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# Issue Paper on Nutrient Pollution in the Danube River Basin

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## Status Cover Page

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This draft issue paper on nutrients pollution provides an overall guidance on how to approach the implementation of measures according to the EU Water Framework Directive (2000/60/EC).

It is still a living document that will need continuous input and improvements as application and experience build up in all Danube countries and beyond.

Preliminary drafts of the issue paper on nutrients were discussed at the P&M EG and RBM EG meetings. At the 9<sup>th</sup> ICPDR Ordinary Meeting in December 2006, as well as at the 5<sup>th</sup> Standing Working Group Meeting in June 2007, guidance was provided for finalising the document, expected to be endorsed by the ICPDR at the 10<sup>th</sup> ICPDR Ordinary Meeting in December 2007. This current draft, based on the discussions at the last P&M EG Meeting, September 2007, is presented to the 24<sup>th</sup> RBM EG meeting, October 2007.

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# 1 Introduction

The EU Water Framework Directive (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,
- requires and encourages public participation in the development of river basin management plans encouraging active involvement of interested parties including stakeholders, non-governmental organizations and citizens.

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. “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.

The EU as well as ICPDR member countries have agreed that the ICPDR provides the platform for the coordination necessary to develop and establish the River Basin Management Plan for the Danube Basin.

The first main output of the joint efforts to implement the WFD in the Danube River Basin is the Roof Report 2004, which has been prepared in line with Art. 5, 6 and Annexes II, III, IV of the WFD. The RBM EG provides the coordination of the development of a Danube River Basin Management Plan, according to the agreed ICPDR documents related to the specific strategy DOC-101 “Development of a Danube River Basin District Management Plan – Strategy for Coordination a Large River Basin” and within the corresponding “Road Map for the Development of a Danube River Basin District Management Plan 2005- 2010” (ICPDR DOC 110, 2005).

The Danube nutrient loads are an important factor responsible for the deterioration of the Black Sea ecosystem. Therefore, they have been dealt with already in the Memorandum of Understanding (ICPBS and ICPDR, 2001) as well as in the Danube Declaration (Ministerial Meeting, 2004).

According to the **Memorandum of Understanding** *"the long-term goal in the wider Black Sea Basin is to take measures to reduce the loads of nutrients and hazardous substances discharged to such levels necessary to permit Black Sea ecosystems to recover to conditions similar to those observed in the 1960s.*

*As an intermediate goal, urgent measures should be taken in the wider Black Sea Basin in order to avoid that the loads of nutrients and hazardous substances discharged into the Seas exceed those that existed in the mid 1990s."*

The objective iii) of the **Danube Declaration** is *"to reduce the total amount of nutrients entering the Danube and its tributaries to levels consistent with the achievement of good ecological status in the Danube river and to contribute to the restoration of an environmentally sustainable nutrient balance in the Black Sea"*.

## 2 Problem Description

The work carried out so far 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' objective.

This is due to the impact of:

1. organic pollution
2. **nutrient pollution**
3. pollution resulting from hazardous substances
4. 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 will be developed to enable the achievement of good ecological status in all affected surface waters. Therefore, for each of the above mentioned water management concerns, issue papers will be drafted. This one deals exclusively with issues related to **nutrient pollution and corresponding measures**.

Nutrient pollution comprehends mainly pollution from **phosphorus** and **nitrogen** input. **Point** and **diffuse source** discharges are to be distinguished. Point source discharges are caused by single activities and are locally confined, whereas diffuse source discharges are caused by widespread activities like agriculture with multiple undifferentiated sources.

The Art. 5 WFD reports are a valuable source of information for targeting the areas of high nutrient pollution and setting the objectives of the measures. The results of the pressures and impact assessment of the Roof Report enable a good understanding of the relationships between the response (eutrophication) and the causes (which nutrients, nutrient inputs, concentrations, transfers), thus contributing to the identification of the appropriate reductions in nutrient inputs as well as the most cost-effective solutions for achieving these reductions.

Based on findings of the RR 2004 altogether 758 kt of Nitrogen and 68 kt of Phosphorus is yearly generated in the Danube River basin. These Figures are far from the background conditions (8 % for N; 10 % for P). The shares of pollution from settlements (of point and diffuse character) in these figures represent 27 % and 53 % for N and P respectively. Portion of agriculture is 39 % for N and 32 % for P. The most dominant pathway from diffuse pollution into the surface water for nitrogen is groundwater and for phosphorus it is erosion.

For risk assessment of surface water on the basin wide level no common criteria were defined due to the heterogeneity of the surface water types. Therefore countries applied national

criteria – nutrients (phosphorus and nitrogen) were used as alone-standing criteria or as a supplement to chlorophyll a values.

Impact from nutrients can be seen mainly in transitional and coastal waters, which are classified “at risk” or “possibly at risk” to reach the environmental objectives (Fig 1). Impacts are also seen in many lakes and groundwater bodies throughout the basin. Furthermore, some slow flowing river stretches such as the middle Danube or impounded river sections may be considerably affected by eutrophication, whereas in turbulently flowing rivers nutrients generally cause fewer problems.

