Management Objective: In the EU Member States, phase out, by 2015 at the latest, all discharges of untreated wastewater from towns with populations over 10,000; and specify the number of wastewater collecting systems in other Danube States.

Surface water: Nutrient pollution

Vision: Danube Basin and Black Sea waters are no longer threatened by eutrophication.

Management Objectives: Reduce nutrient discharges to the Danube and Black Sea coastal areas; reduce phosphates in detergent products; and implement the EU Nitrates Directive in EU Member States.

Surface water: Hazardous pollution

Vision: Hazardous substances pose no risk to human health and aquatic systems.

Management Objective: Implement 'Best Available Techniques and Environmental Practices' including the further improvement of treatment efficiency.

Surface water: Hydromorphological alterations

Vision: Aquatic ecosystems function holistically and are home to all native species.

Management Objectives: Construct fish migration aids; re-connect adjacent floodplains and wetlands; and conduct Environmental Impact Assessments and/or a Strategic Environmental Assessment during the planning phase of future infrastructure projects if needed.

Groundwater: Alterations to quality

Vision: Polluting substances do not deteriorate groundwater quality, and where already polluted, restoration will be the goal.

Management Objectives: Increase wastewater treatment efficiency; and implement the EU Groundwater Directive in the EU Member States.

Groundwater: Alterations to quantity

Vision: Water use does not exceed available groundwater resources, especially considering the future impacts of climate change.

Management Objectives: Avoid the over-abstraction of groundwater bodies.

The DRBM Plan will include a Joint Programme of Measures), which will be at least as detailed and ambitious as the previous ICPDR Joint Action Programme (JAP – 2001 to 2005). For each SWMI, the JPM will be based on the defined management objectives and will – as a consequence - include commonly agreed, basin-wide measures. Until the end of 2008, national data for the Plan will be collected. The ICPDR will then produce a document, presenting the status of preparing the Plan, to support national pubic participation efforts. Starting from January to June 2009 the draft Plan will be compiled. An international public consultation phase will last from June until October 2009. After incorporating all public input, a revised draft will be presented in December 2009. The final Plan should be endorsed by Ministers in February 2010.

5.12.6 Development of public participation strategy

Active involvement in planning procedures leads to shared responsibilities and higher acceptance of measures in the WFD implementation process. The ICPDR – being the co-ordination platform for the implementation of the WFD on issues of basin-wide or multilateral concern - has taken this new challenge as a basis to reviewing its ongoing practice. The ICPDR started an active process towards defining a "Danube River Basin Strategy for Public Participation in River Basin Management Planning 2003-2009" and consequently developing an "ICPDR Operational Plan". The basic principles of the "Danube River Basin Strategy for Public Participation in River Basin Management Planning 2003-2009" were approved in June 2003.

Based on Article 14 of the WFD, the objectives of this strategy are to (i) ensure public participation in the implementation of the WFD, especially concerning the development of the Danube River Basin Management Plan, (ii) facilitate the establishment of effective structures and mechanisms for public participation that will continue operating beyond the first cycle of river basin management planning, (iii) provide guidance to national governments on how to comply with their obligations under the WFD by providing practical support and

guidance in addressing public participation, and (iv) inform key stakeholders about the structures for public participation and public involvement at the various levels.

The activities at ICPDR level were developed in detail and summarized in the "ICPDR Operational Plan", adopted in December 2003, which provides a description of the activities at the roof level, including a timetable and a workplan. The Operational Plan is seen as a planning tool, which is regularly adjusted to the needs of the ICPDR.

The integrated Operational Plan for Public Participation (2005-2010) transforms the overall strategic approach (see DOC 101 "Danube River Basin Strategy for Public Participation in River Basin District Management Planning 2003-2009") into practical activities indicating relevant timelines, which are directly linked to the Road Map and based on the existing ICPDR structures and mechanisms.

5.12.7 Economic analysis

According to Article 5 and Annex III of the WFD, an economic analysis of water uses has to be carried out with the aim of assessing the importance of water use for the economy and assessing the socio-economic development of the river basin. Four main areas can be identified:

- Contribution of socio-economic information for the establishment of a baseline scenario;
- Assessment and improvement of the cost recovery level of water services (including environmental and resource costs) as well as the adequate contribution of different water uses/service users to these costs (Art. 9);
- Estimation of the cost-effectiveness of measures and sets of measures at different implementation scales in order to reach the EU WFD-objectives (Art. 11);
- Assessment of the proportionality/disproportionality of costs associated to proposed measures in order to justify potential exemptions from the EU WFD-objectives (Art. 4).

Information on the understanding of these economic EU WFD-elements has been provided by a number of documents produced in the context of the Common Implementation Strategy, e.g. the WATer ECOnomics-document (see http://circa.europa.eu/Public/irc/env/wfd/library) as well as different information sheets covering specific topics (on cost-effectiveness analysis, environmental and resource costs etc.). In addition, many Member States have developed specific analysis and guidance documents clarifying the main concepts of interest regarding EU WFD economics.

According to the requirements of Article 5 and Annex III of the WFD, an economic analysis of water uses was carried out for the Danube Basin Analysis 2004 on the river basin district scale, using data of the reference year 2000. The analysis covered three issues and was based on the national contribution and basin wide assessments:

1. assessing the economic importance of water uses;
2. projecting trends in key economic indicators and drivers up to 2015 and
3. assessing current levels of the recovery of the costs of water services.

