Summary Report to EU on monitoring programmes in the Danube River Basin District designed under Article 8 – Part I.

WFD Roof report on Monitoring - Part I: Development of WFD compliant monitoring programmes for the Danube River Basin District

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Table of content

Preface

In view of fulfilling the reporting obligations on the implementation of the EU Water Framework Directive the ICPDR mandated the Monitoring and Assessment Expert Group (MA EG) in December 2005 to elaborate a Summary (Roof) Report on the development of monitoring programmes in line with Article 8 WFD.

This paper outlines the overall strategy for ensuring that the ICPDR basin-wide monitoring programmes are in line with the requirements of the WFD and provide an overview on water quality on a basin-wide level.

1. Introduction

According to the Article 8 of the EU Water Framework Directive (WFD) the Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district. These programmes shall be operational at the latest six years after the date of entry into force of WFD (i.e., by December 2006). Such monitoring shall be in accordance with the requirements of Annex V of WFD.

According to Article 15 paragraph 2 WFD the Member States shall submit summary reports of the monitoring programmes until 22 March 2007.

2. Current monitoring programmes and warning systems of the ICPDR

2.1. The Transnational Monitoring Network

The Transnational Monitoring Network (TNMN) is the basin-wide monitoring network of the ICPDR. It was established in 1995 and builds on the earlier monitoring network set-up under the Bucharest Declaration. The overall purpose of the TNMN is:

- To provide an objective and reliable source of data on water quality;
- To provide a basis for assessing the effectiveness of point and diffuse source pollution abatement measures;

- Safeguarding the health of humans using the Danube (and tributaries) as a source of drinking water;
- Safeguarding all other agreed uses of the Danube such as commercial and recreational fisheries, bathing and other water contact recreations, as a habitat for flora and fauna, as a source of irrigation water, industrial uses and so on.

The objectives of the TNMN were based on the results of the EC Environmental Programme for the Danube River Basin and were agreed as follows:

- To be capable of supporting reliable and consistent trend analysis of concentrations and loads of priority pollutants;
- To support the assessment of water quality for water use;
- To assist in the identification of major pollution sources;
- To include water quality monitoring in sediments and bioindicators;
- To include quality control.

It was agreed that the monitoring network in the frame of TNMN would be based on national surface water monitoring networks. For TNMN monitoring sites the following selection criteria had been set up:

- Located just upstream/downstream of an international border,
- Located upstream of confluences between Danube and main tributaries or main tributaries and larger sub-tributaries (to enable estimation of mass balances),
- Located downstream of the major point sources,
- Located to control important water uses.

2.2. Joint Surveys

The TNMN has been supplemented by a Joint Danube Survey (JDS) in August/September 2001 and Joint Tisza Survey in October 2001. These surveys were longitudinal surveys of selected physico-chemical determinands and selected biological components. Since the analyses of the different components were carried out with the same methodology by the same expert it was possible to receive homogeneous data sets. It is foreseen to continue such surveys in regular time intervals, preferably every 6 years in order to align these surveys with the monitoring needs of the WFD. The second Joint Danube Survey is going to be organized in August/September 2007. A primary focus will be given to the monitoring of those WFD quality elements (biological, chemical and hydromorphological) not included in a regular TNMN.

2.3. Accident Emergency Warning System

To prevent the surface waters from pollution caused by accidents it is necessary to establish an efficient basin-wide warning system and to adopt the appropriate precautionary measures to minimize the risk from accident pollution. In the past the ICPDR put strong efforts to the sector of accident

prevention and control by establishing an Accident Emergency Warning System as well as by developing the effective accident prevention policy.

The general objective of the system is to increase public safety and protect the environment in the case of an accidental pollution by providing early information for affected riparian countries. In the participating countries so-called Principal International Alert Centres (PIACs) have been established. The main function of these centres is to propagate the warning message at the international level. The Danube AEWS is activated in the event of transboundary water pollution danger or if warning threshold levels are exceeded.

3. Monitoring requirements of the Water Framework Directive

Article 8 of the Directive establishes the requirements for the monitoring of surface water status, groundwater status and protected areas.

3.1. Surface Waters

Annex V 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.

As mentioned earlier, 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.