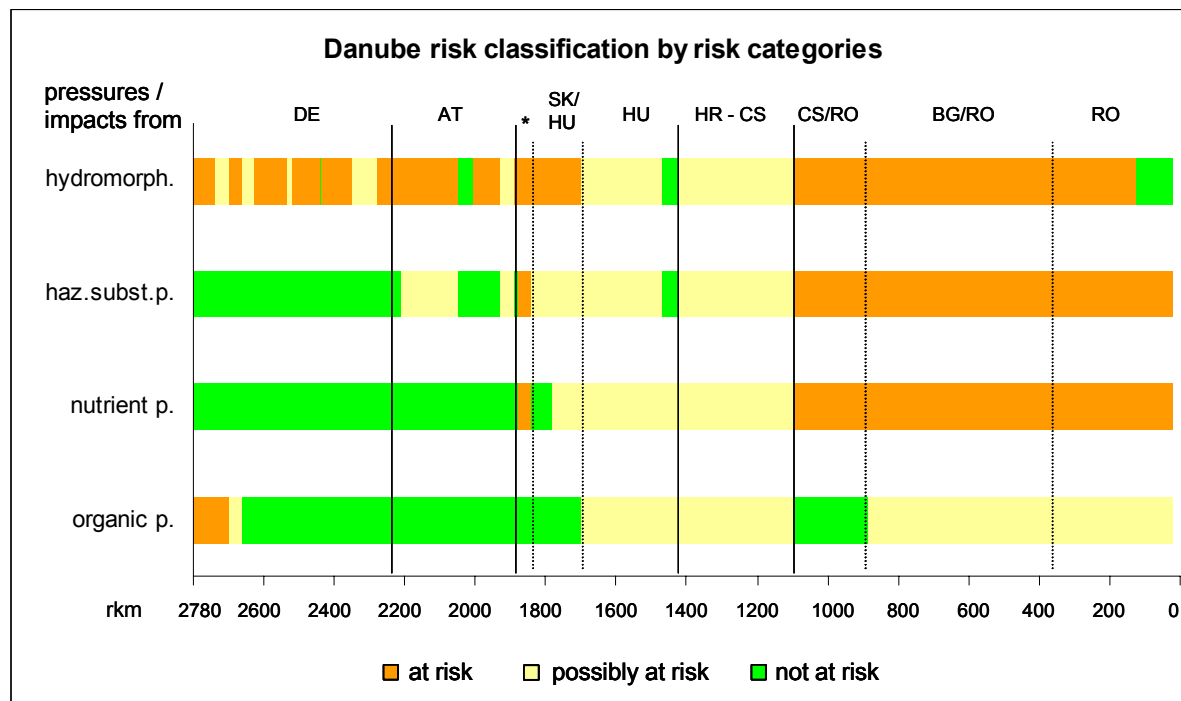


Figure 1 Risk classification of the Danube, disaggregated into risk categories. Each full band represents the assessment for one risk category (hydromorphological alterations, hazardous substances, nutrient pollution, organic pollution). Colours indicate the risk classes. \* SK territory.

The highest nutrient loads were discharged during the 80s causing eutrophication with widespread anoxic zones in the coastal areas. Starting in 1990's signs of recovery can be seen (Fig. 2) and this recovery is caused by the economic decline of industry and agriculture due to the political changes and by upcoming nutrient removal in wastewater treatment plants.

The number of macro benthic species in front of the Danube delta (data from C. Dumitrache, IRCM Constanta according to Fig. 57 RR 2004) can be used as an indicator for the ecological status in the shelf area of the Black Sea. The following figure shows the increase of species till the year 2002.

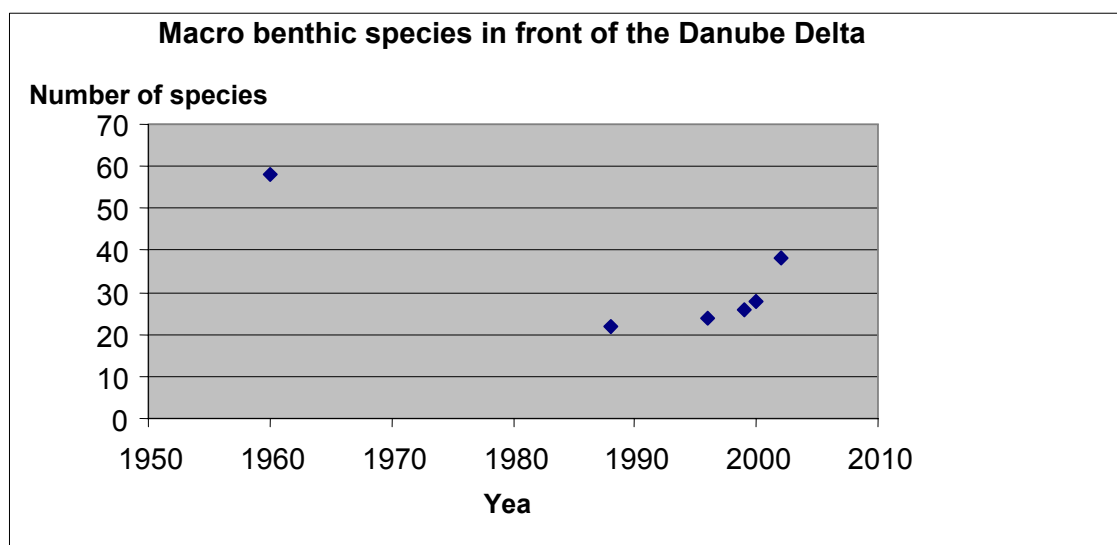


Figure 2 Development of macroinvertebrate benthic species in front of Danube delta

The proper management and possibly further reduction of nutrient loads under conditions of an improving economy will be a key issue in the next steps of the implementation of the WFD. Research results (daNUbs) have shown that the trophic status of Romanian coastal waters is limited by phosphorus since beginning of this century.