A general comment should be made about the difficulties in the data gathering process as data collected by national statistical institutions are very rarely collected at the required scale, i.e. on a river basin district. Therefore, two different options of normalisation have been used for re-calculating data presenting the national situation on the Danube-level using the population equivalent (i.e. the share of population living in the DRB in each country; or using the territorial/geographical equivalent or the share of the area being within the DRB).

The results of 2004 assessment on the three mentioned issues are summarised below:

1. The assessment of the economic importance of water uses made use of (i) basic socio-economic data covering all eighteen countries belonging to the Danube River Basin (i.e. GDP, total population, GDP per capita), and (ii) basic information regarding water services, such as water production, wastewater services and connection rates.

   The assessment shows relatively high rates for the connection of the population to public water supply, but lower rates for the connection on to the public sewerage system and to wastewater treatment plants.

   In addition, the analysis highlighted the challenges the middle and downstream Danube countries were facing in ensuring necessary investments into pollution reduction and environmental protection measures as required under the EC directives. Further, the existing differences in the economic structure of the Danube countries mainly due to the varied importance of the agricultural sector, but also industry and electricity generation contributed to different economic values of the water.

2. Projecting trends in key economic indicators and drivers up to 2015 was mainly based on the assessment of key economic variables needed for developing a baseline scenario, particularly regarding the influence of these variables on the pressures and consequently the water status up to the year 2015. The anticipated growth rates of the main economic sector have been also taken into consideration.

   The analysis shows that quantitative forecasts regarding future trends in total water supply and demand are not available in the majority of the Danube countries. The national analyses highlighted the causes, rationales and underlying assumptions, such as changes in the connection rates, efficiency improvements in the water supply systems by reducing leakage rates, for these forecasts.

3. The results of assessing the current levels of the recovery of the costs of water services, in accordance with Article 9 of the WFD provided a diverse picture for the Danube basin. As a result of differing economic, financial and institutional conditions in the Danube countries, the pricing systems also vary considerably among the countries. In addition, Danube basin wide relevance for cost recovery is not fully respected in many countries. The application of economic and environmental principles into price setting and the degree of application of cost recovery vary from one to another Danube country according to the specific legal and socioeconomic conditions.

For further work on economic elements of the WFD, the following issues will be approached in the preparation of the RBM Plan:

- the efficient inter-linkage of WFD economic issues between the national and international scale,
- the identification of economic issues, that should be dealt with on the national scale and
- the identification of relevance regarding specific WFD economic issues on the basin wide scale.

5.13 Reporting JAP

The time foreseen for the implementation of this Joint Action Program is from 01/01/2001 till 31/12/2005.

The organising of the implementation of the Joint Action Programme lies in regard to the needed transboundary cooperation with the ICPDR and its supporting bodies, and in regard to national tasks with the Contracting Parties to the DRPC.

The ICPDR reported on the implementation of the Joint Action Programme for the period 2001 to 2003 at the year 2004, and for the period 2001 to 2005 at the year 2006. In order to make use of the UNDP GEF DRP

results the report was compiled in 2007, and submitted for comment and approval at the 10th Ordinary Meeting of the ICPDR, December 2007.

6 INVESTMENTS, FINANSING AND POLLUTION REDUCTION

6.1 Overview of environmental projects in the DRB

The JAP final Implementation report presents the achievements on the implementation of policies, directives and investment projects in the last five years in Danube countries. The ICPDR organised within the frame of DABLAS several investigations on the investments in the basin, which are summarised below, only for having a complete overview of countries achievements on JAP implementation, as well ongoing and planned efforts towards implementation of EU Directives, long after the JAP finalisation. The assessment within the frame of DABLAS do not include Austria and Germany.

6.1.1 ICPDR Database on investments

At the occasion of the Ministerial Conference on 26 November 2001 in Brussels a joint declaration on the "Protection of Water and Water related ecosystems in the wider Black Sea Region" has been signed. To implement this declaration, the DABLAS Task Force was formed with the main objective to provide a platform for co-operation and to facilitate financial arrangements for the implementation of projects for pollution reduction and rehabilitation of ecosystems in the wider Black Sea region.

Within the frame of DABLAS Task Force, the ICPDR Secretariat carried out two investigations on the measures achieved and proposed in the Danube River Basin on the implementation of the JAP. Thus, for the first assessment, in 2002, the ICPDR Secretariat conducted data gathering and revision of lists of national projects of the JAP and, developed an operational framework for prioritisation of projects. The objective was to develop an operational database for the prioritisation of municipal wastewater treatment projects in the 11 DRB countries (Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Moldova, Romania, Slovakia, Slovenia, Ukraine and Yugoslavia). 158 investment projects for municipal wastewater treatment were analysed out of which 45 projects were identified as fully financed (CZ, H, SI and SK).

In 2004, for the Interim Implementation Report on the JAP, more detailed information was collected, also within the frame of DABALS Task Force, on the implementation of policies, directives and investment projects in the last five years in Danube countries. The evaluation was based on the implementation of the JAP, addressing besides municipal waste water treatment also other sector-specific projects such as indu4strial pollution control, risk management and pollution control from agricultural point and non point sources.

The ICPDR database has been revised to include municipal, industrial, agro-industrial, wetland restoration, and agricultural & land use projects. The database is linked with the ICPDR Emission inventories database. The database has been developed as an interactive tool to be used for evaluating remaining needs for investments and policy measures on a regional, national, and sector basis.

A total of 354 investment projects were assessed in 11 countries in the Danube River Basin (BA, BG, CS, CZ, HR, HU, MD, RO, SI, SK, UA), and an additional 41 projects were identified in Austria (21) and

Germany (20). Municipal sector projects (191) accounted for more than 50% of the total number of investment projects. There were 77 industrial and 32 agro-industrial projects; combined, these two point-source sectors represented 30% of the total. Wetlands and Land Use sector had 40 and 14 projects, respectively. Estimated investment costs for the 354 projects total 3822 million EUR.