3.1.1. Objectives of surveillance monitoring

The objectives of surveillance monitoring of surface waters are to provide information for:

- Supplementing and validating the impact assessment procedure detailed in Annex II;
- The efficient and effective design of future monitoring programmes;
- The assessment of long term changes in natural conditions; and
- The assessment of long-term changes resulting from widespread anthropogenic activity.

The results of such monitoring should be reviewed and used, in combination with the impact assessment procedure described in Annex II, to determine requirements for monitoring programmes in the current and subsequent River Basin Management Plans (RBMP). Surveillance monitoring has to be undertaken for at least a period of one year during the period of a RBMP. The deadline for the first RBMP is 22 December 2009. The monitoring programmes must start by 22 December 2006. The first results will be needed for the first draft RBMP to be published at the end of 2008, and then for the finalized RBMPs at the end of 2009. If there is low confidence in the Annex II risk assessments (e.g. because of limited existing monitoring data), more surveillance monitoring will be required initially to supplement and validate the assessments than will be the case where existing information is extensive.

Surveillance monitoring may also initially need to be more extensive in terms of the number of water bodies included, monitoring stations within bodies and the range of quality elements. This is because:

- Of the probable lack of appropriate existing monitoring information and data;
- The Directive requires Member States to consider a different range of quality elements and a different range of pressures than have previous Directives.

Member States may also wish or have the need to (depending on the amount of existing information and the confidence in the first Annex II risk assessments) undertake surveillance monitoring each year.

3.1.2. Objectives of operational monitoring

The objectives of operational monitoring are to:

- Establish the status of those bodies identified as being at risk of failing to meet their environmental objectives; and
- Assess any changes in the status of such bodies resulting from the programmes of measures.

Operational monitoring has to be undertaken for all water bodies that have been identified, by the review of the environmental impact of human activities (Annex II) and/or from the results of the surveillance monitoring, as being at risk of failing the relevant environmental objectives under Article 4. Monitoring must also be carried out for all bodies into which priority substances are discharged.

3.1.3. Objectives of investigative monitoring

Investigative monitoring is not as strictly regulated as surveillance and operational monitoring. It is an opportunity to fill all kinds of gaps concerning the knowledge of water quality, to test new methods for quality assessment, to prove assumptions on pressures and impacts. It is not necessary to fix monitoring programmes, monitoring sites and quality elements in advance and report it to the EU Commission but only to describe purposes and hypotheses.

3.2. Groundwater

Article 8 of the WFD establishes the requirements for the monitoring of groundwater status. Annex V indicates that monitoring information from groundwater is required for:

- Providing a reliable assessment of quantitative status of all groundwater bodies or groups of bodies; (Member States must provide maps illustrating the quantitative status of all groundwater bodies or groups of bodies using the colour-coding scheme set out in the Directive);
- Estimating the direction and rate of flow in groundwater bodies that cross Member States boundaries;
- Supplementing and validating the impact assessment procedure;
- Use in the assessment of long term trends both as a result of changes in natural conditions and through anthropogenic activity;
- Establishing the chemical status of all groundwater bodies or groups of bodies determined to be at risk. (Member States must provide maps illustrating the chemical status of all groundwater bodies or groups of bodies using the colour-coding scheme set out in the Directive.);
- Establishing the presence of significant and sustained upwards trends in the concentrations of pollutants. (Member States must indicate on the maps of chemical status using a black-dot, those groundwater bodies in which there is a significant upward trend); and,
- Assessing the reversal of such trends in the concentration of pollutants in groundwater (Member States must indicate on the maps of chemical status using a blue-dot, those groundwater bodies in which a significant upward trend has been reversed).

3.2.1. Objectives of surveillance monitoring

Surveillance monitoring shall be carried out in order to:

- Supplement and validate the impact assessment procedure;
- Provide information for use in the assessment of long term trends both as a result of changes in natural conditions and through anthropogenic activity.

3.2.2. Objectives of operational monitoring

Operational monitoring shall be undertaken in the periods between surveillance monitoring programmes in order to:

- Establish the chemical status of all groundwater bodies or groups of bodies determined as being at risk;
- Establish the presence of any long term anthropogenically induced upward trend in the concentration of any pollutant.

3.3. Additional monitoring requirements for protected areas

With respect to protected areas the Directive stipulates that the programmes for surface water and groundwater shall be supplemented by those specifications contained in Community legislation under which the individual protected areas have been established (WFD, Art. 8 and Annex V).