### 3 Scope and General Aims of this Issue Paper

#### 3.1. Aims of this issue paper

In this paper, an overall strategy and guidance for addressing the management issue of nutrients will be developed. The specific objective is to provide support on the implementation of the WFD by developing a common understanding and an overall guidance on how to select the most cost-effective set of measures to address nutrient pollution, as part of the program of measures within the frame of the river basin management plan to be set up for the Danube basin by 2010.

**This issue paper provides an overall strategy and guidance how to address the management issue of nutrient pollution, 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 document includes objectives for the basin wide scale, which are based on visions and which will guide the Danube countries towards a common environmental aim.**

*The ICPDR's basin wide vision for nutrient pollution is the balanced management of nutrient emissions via point and diffuse sources in the entire DRB that neither the waters of the DRB nor the Black Sea are threatened or impacted by eutrophication.*



**The objective is to give guidance to develop the Joint Programme of Measures (JPM) within the frame of the Danube RBM Plan. The issue paper might also support the development of the national Programmes of Measures.**

### 3.2. What is covered by this document?

The subsequent issues are addressed within this document:

#### *a. Measures related to current pressures and an approach for future pressures*

The Danube River Basin Management Plan created on the bases of all issue papers will address both current and future pressures, which may impact ecological status. This issue paper outlines needed inputs for the DRBM Plan and a preparatory process for present and future pressures.

The sources of nutrient pollution and the possible measures to reduce it have a great overlap to the sources of and the possible measures against organic pollution. So both documents should be used in parallel.

According to the requirements of the WFD current nutrient pressures on the basin-wide level have to be listed, and the **List of Measures to reduce Nutrient pollution** has to be developed. . This List of measures - identified, selected and prioritised at the basin wide level - will be integrated into the **Joint Programme of Measures (JPM)**.

The methodology to approach the future measures will be developed as part of the RBMP preparatory process.

#### *b. Criteria/indicators for measuring success of process*

To secure a successful implementation strategy, any management process should include evaluation mechanisms. For the Danube River Basin Management Plan and fulfilment of the Programme of Measures it seems most crucial to include criteria or indicators, which enable the measurement of success of the process described in this document: reduction of nutrients entering the Danube to levels consistent with the achievement of the good ecological/chemical status in the Danube River by 2015 (WFD), and reduction of discharged nutrient loads in the Black Sea Basin to such levels, which permit the Black Sea ecosystems to recover to conditions similar to those observed in the 1960s (MoU).

Based on the procedure outlined in Chapter 7, targets have to be set related to the nutrient reductions that - first - can be achieved and - second - still have to be agreed on to minimize the difference towards the environmental objective (e.g. concentrations of N and P in the Danube Delta or in other sensitive areas, or % of expected N and P reduction, or t/year). However it should be borne in mind that the source of pollution and the most sensitive location for effects may be separated by a long distance. So not only the local concentration but also the load transported along the river stretch must be considered when evaluating the effect of the basic and supplementary measures.

#### *c. Improvement of methodologies and data availability*

This chapter addresses issues that need improvement related to the procedures within the Danube River Basin Analysis in order to achieve comparable approaches. This will include methodologies and guidelines for data collection and reporting as well as for cost benefit and

cost effectiveness analysis. Further, this includes the need to identify weaknesses in data and recommendations for data improvements.

***d. Environmental objectives and exemption***

This chapter of this issue paper refers to the most efficient ways to reach the WFD environmental objectives, specifically through measures to address nutrient pollution. The approach will be described in the Significant Water Management Issues paper and details on the correct application of exemptions for the nutrient measures will be part of this issue paper.

***e. Economics Analysis***

The assessment and prioritisation of selected measures addressing nutrient pollution will consider the benefits of reducing nutrient pollution and the overall costs of meeting the targets to reduce nutrient on the basin wide scale. The selection of the “baseline” scenarios will help to identify the likely contribution from planned or prospective initiatives that will help to reduce nutrient pollution. The analysis of the comparative cost-effectiveness of potential approaches in delivering the remaining required changes and their performance against certain criteria will lead to the most cost effective combination of measures proposed to reduce nutrients. Options for financing the measures will be included.

## 4 Measures related to current pressures

The updated list of current nutrient pressures in the DRB will be provided and a methodology to select the most efficient measure of the Joint Program of Measures (JPM) will be proposed. The list of pressures is based on findings of the Danube River Basin Analysis and on the national reports. This list of current pressures represents the basis for the List of Measures to address nutrients as part of the Joint Programme of Measures.

The final List of Measures, as Deliverables for the Danube RBM Plan will include cost effectiveness considerations and will be the basis for the documentation of implementation success. Further, considerations on implementation costs will be included to enable basin-wide finance plans/mechanisms.

The DPSIR framework (Driving force-Pressure-State-Impact-Response) was chosen as the underlying conceptual framework of the developing the program of measures.