The ICPDR database developed in 2002 was expanded to include projects from sectors other than municipal. Data submission on the investments projects was made on the Internet and the database was automatically updated; the further development of the database was intended to allow more flexible and interactive updating and tracking.

The reviews of activities conducted under the 2004 assessment highlighted that many investment and actions are happening. However, the assessment highlighted both the implementation efforts and deficits. This is especially the case for those EU Directives that require substantial administrative reform and financial investments.

More recent, the results of DABLAS assessments were further used for an updated assessment at the national and basin levels, within the frame of the EBRD, "Danube Regional Study", 2006-2007.

The evaluation of municipal projects in the Danube countries was applied to 224 municipal projects with a total investment demand of 4,545 MEUR.

The status of environmental investment projects throughout the DRB was evaluated for the following five sectors: municipal, industrial, agro-industrial, wetlands, and land use.

The investment projects were group into three main categories:

1. Projects implemented in the past five years and projects that are fully financed and under implementation, taking into account type of project (technical description), investment cost, financing modalities and achieved results in terms of compliance with EU directives and pollution reduction (BOD, COD, N and P).
2. Projects that are prepared and do not need further technical support but require further financial support.
3. Projects that require further assistance for technical and investment planning.

Investment project data were collected in the database. The prioritisation criteria were further adapted to account for experiences gained in the DABLAS 2002 assessment ("Development of an Operational Framework for the Prioritisation of Projects") and the additional sectors. The detailed status of all projects reported and the results of screening of investments projects are presented in the DABLAS Report, 2004.

6.1.1.1 Overview of Results in the ICPDR Database

A total of 354 investment projects (Table 55) were assessed in 11 countries in the Danube River Basin (BA, BG, CS, CZ, HR, HU, MD, RO, SI, SK, UA). (DABLAS Report, 2004)

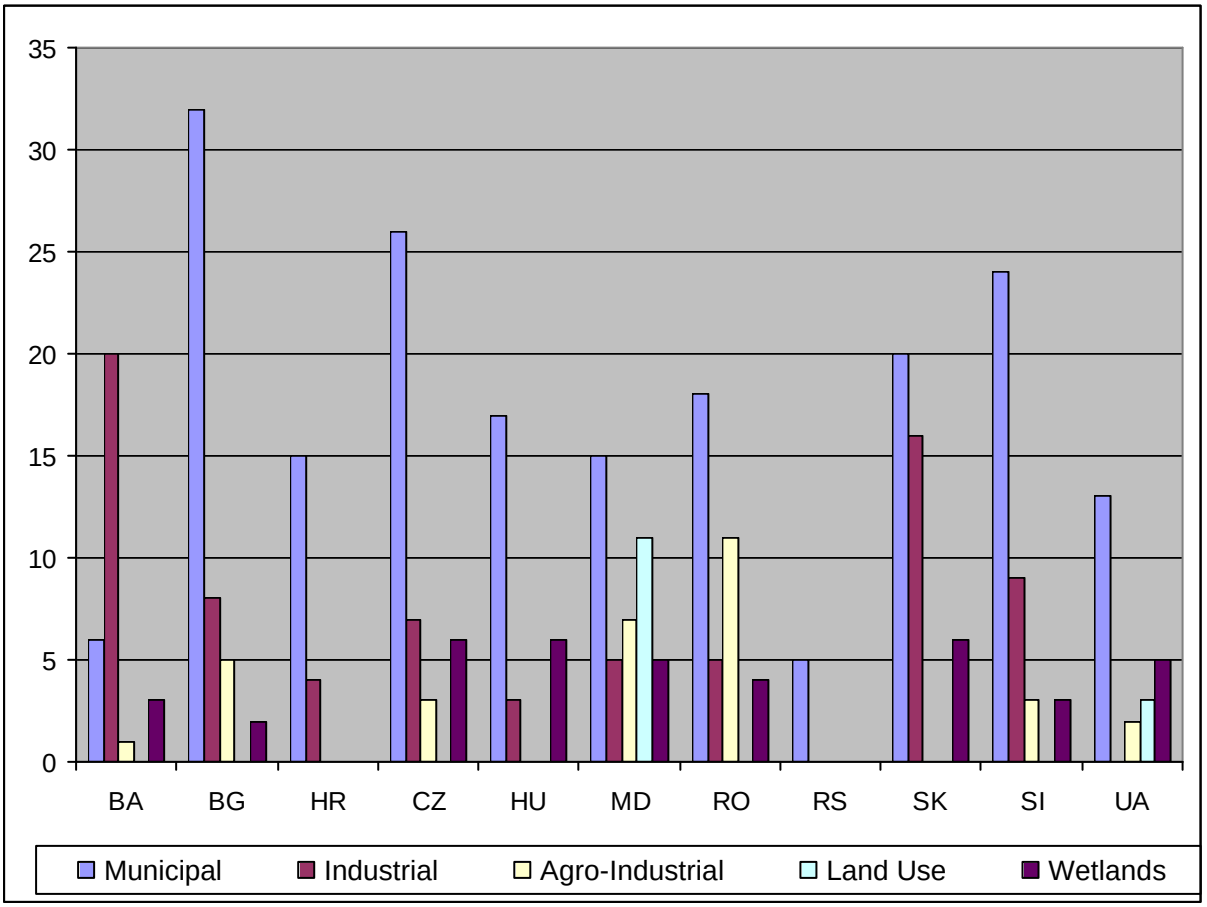
Table 55: Environmental investments projects in the DRB