4. Design of the future ICPDR Monitoring Programmes

4.1. Combining the objectives of the DRPC and WFD

4.1.1. General objectives

The ICDR Monitoring Programmes in future need to reflect the provisions of the DRPC as well as the requirements of the WFD.

From the WFD it is clear that TNMN shall be designed so as to provide a coherent and comprehensive overview of the status of surface waters and – where appropriate – of groundwaters within the Danube River Basin District according to Art. 8 WFD and shall permit classification of surface and groundwater bodies in line with the normative definitions (Annex V WFD).

The DRPC among others requires that the Contracting Parties shall elaborate and implement joint programmes for monitoring the riverine conditions in the Danube catchment area concerning both, water quality and quantity, sediments and riverine ecosystems as a basis for the assessment of transboundary impacts such as transboundary pollution. Another factor to be taken into account is the

availability of the TNMN data from years 1996-2005, which are supported by a sound analytical quality control programme. That is why it is essential to consider the possibility of combining the existing TNMN data with those being collected after its revision in 2006. Such an approach would enable a long-term view of the surface water quality trends in the Danube River Basin and would strengthen the informational basis for the decision makers in the region.

To fulfil the above-mentioned prerequisites, TNMN should have a unique and well-defined role in the basin-wide context. This also means that TNMN outputs should not be redundant to the national monitoring schemes and the TNMN data flow should not simply double the data presentation, which belongs to the national competences of the ICPDR Contracting Parties stemming from the implementation of WFD. It is necessary to stress that TNMN is and will be a part of national monitoring networks.

The major objective of the 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.

4.1.2. Specific objectives

The TNMN shall be designed in a way in order to obtain a continuous long-term data set for the whole basin using a defined set of parameters. If this objective is compared with the monitoring objectives under WFD, a common basis with the principles of the surveillance monitoring can be seen. Therefore, the specific objectives of the future TNMN can be formulated in line with the Annex V of WFD as follows:

1) Supplementing and validating the risk assessment detailed in the Danube Basin Analysis (WFD Roof Report 2004) according to Annex II WFD;

The Danube Basin Analysis (WFD Roof Report 2004) showed the situation concerning the surface water and groundwater, and indicated the gaps and uncertainties of the existing TNMN data. It is in the interest of all Danube countries to supplement the missing information to achieve a complete picture of the status of the major river network in the Danube River Basin District.

2) The efficient and effective design of future monitoring programmes;

In future, the results of TNMN may be reviewed and used, in combination with the risk assessment described in WFD, Annex II, to determine requirements for monitoring programmes in the current and subsequent River Basin Management Plans (RBMP).

3) The assessment of long-term changes in natural conditions;

The ICPDR will not monitor reference sites for the detection of long-term natural changes at present. Such monitoring will be collected on the national level only. Countries will be requested to inform the ICPDR if any changes in natural conditions are detected in order to include such information in the basin-wide analysis of monitoring data. For possible future needs see Chapter 9.

4) The assessment of long term changes resulting from widespread anthropogenic activity;

Surveillance monitoring is also required to provide information on long-term changes resulting from widespread anthropogenic activity. This kind of monitoring will be important to determine or confirm the impact of, for example, long-range transport and deposition of pollutants from the atmosphere. If this is likely to lead to a risk of water bodies deteriorating in status (any status level down to poor) then those water bodies or groups of bodies will have to be included in operational monitoring programmes. In the Danube River Basin widespread anthropogenic activities could result e.g. from agriculture or navigation.

The results of the first round of surveillance monitoring should also seek to establish a quantitative baseline for future assessments of long-term anthropogenically induced changes, and also against which reductions in pollution from Priority Substances (PS), and cessation and phasing out of emissions of Priority Hazardous Substances (PHS) will be judged. This will be important in supplementing and validating the assessment of whether water bodies are at risk of failing Article 4 environmental quality objectives or not. A thorough focus on Priority Substances in future TNMN is essential as currently available information on the occurrence of these substances in surface waters of the Danube River Basin suffers from serious data gaps. In future, those priority list substances discharged into the river basin or sub-basins must be monitored.