The Danube Basin Analysis lists the following **key nutrients drivers**, of which the first three are most relevant ones:

1. **Agriculture**
2. **Households**
3. **Industry**
4. Land use practices
5. Deforestation
6. Climate conditions

The DPSIR will be extended by the concepts of decision making (scenarios, options, criteria and evaluation as part of the further development of MONERIS model as a management tool) in order to provide a common structuring support for the decision making process of the ICPDR. In this context the DPSIR approach can support the Danube countries by introducing

a structural system of the catchments in which cause effect chains are formalized and eventually modelled to simulate the expected effects of the proposed courses of action (responses to the key water management issues).

According to WFD Art. 11/3 a Programme of Measures (PoM) has to include a minimum set of obligatory measures, the “basic measures” from which the following measures seem appropriate to tackle nutrient pollution:

- a) *those measures required to implement Community legislation for the protection of water, including measures required under the legislation specified in Article 10 and in part A of Annex VI;*
- b) *Point Sources:*
- c) *The Urban Waste Water Treatment Directive 91/271/EEC*
- d) *The Integrated Pollution Prevention Control Directive 96/61/EC*
- e) *Diffuse Sources:*
- f) *The Nitrates Directive 91/676/EEC*
- g) *The Sewage Sludge Directive 86/278/EEC*
- h)
- i) *Point and Diffuse Sources:*
- j) *The Environmental Impact Assessment Directive 85/37/EEC*
- k) b) *measures deemed appropriate for the purposes of Article 9;*
- l) *for point source discharges liable to cause pollution, a requirement for prior regulation, such as a prohibition on the entry of pollutants into water, or for prior authorization, or registration based on general binding rules, laying down emission controls for the pollutants concerned, including controls in accordance with Articles 10 and 16. These controls shall be periodically reviewed and, where necessary, updated;*
- m) *for diffuse sources liable to cause pollution, measures to prevent or control the input of pollutants. Controls may take the form of a requirement for prior regulation, such as a prohibition on the entry of pollutants into water, prior authorisation or registration based on general binding rules where such a requirement is not otherwise provided for under Community legislation. These controls shall be periodically reviewed and, where necessary, updated.*
- n) (j) *a prohibition of direct discharges of pollutants into groundwater*

In addition to the obligatory basic measures according to WFD, Annex VI a set of generally not compulsory supplementary measures has to be taken in consideration in order to reach the environmental objectives, from which the following can be relevant for nutrient pollution: legislative, administrative, economic or fiscal instruments, negotiated environmental agreement, emission control, BAP, research, development and demonstration projects.

#### **4.1. Pressure: point sources of pollution from Settlements, Industry and Agriculture**

##### **Results according to Danube River Basin Analysis**

The 2006 data collection on the wastewater treatment plants, on an agglomeration level for agglomerations which fall under the scope of the Urban Waste Water Directive (i.e. > 2000 p.e), reference year 2005, shall be linked to the data sets already available in the ICPDR Emission inventory and the DABLAS database, through a two-step approach. In the first phase (2006) the methodology has been developed and the data on agglomerations with more than 10,000 p.e. are

collected. In the second phase (2007) the data of the agglomerations between 2,000 and 10,000 p.e shall be collected. This compilation includes an estimation of the pollution loads discharged from the agglomerations to the Danube catchment.

The currently planned and anticipated developments with regard to urban waste water treatment for the years 2009, 2012 and 2015 will be collected as well to compile a status overview for those dates taking into account different planning decisions (e.g. designation as sensitive area).

The outcome should be a consistent description of the situation as an input from P&M EG for the River Basin Management Plan. Further outcomes are a much more refined conceptual data model for the ICPDR database and a set of tools for data collection and evaluation. The ICPDR database should be upgraded with the new data model, so that the newly collected data are available for further evaluations and for comparison with further data collections in the future.

### **Drivers DRB scale**

1. Urban development
2. Livestock
3. Industry

### **Possible impacts – failure of good status**

Increased eutrophication, resulting in:

1. a loss of habitat
2. an increased oxygen depletion
3. a limited use of waters (e.g. recreation, etc.)

### **Basin Wide Management Objectives – Nutrient Pollution**

The way towards the vision will be achieved through the implementation of the following management objectives by 2015:

#### **EU Member States, Accession Countries and Non EU MS:**

- ⇒ Reduction of the total amount of nutrients entering the Danube and its tributaries to levels consistent with the achievement of the good ecological/chemical status in the Danube River Basin by 2015.
- ⇒ Reduction of discharged nutrient loads in the Black Sea Basin to such levels, which permit the Black Sea ecosystems to recover to conditions similar to those observed in the 1960s.
- ⇒ Reduction of phosphates in detergents preferably by eliminating phosphates in detergent products as it is already the case for some Danube countries.
- ⇒ Implementation of the management objectives described for organic pollution with additional focus on the reduction of nutrient point source emissions (see above).
- ⇒ Implementations of best environmental practices regarding agricultural practices (for EU Member States linked to EU Common Agricultural Policy (CAP)).
- ⇒ Create baseline scenarios of nutrient input by 2015 taking the respective preconditions and requirements of the Danube Countries (EU Member States, Accession Countries, Non EU Member States) into account.
- ⇒ Definition of basin wide, sub-basin and/or national quantitative reduction targets (i.e. for point and diffuse sources) taking the respective preconditions and requirements of the Danube Countries (EU Member States, Accession Countries, Non EU Member States) into account.