Sector Overview: Number of Investment Projects						
Country	**Municipal**	**Industrial**	**Agro-Industrial**	**Land Use**	**Wetlands**	**Total**
Bosnia-Herzegovina – BA	6	20	1	-	3	30

Sector Overview: Number of Investment Projects						
Bulgaria – BG	32	8	5	-	2	47
Croatia – HR	15	4	-	-	-	19
Czech Republic – CZ	26	7	3	-	6	42
Hungary – HU	17	3	-	-	6	26
Moldova – MD	15	5	7	11	5	43
Romania - RO	18	5	11	-	4	38
Serbia-Montenegro – CS	5	-	-	-	-	5
Slovakia – SK	20	16	-	-	6	42
Slovenia – SI	24	9	3	-	3	39
Ukraine - UA	13	-	2	3	5	23
Totals:	**191**	**77**	**32**	**14**	**40**	**354**

Figure 53 shows the overview of the total number of investment projects, reported by countries in the Danube River Basin into the ICPDR database.

Figure 53: Overview of the number of investment projects



Municipal sector projects (191) account for more than 50% of the total number of investment projects. There are 77 industrial and 32 agro-industrial projects; combined, these two point-source sectors represent 30% of the total. Wetlands and Land Use sector have 40 and 14 projects, respectively.

Estimated investment costs for the 354 projects total 3822 million EUR (Table 56).

Table 56: Total investments per sectors and country

Sector Overview: Total Investments (MEUR)						
Country	**Municipal**	**Industrial**	**Agro-Industrial**	**Land Use**	**Wetlands**	**Total**
Bosnia-Herzegovina – BA	145.2	38.5	2.3	-	11.9	**198**
Bulgaria – BG	217.1	15.2	24.5	-	4	**260.8**
Croatia – HR	217	4.5	-	-	-	**221.5**
Czech Republic – CZ	199.6	7.9	69.2	-	6.9	**283.6**
Hungary – HU	981	41.6	-	-	7.3	**1,029.9**
Moldova – MD	37.1	3.5	10.4	6.2	5.9	**63**
Romania - RO	524.2	33.2	25.5	-	1.9	**584.7**
Serbia-Montenegro – CS	530	-	-	-	-	**530**
Slovakia – SK	271.3	36.2	-	-	1.1	**308.6**
Slovenia – SI	301.1	12.7	10.5	-	3.5	**327.7**
Ukraine - UA	51.1	-	2.6	5.4	15.1	**74.2**
Totals:	**3,475**	**193**	**145**	**11.6**	**57.6**	**3,882**

Hungary accounts for more than 25% (1030 MEUR) of the total investment costs, followed by **Romania** with 585 MEUR and **Serbia-Montenegro** with 530 MEUR. The 3 largest municipal projects are, in fact, in these 3 countries: Budapest-Central, Bucharest, and Belgrade.

The **municipal** projects account for approx. 90% of estimated investment and emission reduction (Table 57).

Table 57: Summaries of Total Costs and Pollution Reduction

Summary of Total Costs and Pollution Reduction								
Sector	**No. of Projects**	**Cost and Financing**			**Emission Reduction**			
		Total Investment MEUR	**Funds Secured MEUR**	**Funding Gap MEUR**	**BOD t/a**	**COD t/a**	**N t/a**	**P t/a**
Municipal	191	3,474.70	1,700.70	1,774.00	265,644	520,728	44,400	9,070
Industrial	77	193.2	67.4	125.8	25,951	68,341	928	92
Agro-Industrial	32	144.9	10.7	134.3	6,396	4,289	2,032	632

Wetlands	40	57.6	10.5	47.8	not estimated	not estimated	19,029	1,903
Land Use	14	11.6	0.9	10.7	not estimated	not estimated	not estimated	not estimated
Totals:	**354**	**3,882**	**1,790**	**2,093**	**297,991**	**593,358**	**66,389**	**11,697**

There are a number of possible explanations for the high representation of the municipal sector, for example:

- Firstly, and probably most importantly, data were more readily available for the municipal sector (public infrastructure), while pollution reduction and planned investments among the private sector (e.g., industrial and agro-industrial) are not fully publicly disclosed in many of the assessed countries.
- In many cases, the municipal sector projects include sewerage in addition to wastewater treatment, while the industrial and agro-industrial investments are more focused on wastewater treatment and/or management. Thus, investment costs for municipal projects are in general higher than industrial wastewater improvements per reduction of pollutants (but not necessarily in terms of overall benefits attained, for example improved sanitation conditions).
- Also, transposition of the Urban Wastewater Treatment Directive (UWWTD) and consequent inception of investment projects seems to be on a faster track than realisation of other water quality legislation affecting the other sectors, such as the IPPC Directive (relevant for industrial and agro-industrial sectors), Nitrates Directive and CAP reform (applicable to land use reform and also agro-industrial operations).
- The majority of the municipal wastewater investments are implemented by municipalities or publicly owned companies, whereas the industrial sector and increasingly the agro-industrial and agriculture sectors are consolidated in the private sector. Certain financing support facilities are primarily servicing public sector investments, and also,
- there might be an information transfer gap among privately held enterprises regarding available financing instruments.

Nevertheless, there were a significant number of **industrial** and **agro-industrial** projects identified, 77 and 32, respectively, and pollution reduction estimations are considerable for several of the projects. As additional data are made available, these two sectors will be better represented in terms of pollution reduction potential, as compared to the municipal sector.