5) Estimating pollutants loads transferred across international boundaries and their discharging into the Black Sea;

The biological quality elements inform on the quality of the ecosystem; data on concentration of a particular substance in a water matrix provide information on a current chemical status of a respective water body. However, to assess a mass balance or flow of certain substance within a catchment, the loads transferred downstream the river must be determined. Therefore, one of the main objectives of TNMN from the beginning of its operation was producing reliable and consistent trend analysis of concentrations and loads of substances diluted in water or attached to sediments. The objective was confirmed also later, in 2000, when getting an overall view of the situation and long-term development of loads of relevant determinands in the important rivers of the Danube Basin was agreed as the main objective of the TNMN. For the future operation of TNMN it is essential to maintain this objective so that the flow of nutrients and/or specific pollutants in the catchment can be evaluated. Moreover, operation of the TNMN Load Assessment Programme complies with the commitment of the ICPDR concerning the reporting obligations towards the Black Sea Commission.

4.2. Scope of the future ICPDR Monitoring programmes

4.2.1. Geographical scope

In the past, the TNMN covered monitoring stations on the Danube River as well as some the major tributaries. In order to respond to the requirements of the WFD the TNMN will be extended to cover relevant sampling points in the whole Danube River Basin District. The Danube River Basin District covers the

1) Danube River Basin,

2) Black Sea coastal catchments on Romanian territory, and

3) Black Sea coastal waters along the Romanian and parts of the Ukrainian coast.

The Danube River Basin District includes the Black Sea coastal waters along the Romanian and partly the Ukrainian coast (up to the hydrological boundaries of the Danube River Basin). The Romanian coastal waters are delineated at 1 nautical mile from the baseline, which is defined along 9 points within the territorial sea of Romania as laid down in the Romanian Law No. 17/1990, modified by Romanian Law No. 36/2002. The Ukrainian coastal waters are not defined by Ukrainian law. For WFD implementation, the coastal waters are defined in line with Art. 2.7 WFD at 1 nautical mile from the baseline.

4.2.2. Water bodies to be monitored at the basin-wide scale

4.2.2.1. Surface waters of basin-wide importance

The WFD covers different categories of surface waters (rivers, lakes, transitional and coastal waters). The WFD Roof Report of the ICPDR identifies the following surface waters to be relevant on the basin-wide scale (see Map 1):

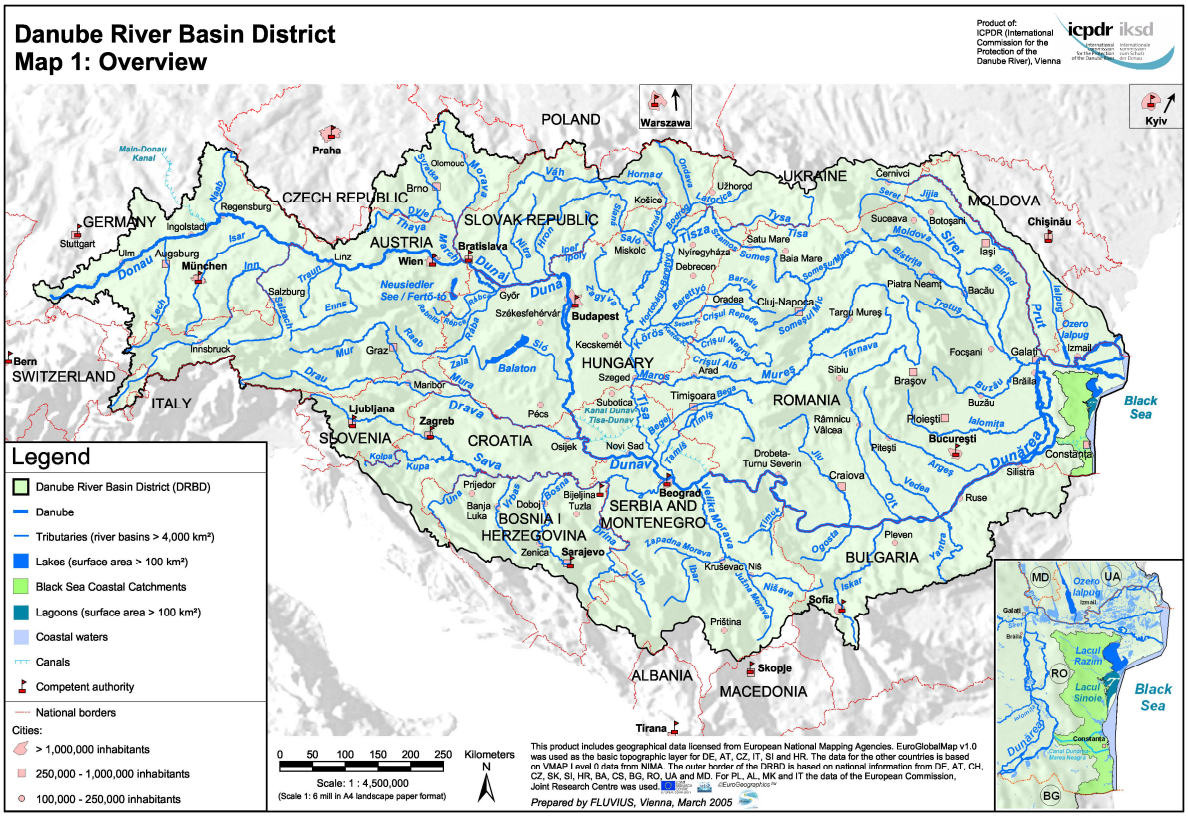
- Rivers with a catchment size of more than 4000 km²;
- Lakes with a surface area of more than 100 km²;
- The main navigation canals (as shown on the DRBD overview map);
- Transitional and coastal waters.