**In addition, for EU Member States:**

- ⇒ Implementation of the UWWTD (91/271/EEC) as described for organic pollution (see above) taking into account the character of the receiving coastal waters as a sensitive area.
- ⇒ Implementation of the EU Nitrates Directive (91/676/EEC) taking vulnerable zones into account in case natural freshwater lakes, other freshwater bodies, estuaries, coastal waters and marine waters of the DRB are found to be eutrophic or in the near future may become eutrophic.

**Input for the Danube RBM Plan**

By the end of 2007 a list of the outstanding (obligatory) basic measures and supplementary measures related to sewage discharges in the DRB will be delivered for the JPM of the Danube RBMP.

**Basic measures** (in line with the requirements imposed by the identification of the DRB and its coastal waters as sensitive area):

1. Implementation of the UWWTD (or Non-EU countries the appropriate ICPDR-Recommendation, alternatively), including
  - connecting settlements to public sewers and appropriate treatment plants
  - upgrading the wastewater treatment plants with respect to N and P removal.
2. Implement BAT on the agro-industrial units

**Possible supplementary measures:**

Supplementary measures will be identified. These might include:

1. Reduction of volumes of wastewater directly discharges from combined sewerage systems to the rivers.
2. Construction of combined sewage network and rainwater treatment
3. Economic instruments to reduce pollution
4. Research, training, educational programs, advisory services, etc.

**Preparatory process**

Specific tasks include:

**Step 1a: Collation of all pressures**

1. Collation of data from Article 5 reports and other existing evidence (such as the DBS JTWG report on the impact of the Danube on the NW Black Sea, daNUbs, MONERIS, other) to identify scale of the challenge facing Danube countries from nutrient pressures in meeting WFD (and other relevant Directive, in particular the UWWTD, Nitrates and the Groundwater Directive) objectives.
2. Performing a revised river basin characterisation aiming to refine the initial analysis and reduce uncertainties in Stage 1 analysis by refining risk of failure methods. Assessment against WFD and other EU Directive (UWWTD, Nitrates/Groundwater) objectives.

**Step 1b: Basic measures**

3. Determine what basic measures are already in place to reduce nutrient pressures and impacts and how far they will go to meeting WFD objectives. Basic measures represent the minimum requirements to be complied within a river basin. For EU member states these are the measures required under the relevant Community legislation (e.g. UWWTD-Directive, IPPC-Directive, Action plans and codes of Good

Agricultural Practice on fertilization under the Nitrates Directive, application of best available practices in intensive farming, elimination of nutrients pollution of water bodies through new wastewater treatment plants, prevention or control of the input of pollutants from point and diffuse sources). For Non-EU countries the ICPDR-Recommendations shall be applied, alternatively.

4. Assessment of the ongoing process of implementation of basic measures (not already in place in some countries)

#### **Step 1c: List of measures**

5. Determine what supplementary measures (according to the definitions of the WFD) are already in place. In order to tackle agricultural pressures activities under the CAP reform are of high relevance. This would include an evaluation how delivery of the WFD objectives is considered in the current Rural Development Programmes.
6. Assessment of supplementary measures that will be needed to be introduced. Where basic measures do not achieve the objectives, supplementary measures could include i.a.:
  - New investments, sector policy, economic instruments
  - Establishment of codes of Good Practice
  - Measures affecting land management and use (i.a. to restore previous flow patterns, to establish buffer strips, to recreate and restore wetland areas),
  - Requirements to adapted agricultural practices
  - Voluntary adoption of the Phosphate Detergent ban
  - Research, development, education and training measures.

#### **Step 2 Deliverable: Compile final List of measures**

7. Provide recommendations on potential opportunities for minimizing the risk of not meeting WFD targets, and ways to prioritise action to address these risks.
8. Develop appropriate policy approaches and the possible use of exemptions (both time extended and less stringent objectives)
9. Perform cost-effectiveness analysis of the selected combination of measures.

The Danube Basin Analysis lists the following **key nutrients drivers**, of which the first three are most relevant ones:

- 1. Agriculture**
- 2. Households**
- 3. Industry**
4. Land use practices
5. Deforestation
6. Climate conditions

The DPSIR will be extended by the concepts of decision making (scenarios, options, criteria and evaluation as part of the further development of MONERIS model as a management tool) in order to provide a common structuring support for the decision making process of the ICPDR. In this context the DPSIR approach can support the Danube countries by introducing a structural system of the catchments in which cause effect chains are formalized and eventually modelled to simulate the expected effects of the proposed courses of action (responses to the key water management issues).

### **Cost-effectiveness**

Suitable measures to achieve the improvement of the ecological status are provided including pre-collected information on their costs and effectiveness. An economic analysis will be performed enabling the decision which measures/combination of measures will achieve an improvement of the ecological status in the most cost efficient way.

### **Documentation of implementation success**

A list of monitoring and evaluation indicators will be developed and used in the progress evaluation report.

The same approach would follow for other pressures from point sources: fertilisers' production, food industry, and agricultural point sources.

## **4.2. Pressure: diffuse sources of pollution**

### **Results according to Danube River Basin Analysis**

In the frame of the Danube River Basin Analysis nutrient emissions into the river system through individual pathways by means of MONERIS was estimated. Based on the recent data collected by countries, the MONERIS model will provide an updated picture of the diffuse sources of pollution by March 2007.