Wetlands restoration efforts are active among most of the surveyed countries, and completed and planned projects have the potential to realise significant nutrient reductions. Unlike the point-source pollution reduction projects (municipal, industrial, agro-industrial), pollution decreases achieved through wetlands restoration projects are difficult to measure and only approximate estimations can be made, as there are numerous factors involved in the functioning of a wetland as a nutrient "sink".

Only 2 countries, Moldova and Ukraine, indicated **Land Use** projects. The limited data submitted for the Land Use sector seems to be attributed to following:

- Land Use investment projects were not readily available to the national consultants.
- Some apparent Land Use investment projects were submitted as Wetlands sector projects (e.g., for the Czech Republic and Moldova); these projects are presently being evaluated for inclusion under Land Use.
- Although agricultural reform legislation has been transposed in most of the countries, there are very few concrete "Land Use" investment projects in the pipeline, possibly due to widespread re-

organisation of the agriculture sector throughout the lower Danube countries and, the collapse of former markets, the shortage of capital among agricultural enterprises and financing limitations.

Among the 11 DRB countries assessed as part of the DABLAS 2004 programme, there were 29 projects completed for a total investment of 222 MEUR by the end of 2003.

Table 58: Projects in all sectors finalised before the end of 2003, 2005 and after 2005

Project Realisation (all sectors combined)								
Country	All Projects		Projects Completed by 2003		Projects Completed by 2005		Projects Completed after 2005	
	No. of Projects	Investment MEUR	No. of Projects	Investment MEUR	No. of Projects	Investment MEUR	No. of Projects	Investment MEUR
Bosnia-Herzegovina	30	198	0	0	2	0.6	28	197.4
Bulgaria	47	260.8	0	0	2	7.8	45	253
Croatia	19	221.5	0	0	2	2.2	17	219.3
Czech Republic	42	283.6	5	40.6	16	169.8	26	113.9
Hungary	26	1029.9	8	57.7	15	110.7	11	919.2
Moldova	43	63	0	0	1	0.3	42	62.7
Romania	38	584.7	0	0	0	0	38	584.7
Serbia and Montenegro	5	530	0	0	0	0	5	530
Slovakia	42	308.6	11	46.5	23	100.5	19	208.1
Slovenia	39	327.7	5	77	14	176.5	25	151.2
Ukraine	23	74.2	0	0	2	3.9	21	70.4
Totals:	**354**	**3882**	**29**	**222**	**77**	**572**	**277**	**3310**

The completed projects by 2003 were carried out in the four EU accession countries, Czech Republic, Hungary, Slovakia, and Slovenia, and total investment costs range from 40.6 MEUR in the Czech Republic (5 projects) to 77 MEUR in Slovenia for completion of 5 projects.

A considerable amount of national and local financing was raised for the 29 completed projects through 2003. In fact, nearly 100% of the investment costs for the 11 completed projects in Slovakia was from national and/or local funds. Similarly, in Hungary and the Czech Republic, the majority of project financing was from national and/or local sources: 88% and 70% respectively. In Slovenia, 24% of the 77 MEUR for the 5 completed projects were raised from national and/or local sources, an additional 20% from EU funds, and the remaining 56% from loans and/or grants from International Financial Institutions (IFIs).

Considering the pollution reduction (BOD, COD, Total N, Total P) expected through the 354 DABLAS 2004 investments, approx. 5% of the reduction has been achieved by projects completed by 2003. The rate increases to 10-15% by 2005; however, it is questionable whether all projects planned for completion by 2005 will actually be realised by that time. This means that 85-90% of the expected pollution reduction will be carried out through projects completed after 2005 (DABLAS Report, 2004).

Table 59: Emission reductions for projects finalised before the end of 2003 and 2005

Emission Reduction Breakdown by Realisation Period							
Realisation Period	**Sector**	**No. of Projects**	**Investment MEUR**	**BOD t/a**	**COD t/a**	**N t/a**	**P t/a**
Projects Completed by 2003	**Total**	**29 + 5***	**233**	**14,075**	**31,213**	**7,770**	**1,262**
	Municipal	19	206	13,850	29,700	4,915	977
	Industrial	6	12	224	1,504	0	0
	Ag-Industrial	1	3.5	1	9	1	0
	Wetlands	3 + 5*	11	not estimated	not estimated	2,854	285
	Land Use	0	0	not indicated	not indicated	not indicated	not indicated
Projects Completed by 2005	**Total**	**77 + 5***	**602**	**41,405**	**88,160**	**15,412**	**2,700**
	Municipal	50	498	36,123	75,756	10,562	2,224
	Industrial	14	62	5,281	12,395	92	0
	Ag-Industrial	2	3.8	1	9	1	0
	Wetlands	10 + 5*	35	not estimated	not estimated	4,757	476
	Land Use	1	3.4	not indicated	not indicated	not indicated	not indicated
Projects Completed after 2005	**Total**	**277 + 13***	**3,379**	**256,586**	**505,198**	**50,978**	**8,998**
	Municipal	141	2,976	229,521	444,972	33,838	6,846
	Industrial	63	131	20,670	55,946	836	93
	Ag-Industrial	30	141	6,395	4,280	2,032	632
	Wetlands	30 + 13*	123	not estimated	not estimated	14,272	1,427
	Land Use	13	8.2	not indicated	not indicated	not indicated	not indicated

*Wetlands projects (AT, RS, DE) not included in the DABLAS assessment are added separately. The pollution reduction estimations for the wetlands sector include the 40 projects identified in the DABLAS 2004 assessment and projects in AT, CS, DE included in the ECO EG country status reports.