With respect to surface waters, the TNMN will continue to monitor **rivers** relevant on the basin-wide scale (> 4000 km²). The TNMN could also include monitoring stations on the main navigation canals if needed.

There will be no basin-wide monitoring programme for **lakes** since there are only few lakes larger than 100 km². Only Neusiedler See / Fertö-tó is transboundary and is being jointly monitored in the frame of an Austrian-Hungarian agreement.

WFD Guidance Document on **transitional and coastal water** stresses the need of establishing surveillance monitoring programmes to provide information for supplementing and validating the impact assessment procedure detailed in Annex II. It is also pointed out that in the marine environment there is a lack of biological and chemical data for high status sites as the focus for monitoring programmes has historically been centred on polluted areas. Therefore, in line with the major objective of TNMN, the coastal monitoring should primarily focus on providing overview information on long-term changes of the coastal waters of the Danube River Basin District.

Map 1 Surface waters of basin-wide importance of the Danube River Basin District



The transitional waters are located in the branches of the Danube Delta and will be monitored on the national level. The Danube Basin Analysis Report (Roof Report 2004) shows that more than 90 % of the Danube is discharged through the 3 main branches into the Black Sea. Less than 10 % of Danube water is discharged through the Delta complexes. The Danube Delta is more or less a system of its own which needs more detailed analysis for the understanding of its functioning. Therefore, there will be no basin-wide monitoring programme for transitional waters.

With respect to the coastal waters the TNMN will be extended to include monitoring stations in the Black Sea. This is an issue of basin-wide importance due to the influence of the Danube nutrient loads for the eutrophication of the Black Sea, in particular of its coastal waters off the Romanian coast which are relevant for the Danube River Basin District. This part of the TNMN will be performed by Romania.