### **Drivers DRB scale**

1. Households – municipalities which are not provided by sewerage collection and treatment
2. Agriculture (area under cultivation, intensity of production, specific crops, livestock densities)
  - arable land: nutrients from fertilisers and manure, sediment loss
  - grassland: nutrients from manure
  - over grazing (leading to erosion)
  - application of agricultural waste to land
  - sewage sludge recycling to land drainage
3. Industry – significant industrial plants not provided with proper waste management facilities

### **Possible impacts – failure of good status**

Increased eutrophication, resulting in:

4. a loss of habitat
5. an increased oxygen depletion
6. a limited use of waters (e.g. recreation, etc.)

### **Input for the Danube RBM Plan**

For each measure the List of Measures will contain:

### **Possible basic measures:**



1. Implement Nitrates Directive (or Non-EU countries appropriate BAP, alternatively)
2. Implement Action Programmes according to the Nitrates Directive taking into account the character of the Danube River Basin as a vulnerable zone (or Non-EU countries appropriate BAP, alternatively).
3. BEP for farmers linked to CAP.
4. Prevent and control soil erosion.

#### **Possible supplementary measures:**

1. Instruments and policy measures to support and implement the WFD
2. Compensation payments for changing land use management etc.
3. Ensuring integration between River Basin Management Plans and Land Use Planning  
The achievement of WFD objectives depends fundamentally on the management of land, including the built environment. Factors including the pressures from housing for more water, the management of domestic waste, the impacts of diffuse urban pollution and the impacts of flood management, all affect the water environment and need to be integrated into the deliverable set of measures.
4. Wetland creation and restoration  
Pressures on wetlands (e.g. physical modification or pollution) can result in impacts on the ecological status of water bodies. Measures to manage such pressures will need to be considered as part of RBMPs in order to meet the environmental objectives of the Directive. Further, wetland creation and enhancement should be used within Programmes of Measures to deliver sustainable, cost effective and socially acceptable mechanisms for helping to achieve environmental objectives – e.g. flood management, pollution control, coastal management, groundwater recharge.  
Transposition of the relevant parts of article 11 on supplementary measures, with text stressing that wetlands should be used to achieve the most cost effective and sustainable programme of measures for WFD standards.
5. The Rural Development Regulation (RDR) for the period 2007-2013 is designed to place agriculture in a broader context by covering three major policy objectives. These objectives aim to improve: i) competitiveness of farming and forestry (Axis 1); ii) environment and land management (Axis 2); and iii) quality of life and diversification (Axis 3). The three thematic axes are complemented by a fourth implementation axis (LEADER) that streamlines the local development strategies, which could also include WFD implementation. Measures under all axes could contribute to reaching the WFD objectives as they offer various possibilities to protect and enhance natural water resources. While the measures under axis 1 and 3 are mainly indirectly linked to water, the measures provided under axis 2 offer high potential to support the implementation of the WFD directly. Measures contributing to water protection are contained mainly under Axis 2 of the Rural Development Programs. Especially the voluntary agri-environmental measures are used to address diffuse and point sources of agricultural water pollution (nitrates, phosphates, pesticides) as well as soil erosion. Under this second axis, also a specific measure allowing farmers to be compensated for income foregone due to WFD implementation (Art. 38) is provided.

In order to implement the supplementary measures a two-step approach, could be considered:



In a first step the supplementary measures should - wherever possible – consist of voluntary programmes with cooperative agreements. Thus they can be (partly) funded and the participation by farmers, etc will be open and for these reasons well accepted.

In a second step binding programmes should be foreseen. They will not be fundable; then participation is obligatory. The announcement of the upcoming of a second (binding) step in case of failing the objectives, leads to serious discussions of the necessary measures of the voluntary programmes, a sharing of responsibility with the stakeholders, higher interest in the voluntary programme, higher participation rates and a closer cooperation.

### **Deliverables for the Danube RBM Plan**

By the end of 2008 a list of most appropriate measures related to diffuse nutrient pollution reduction in the DRB is available for inclusion into the River Basin Management Plan.

Suitable measures to achieve the improvement of the ecological status are provided including pre-collected information on their costs and effectiveness. An economic analysis will be performed enabling the decision which measures/combination of measures will achieve an improvement of the ecological status in the most cost efficient way, and considering the influence of time scale in assessing the ecological effects.

### **Preparatory process**

The selection and assessment of measures will follow a bottom-up approach, based on the data collection organised at the national level. The collection of measures will be organised based on agreed templates. Each measure will include a description of the measure, the general preconditions for its use, and an analysis of the strength, weaknesses and effectiveness of the measure, information on the cost-effectiveness and implementation criteria (administration, enforcement and control). Tools for evaluation and prioritisation of the measures will be proposed by the P&M EG and agreed basin wide.

### **Documentation of implementation success**

A list of monitoring and evaluation indicators will be developed and used in the progress evaluation report.

The same approach would follow for other pressures from diffuse sources.

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## **5 Approach for future pressures**

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The procedure related to future pressures and measures will be different than for current pressures/impacts. Best practice solutions will be promoted on the transboundary level. The selection of future measures is influenced by the prognosis of population and economic development, future legislation requirements and the assessment of the results of already planned measures as part of the scenario development. For new activities having a possible transboundary effect there will EIA concluded. Scenarios calculations for a set of different measures will be developed for the total Danube basin as well as for individual sub basins or countries, based on MONERIS.