Figure 54 and Figure 55 show the comparison of BOD, COD, N and P emission reduction, achieved through the implementation of the projects during the different realisation periods. For BOD and COD, the main

reduction of loads is due to the implementation of the municipal projects. The highest Phosphorus and Nitrogen reduction of loads is achieved through the implementation of both municipal and wetlands projects.

Figure 54: BOD and COD emissions reduction by realisation period

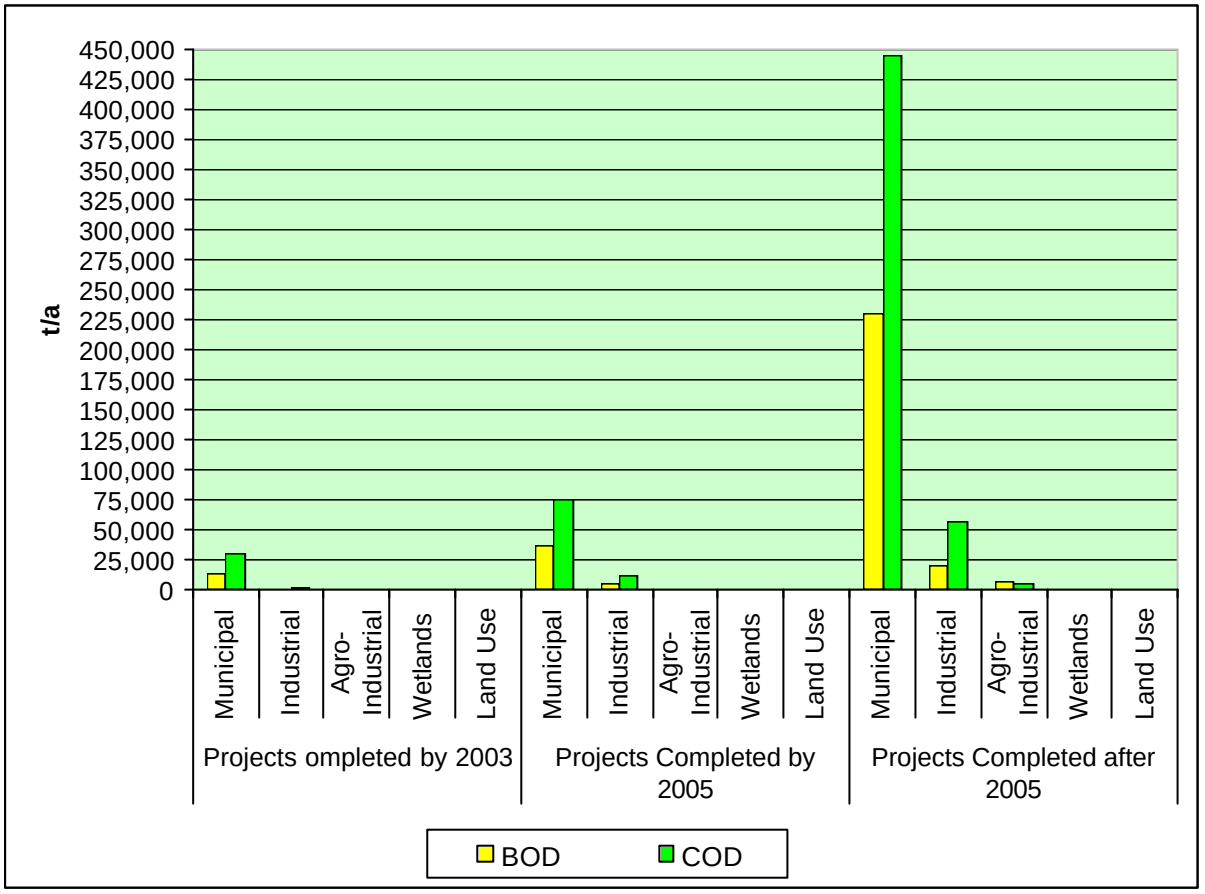


Figure 55: N and P emissions reduction by realisation period

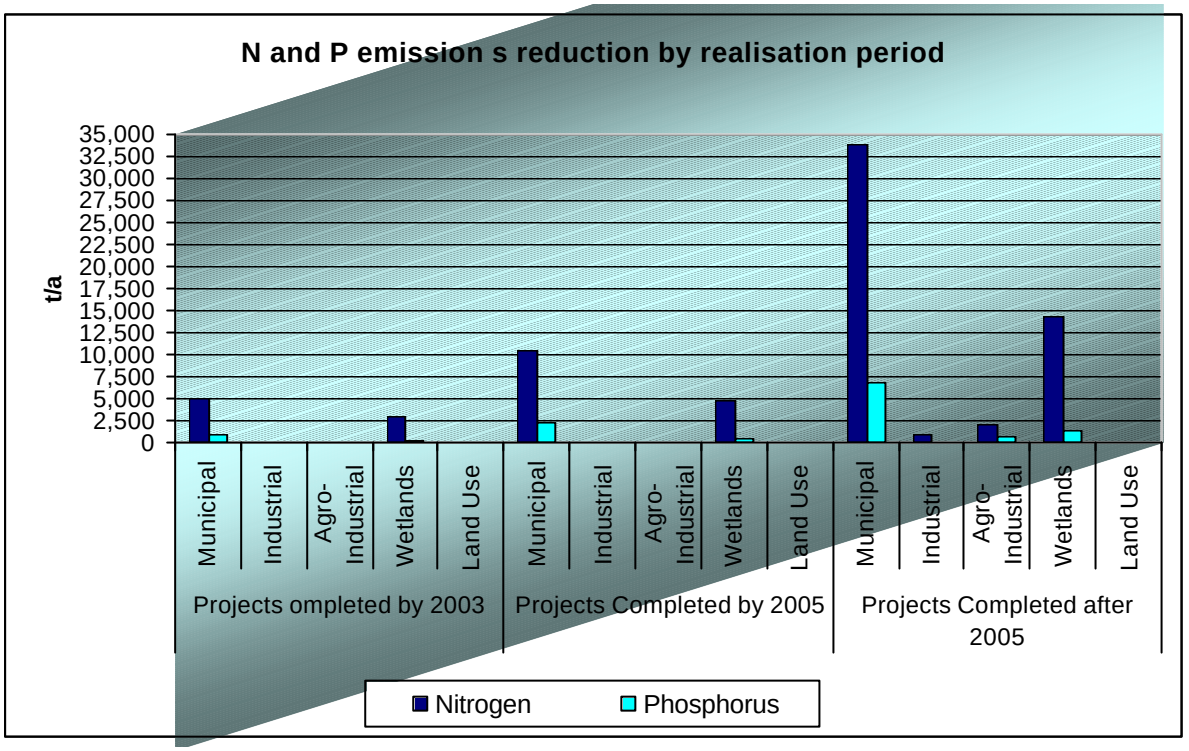


Table 60: Funding sources for municipal sector reported under DABLAS 2004

Breakdown of Funding Sources: Fully Financed Projects						
Country	No. of Projects	Total Investment MEUR	% of Total			