4.2.2.2. Groundwater bodies of basin-wide importance

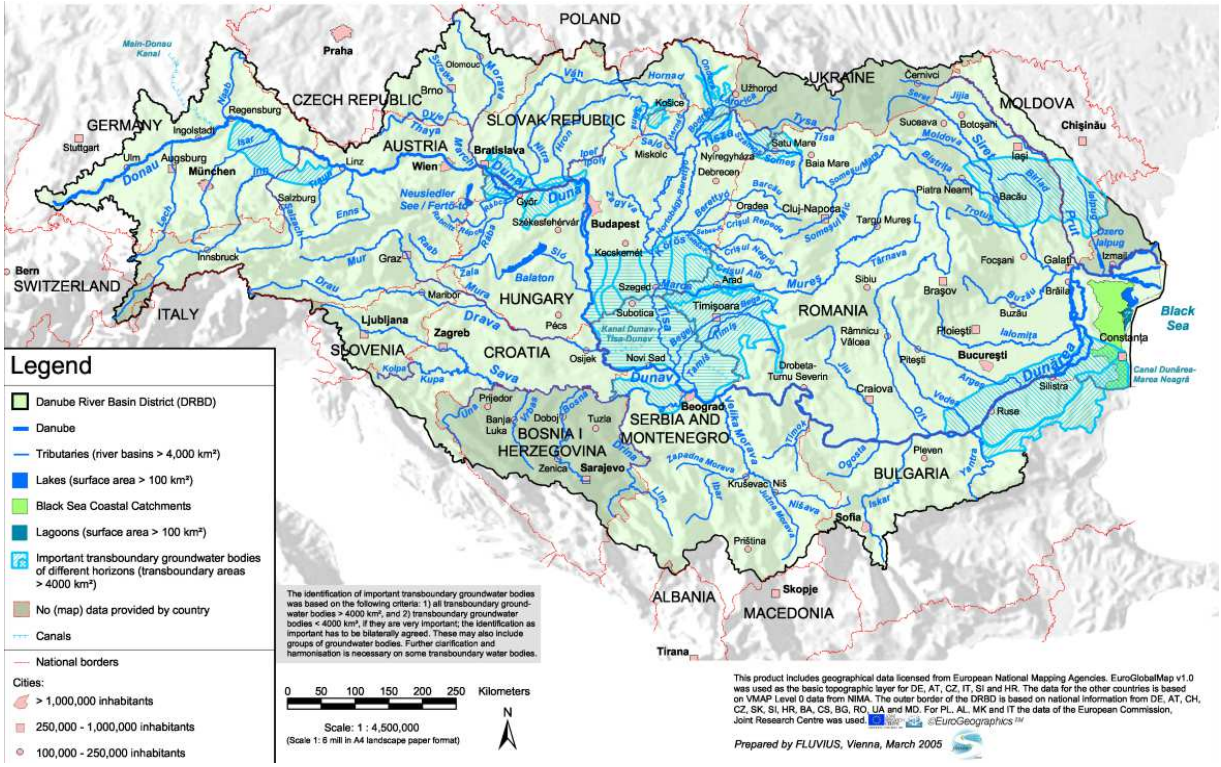
The Danube River Basin WFD Article 5 report provided an overview of important transboundary groundwater bodies in the Danube River Basin. They are defined as follows:

- Important due to the size of the groundwater body which means an area > 4000 km² or
- important due to various criteria e.g. socio-economic importance, uses, impacts, pressures interaction with aquatic eco-system. The criteria need to be agreed bilaterally.

This means although there are other groundwater bodies with an area larger than 4000 km² and fully situated within one country of the DRB they are dealt with at the national level as they are not transboundary and not of basin-wide importance.

Data on the location, boundaries and characterization of important transboundary groundwater bodies were reported by eight countries. Currently information on 11 important transboundary groundwater bodies with eight countries concerned (Germany, Austria, Slovak Republic, Hungary, Serbia, Bulgaria, Romania and Moldova) is available (see Map 2).

Map 2 Important transboundary groundwater bodies in the Danube River Basin District



4.2.2.3. Protected areas of basin-wide importance

The programmes for surface water and groundwater shall be supplemented by those specifications contained in Community legislation under which the individual protected areas have been established. Wetlands play an important role in the Danube River Basin and many of them are transboundary and under international protection. Therefore, an inventory of protected areas for species and habitats has been set up where the maintenance or improvement of the status of water is important for their protection.

The protected areas selected for the basin-wide overview have been defined in the WFD Roof Report 2004 as follows

- An international protection status (RAMSAR and World Heritage Convention, UNESCO/MAB and/or IUCN category II or Natura 2000 site), and
- a size of > 1000 ha.

Protected areas will be monitored only on the national level. Information on the ecological and chemical status of water bodies located in protected areas of basin-wide importance will be collected for reporting and RBM planning.

4.3. Interplay between national and international levels

The International Commission for the Protection of the Danube River (ICPDR) is the implementing body under the "Convention on Cooperation for the Protection and Sustainable Use of the Danube River" (Danube River Protection Convention, DRPC) and serves as the platform for coordination to develop the Danube River Basin Management Plan (DRBMP).

Depending on the issue at hand different levels of coordination should be distinguished. Measures with a clear transboundary impact need to be dealt with on the bilateral/ multilateral or Danube River Basin level. Measures with only local or regional effects can be solved on the national level or within bilateral agreements.