### **Deliverables for the Danube RBM Plan**

The list of future measures will be prepared based on the proposal at the national level and the results of the MONERIS scenarios calculation.

### **Preparatory process**

For diffuse nutrient pressures, the following procedure may be used:

1. Investigations of how the current CAP measures have, may or could potentially contribute to deliver the WFD objectives. There will be some influences due to the trends and developments in the agricultural sector, which can cause future pressures.
2. Exploration of the extent that measures of the CAP (e.g. cross-compliance and agri-environmental schemes) will deliver the WFD objectives, will be of no relevance or even cause negative effects.
3. Identification of those farm practices and related measures not explored under the current pressures that contribute significantly to reducing or increasing water pollution from agriculture.
4. Definition of pilot approaches to educate and inform farmers (and the public) on issues related to agricultural pressures.
5. Identification of successful measures, including those taken under CAP schemes.
6. Economic analysis in line with the Article 4.7 of the WFD related to cost effectiveness.

## **6 Improvement of methodologies and data availability**

This chapter addresses issues, which need improvement related to the knowledge base and procedures within the Danube River Basin Analysis. Further, the issue of data availability will be dealt with - necessary improvements to fill specific data gaps will be identified. An approach on how a GIS could contribute, through their presentation and analytical capabilities, the combination of land use, water and economic information - thus providing information of relevance for river basin authorities.

An updated inventory of pressures from point and diffuse sources of nutrient pollution will be available by the end of 2007 as an important basis for preparing the detailed List of basin-wide nutrient reduction measures as part of the Danube River Basin Management Plan.

According to the list of possible measures for reducing and controlling pollution coming from point discharges and diffuse emissions of nutrient, scenarios for a set of different measures will be developed for the total Danube basin and where necessary and appropriate as well for individual sub basins or countries. The system, which is currently under development through the update of MONERIS, 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 to the sets of measures proposed by the ICPDR. These calculations include: pollution prevention and control, river basin management, design for priority investments, reporting.

The initial economic investigations for the Roof Report helped to perform the economic analyses carried out at river basin district level as part of the Article 5 reports. More detailed methodologies which will be applied to activities in river basin districts in detailed economic appraisals from 2007 onwards are required. These will cover the determination of cost

effectiveness and assessing whether costs are disproportionate in assessing the viability of proposed programmes of measures.

### **Deliverables for the Danube RBM Plan**

The input into the Danube RBMP will include:

- harmonised methodology for collecting measures to address nutrient pollution
- guidelines for scenarios calculation for a set of different measures addressing nutrients
- methodologies related to economic approaches for selection of the most cost effective combination of measures
- other methodologies or guidelines useful for economic analysis, as appropriate
- set of criteria to assess the success of the implementation of measures.

### **Preparatory process**

In the context of assessing cost and benefits linked to different measures, as well for the cost effectiveness of the selected combination of measures, methodologies linked to the economic analysis are already initiated. Information from the Joint Action Program on the cost of measures will be used. Further support is expected from the future Task Group on Economics.

## **7 Environmental Objectives and Exemptions**

For Environmental objectives and exemptions a formalised EU procedure exists. The WFD environmental objectives are clearly defined within the WFD and have to be reached in the most efficient way by 2015: reduction of nutrients entering the Danube to levels consistent with the achievement of the good ecological/chemical status in the Danube River by 2015. In addition, the goals of the MoU between the ICPDR and BSC have to be reached: reduction of discharged nutrient loads in the Black Sea Basin to such levels, which permit the Black Sea ecosystems to recover to conditions similar to those observed in the 1960s.

In defining the status of the Water Bodies and the achievement/failure of the environmental objectives both results of pressures and measures analysis and the monitoring results have to be combined.

The procedure and agreement on environmental objectives and exemptions are performed in parallel.

On the basin-wide scale the following procedure for defining the environmental objectives and exemptions is suggested:

### ***Step 1: Definition of improvement related to environmental objectives***

Scenarios with differing environmental benefits due to nutrient reduction measures in line with EU policies and the related timetable of individual countries (respecting agreed transitional periods) will be designed and evaluated through investigations (MONERIS, etc).

**The baseline accounts for the effect of existing measures**, including CAP reform, agri-environment schemes and other policy initiatives, on water quality currently implemented in the DRB. Additional voluntary action could lead to wider adoption of specific best practices, such as the Phosphate Detergent ban implemented in the DRB. A baseline scenario of least

change will be established whereby relatively few of the possible options are introduced or are introduced to a minimum level. A number of policy initiatives that are expected to come into effect over coming years will promote changes on farms that will help to reduce water pollution due to nutrients. As a result, the gap between current water quality, and good chemical and ecological status is likely to decrease.

Other policy scenarios will be designed where greatest use is made of the options or they are used to a maximum extent with a view to maximizing environmental benefits and achieving good ecological status. CAP Pillar II measures, with particular emphasis given to environmental measures are introduced in one of the options. Additionally, cross compliance is designed and enforced to achieve environmental protection and management in the selected options. It is expected that some sensitivity analysis should be undertaken to show the likely impacts where either the least or most environmentally favourable implementation package from the WFD perspective is introduced.

The outcome of the scenario analysis will give indications on load reduction achievable with different sets of measures and related costs.