			National Funds	EU Funds	IFI Funds	Missing Funds
Bosnia-Herzegovina	2	0.6	9	91	0	0
Bulgaria	2	4	0	0	100	0
Czech Republic	17	169.4	49	10	41	0
Hungary	17	312.7	63*	36	1	0
Romania	7	369.1	32*	68	0	0
Slovakia	32	202	63*	35	2	0
Slovenia	16	189.2	35	42	23	0
Totals:	**93**	**1,247**				

*Municipal loans extended by IFIs are included under "national" for HU, RO, and SK.

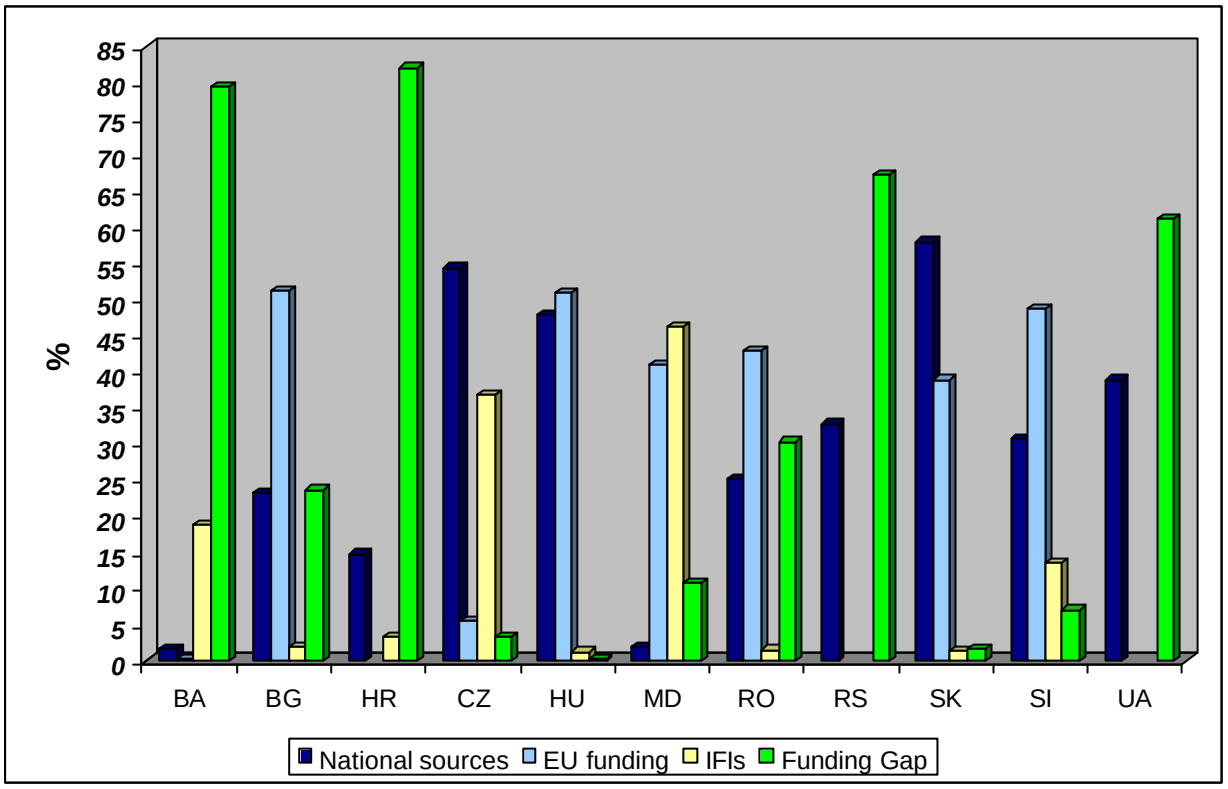
EU funding (e.g., through the ISPA programme) has been influential in supporting municipal sector development, for example, approx. 68% of the 369 MEUR for the 7 fully financed projects in Romania are from EU sources. IFIs have also provided important support; Bulgaria has received a 4 MEUR World Bank Grant for wetlands restoration projects, and the EIB and EBRD have extended loans to numerous municipalities throughout the region.