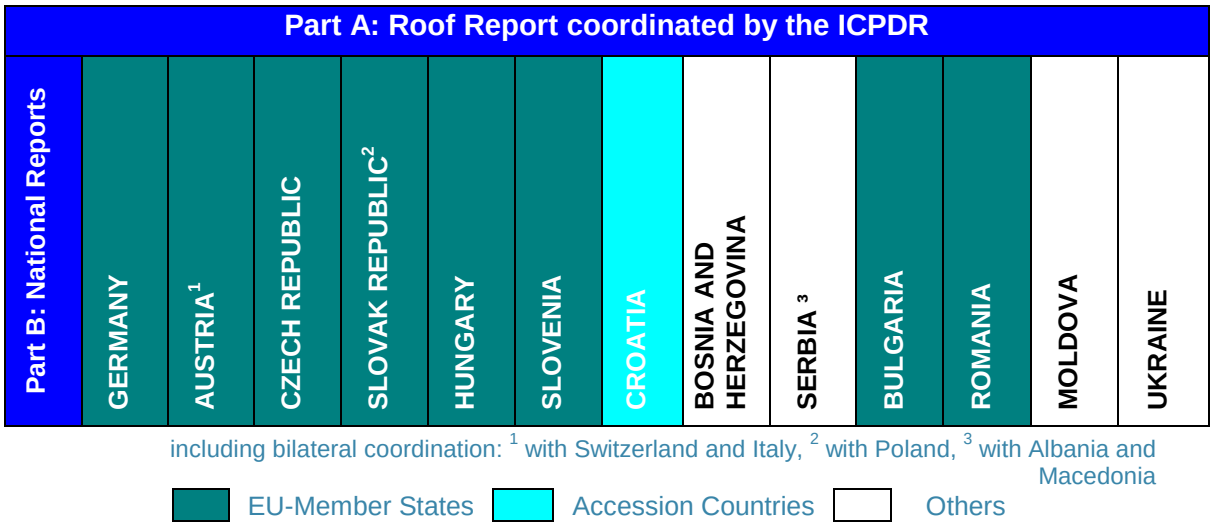
Generally, coordination should take place at the lowest level possible so that the necessary coordination on the international level can be limited to the absolutely necessary.

Three levels of coordination have been defined:

Level	Coordinating body/ competent authority	Amount of coordination
Danube river basin level	ICPDR is coordinating body, not competent authority	limit to the absolutely necessary (issues relevant on the basin-wide scale)
Bilateral/multilateral level	respective countries, e.g. in the frame of bilateral/multilateral agreements	a lot (transboundary effects with mainly bilateral or sub-basin relevance)
National level	designated authorities	a lot (for all issues regarding implementation)

The reports to the European Commission on Art. 8 WFD have been divided into two parts. Part A (Roof Report on ICPDR international monitoring programmes) gives the basin-wide overview; Part B (National Reports on national monitoring programmes) gives all relevant further information on the national level as well as information coordinated on the bilateral level (see Figure 1).

Figure 1 Structure of the report for the Danube River Basin District[1]



[1] This figure reflects the situation at the time of reporting (March 2007).

4.3.1. Part A – Roof report

The Roof report gives the basin-wide overview on issues requiring reporting under WFD. It provides information on the main surface waters, which are shown in the Danube River Basin District overview map and the important transboundary groundwaters shown in Map 15 of the Danube Basin Analysis Report.

The Roof report includes, in particular, an overview of the main pressures in the DRBD and the related impacts exerted on the environment. The overview includes effects on the 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.

The Roof report intends to give an overview of the situation in the Danube river basin district as a whole and to set the frame for the understanding of the detailed national reports. The Roof report is therefore comparatively brief. Detailed information is given in the national reports.

4.3.2. 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 national information is given in addition to the information in Part A.

5. Description of the ICPDR Monitoring Programmes

5.1. Surface waters

As described above the future TNMN will focus on monitoring of rivers and coastal waters of basin-wide importance as defined in Chapter 4.2. Table 1 gives an overview of the different kinds of surface water monitoring.