**Step 2: *Agreement on quantitative improvement***

- Based on the outcome of the scenario analysis and the knowledge of the biological response especially in the North-Western coastal areas an evaluation should be carried out to define the possible gap in reaching the environmental objective.
- Agreement on further steps to minimise the gaps in further implementation of the WFD.
- Develop monitoring tool to measure implementation success in the JPM. The monitoring to reach the WFD environmental objectives is a different process than monitoring the implementation success of measures using defined indicators. The processes can be applied in combination.

**Step 3: *Discussion on exemptions and development of corresponding criteria***

- Initiate the discussion on exemptions (ICPDR EGs and Drafting Group for Nutrients, Danube countries, stakeholders, etc.) and how to deal with them on basin-wide scale.
- Development of criteria to decide on exemptions related to certain pressures and affected water bodies.
- The EC guidance on Environmental objectives and Exemptions will serve as a basis.

## **7.1. Economic analysis**

Overall, the economic analysis is a process of providing valuable information to aid decision-making and should be an essential part of the overall approach for supporting decisions. The economic analysis is also a source of information of interest to stakeholders and the public in the context of information and consultation activities. The economic data to support the implementation of the Water Framework Directive covers a wide range of data sources and contributes to different stages of the process. These include:

- river basin economic characterization and the preparation of a baseline scenario;
- enabling cost recovery analysis;
- performing the cost-effectiveness analysis and
- assessing the economic impact of the programme of measures and informing the disproportionate cost analysis.

Article 9.1 of the WFD states that “Member States shall ensure by 2010: An adequate contribution of the different water uses, disaggregated into at least industry, households and agriculture, to the recovery of costs of water services, based on the economic analysis conducted according to Article 5 and taking account of the polluter pays principle”. The results of Joint Action Program reported January 2007 as well as from other relevant studies (DABLAS, EBRD) will be considered.

Basic regulatory measures under the WFD would need to be implemented by 2012. Nonetheless it is likely that the understanding of what is required to achieve the WFD environmental objectives will increase with time - also leading to a more cost-effective choice of required nutrient reduction targets.

It is assumed that in order to achieve nutrient reduction targets, the decision makers would be faced with implementing a large number of changes in a very short time period, which could have implications for both costs and the effectiveness of implementation.

The measurement of benefits is essentially the measurement of avoided damages. Since the scenarios generally simulate overall improvements in the environment, benefits will tend to get larger as we move from the baseline to the other scenarios.

Costs and benefits analysis of action to reduce nutrient pollution includes:

- the benefits of reducing nutrient pollution
- the overall costs of meeting the targets to reduce nutrient will go on to examine the “baseline” in terms of the likely contribution from planned or prospective initiatives that will help to reduce nutrient pollution.

Information on costs and benefits is highly incomplete and subject to a great deal of uncertainty in the DRB. The approach can include:

- compare estimates of overall costs to analyses of overall benefits;
- identify which costs are likely to be covered by baseline activity
- analyse the comparative cost-effectiveness of potential approaches in delivering the remaining required changes and their performance against certain criteria, including their use in conditions of uncertainty.

Throughout the cost and benefit analysis, we will refer to the WFD water quality target as delivering “good ecological status”. Reducing nutrient pollution will increase water quality, enhancing biodiversity, restoring fish habitats, and improving the aesthetic standards of water bodies, as well as reducing the cost of drinking water treatment. In addition to the water quality benefits, the changes required to reduce nutrient pollution would also help to improve soil structure and reduce soil loss, tourism and recreation industry. Reductions in eutrophication in coastal waters will lead to benefits for the fish and shellfish industries respectively.

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## 8 Monitoring and the Joint Programme of Measures

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The monitoring of the implementation of JPM will be based on suitable indicators for the different sets of measures. This will give knowledge on the implementation successes, but not on the ecological effects.

This information will be provided by the monitoring and assessment according to the WFD. The monitoring results will be used for the subsequent tasks:

- a. Validation of the risk assessment performed according to Article 5: Status class assessments deliver clarification if respective water bodies are at risk. Operational as well as surveillance monitoring results are implemented for these analyses.
- b. Evaluation of the ecological efficiency of nutrient measures: The success of measures to improve the ecological status is assessed. Operational monitoring results are implemented for these analyses.

In the Danube River Basin the revised TNMN and national monitoring results according to the WFD will be used to implement the above tasks.

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## 9 Financing of the Danube RBM Plan

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Preliminary indications are that action is required by 2012 at the latest in order to implement “programmes of measures” in order to achieve “good water status” by 2015. It is extremely likely that taking action later, over a shorter timescale, will mean higher overall costs since there will be less time to identify the most cost effective measures.

Within the EU, LIFE, the Cohesion Fund and the Structural Funds are the most important funding schemes for environmental projects.

Of all tools of the CAP, agri-environment seems the most useful for helping implementing the WFD. Therefore, in the next financing period, Member States should provide for specific agri-environmental measures to support the objectives of the WFD. In addition, Member States need to allocate sufficient funding to this issue to meet the requirements of the implementation of the WFD. Specific measures could target organic farming to sensitive areas to reduce nitrogen and pesticide pollution, target restoration of wetlands (habitats and species) identified as protected zones, or specific measures to meet specific requirements in river basins (e.g. to reduce identified main pollutants).

In addition to Rural Development, LEADER + programmes in Member States referring to water issues should pursue the objectives of the WFD and could thereby help implementing the WFD. Other funding instruments need to be further explored based on the results of the Joint Action Program implementation report, 2007.