Table 61: Overview of funding sources for all projects (all sectors) reported under DABLAS 2004

Country	No. of Projects	Total Investment MEUR	Breakdown of Funding Sources, %			
			National	EU	IFIs	Funding Gap
Bosnia-Herzegovina	30	198	1.6	0.3	18.8	79.4
Bulgaria	47	260.8	23.3	51.2	1.9	23.6
Croatia	19	221.5	14.8		3.2	82.1
Czech Republic	42	283.6	54.4	5.5	36.8	3.2
Hungary	26	1,029.50	47.8	50.9	1.2	0.2
Moldova	43	63.0	1.8	41.0	46.3	10.8
Romania	38	584.7	25.2	43	1.5	30.3
Serbia and Montenegro	5	530	32.8			67.2
Slovakia	42	308.6	58.0	38.9	1.4	1.6
Slovenia	39	327.7	30.8	48.7	13.6	7.0
Ukraine	23	74.2	38.9			61.1
Totals:	**354**	**3,882.1**				

The figure below shows the comparison of secured and still missing funding sources for all projects, reported to the ICPDR database, per country, expressed in percentage. The largest funding gap is needed for project in Bosnia and Herzegovina, Croatia, Serbia and Ukraine. EU funding is relevant for Bulgaria, Hungary, Slovakia and Slovenia. The countries rely strongly on national sources in Czech Republic, Slovakia, Hungary, and Ukraine.

Figure 56: Funding sources for all projects reported under DABLAS



The categories and parameters for prioritization and the results of ranking of the investments projects are presented in the DABLAS Report, 2004.

7 CONCLUSIONS

There has been important progress in establishing the necessary mechanisms for coordination and cooperation under the framework of the Danube River Protection Convention. The EU Water Framework Directive has added strength to the efforts to coordinate actions in support of integrated river basin management and pollution control and reduction.

Assistance has been provided to the Danube countries, the ICPDR EGs, and the ICPDR Secretariat to reinforce the national capacities in terms of policy/legislative reforms and enforcement of environmental regulations (with particular attention to the reduction of nutrients and toxic substances). An important goal was to assure a coordinated, harmonized and transferable approach basin wide of policy and legislative measures introduced at the national level of the participating countries.

The mechanisms for cooperation exist and agreement on the nature of the problems has been reached. It will nonetheless be important that many individual actions are taken that in total will add up to a cleaner and healthier Danube.

The current analysis and reviews of activities conducted at the national level within the frame of Joint Action Program highlight that many investment and actions are happening.

In 2006, 250 projects were reported as finalised, 133 municipal investments, 57 industrial and agro-industrial projects and 57 wetlands measures. The total investments cost for the 250 realised measures is 4266 MEUR.

In addition there has been substantial legislative reform and in particular the implementation of EU community law within the DRB.

In recent years, EU environmental policy has evolved from a traditional, command-and-control approach towards a more integrated and flexible approach. There are now new developments and different instruments to tackle pollution caused by point and diffuse sources used by Danube countries: flexible legislation imposing additional site-specific or national rules, which will vary from one installation to another within the EU (e.g. the IPPC Directive), voluntary and/or market-based instruments setting the basic rules for operators who want to exploit market opportunities, or the introduction of EU-wide environmental quality standards established through the water directives.

The analysis of the JAP implementation has, however, highlighted both the implementation efforts and deficits. This is especially the case for those EU Directives that require substantial administrative reform and financial investments.

Additionally, the results show that future actions in the Danube countries, towards implementation of Danube River Protection Convention should be thoroughly considered in relation to the EU Directives, in particular Water Framework Directive, integrated into the respective Joint Program of Measures.

The final implementation report provides a useful starting point for undertaking analysis related to and reporting on the implementation and effectiveness of policies in Danube countries. Second, it shows that appropriate tasks implementation and reporting are useful for the Danube countries in order to better address and measure the policy responses within the future Joint Program of Measures. Third, the report highlighted the need to streamline reporting obligations under various directives in implementing various ICPDR tasks.

Currently a variety of reporting needs exist under different frameworks. There are gaps and overlapping as still different reporting obligations and periods exist. The reporting and data sharing system are harmonised

aiming to integrate reporting requirements and create a shared comprehensive data and information management system for DRB.

The implementation of the ICPDR JAP raises a number of shared technical challenges for the Danube countries. A common understanding and approach is crucial to the successful and effective implementation of the DRPC and EU Directives. Ensuring the link as to achieve a combined implementation between WFD and other EU directives, such as UWWTD, IPPC, Dangerous substances, Nitrates Directive, etc would contribute to harmonised data collection, monitoring and reporting from the beginning

Sustainable development in the DRB requires continue and enhanced international cooperation. Success will depend on thorough implementation of actions and commitments of the countries and on effective and coordinated contribution of the international community.

The International Commission for the Protection for the Danube River is assisting in providing a forum for the necessary dialogue, understanding and action needed to meet the challenges that exist.

8 ANNEXES INVESTMENTS

9 COUNTRY SUMARY REPORTS

COUNTRY SUMMARY REPORTS

TASK I

IMPLEMENTATION OF POLICIES, REGULATIONS AND MEASURES OF COMPLIANCE IN LINE WITH THE ICPDR JOINT ACTION PROGRAM AND EU RELATED WATER DIRECTIVES

Structure of the country reports

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