Table 1 Overview of surface water monitoring programmes in the Danube River Basin District and their use in fulfilling WFD monitoring requirements)[2]

	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	**X**	**---**	**X**)[3]

[2] Possible monitoring schemes at the sub-basin level (Part C) are not considered.

of water bodies at risk			
Investigative monitoring	**---**	**XX**	**X**

X = data collection on status; XX = joint monitoring

5.1.1. Surveillance monitoring I: Monitoring of surface water status

The design of surveillance monitoring I (SM 1) is based on WFD Annex V, 1.3.1. The monitoring network is based on the national surveillance monitoring networks and the operating conditions are harmonized between the national and basin-wide levels to minimise the efforts and maximise the benefits. The criteria for selecting monitoring points have been modified to meet the scale of the Danube River Basin District.

5.1.1.1. Objective

Surveillance monitoring will be carried out to provide an assessment of the overall surface water status in the Danube River Basin District. More specifically, monitoring will provide information for

- Supplementing and validating the risk assessment detailed in the Danube Basin Analysis (WFD Roof Report 2004) according to Annex II WFD;
- 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.

The results of such monitoring will be reviewed and used, in combination with the impact assessment procedure described in Annex II WFD, to determine requirements for monitoring programmes in the current and subsequent river basin management plans.

5.1.1.2. Selection of monitoring sites

Surveillance monitoring will be carried out on a sufficient number of surface water bodies to provide an assessment of the overall surface water status within each catchment or sub-catchment within the Danube River Basin District. The selection of monitoring sites is based on the criteria given in WFD Annex V, 1.3.1., but has been modified to address the large scale of the Danube River Basin District. The Contracting Parties select the monitoring sites in the following way:

- The rate of water flow is significant within the river basin district as a whole; each river shown in the Danube River Basin District overview map shall have at least one monitoring site:
    - Rivers with catchments of 4000 km² < x < 8000 km² shall have one surveillance monitoring site;
    - Rivers with catchments > 8000 km² shall include one monitoring point per 8000 km²;

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

- The Danube River shall have at least one monitoring site in each Danube river section type.

The total number of sites for the DRBD should amount to about 100.

- Significant bodies of water cross a Contracting Parties State boundary;
- Sites identified under the Information Exchange Decision 77/795/EEC; and
- at such other sites as are required to estimate the pollutant load which is transferred across the Contracting Parties state boundaries, and which is transferred into the marine environment.

A list of monitoring sites is attached in **Annex 1**.

5.1.1.3. Selection of quality elements

The selection of quality elements results from the requirements for surveillance monitoring as defined in Annex V, 1.3.1. WFD. Surveillance monitoring will be carried out for each monitoring site for a period of one year during the period covered by a river basin management plan for

- parameters indicative of all biological quality elements,
- parameters indicative of all hydromorphological quality elements,
- parameters indicative of all general physico-chemical quality elements,
- priority list pollutants which are discharged into the river basin or sub-basin, and
- other pollutants discharged in significant quantities in the river basin or sub-basin.

unless the previous surveillance monitoring exercise showed that the body concerned reached good status and there is no evidence from the review of impact of human activity in Annex II that the impacts on the body have changed. In these cases, surveillance monitoring will be carried out once every three river basin management plans.

5.1.1.4. Frequency of monitoring

As regards the sampling frequencies, the minimum requirement given in the WFD for the surveillance monitoring may not always be adequate to achieve an acceptable level of confidence and precision in an assessment of certain quality elements. Therefore, monitoring frequencies may be increased.

In the frame of the SM 1 information on surface water status (ecological status/ecological potential and chemical status) will be collected; the data on individual parameters will be available at the national level.

A list of the selected quality elements and monitoring frequencies is contained in **Annex 2**.

5.1.2. Surveillance Monitoring II: Monitoring of specific pressures

Surveillance Monitoring II (SM 2) is supplementary to Surveillance Monitoring I and aims at long-term monitoring of specific pressures of basin-wide importance[4]. Selected quality elements or specific determinands will be monitored at higher frequencies than in Surveillance Monitoring I while other quality elements will not be monitored at all. A denser monitoring programme is needed on specific

[4] This monitoring programme has somewhat the character of operational monitoring sensu WFD, since it is geared to monitor specific pressures and trends. On the other hand, it is conceived as a long-term monitoring scheme (in general no dropping of sites as is foreseen for operational monitoring of WFD). It is, therefore, classified as pressure-specific surveillance monitoring

pressures in the Danube River Basin District in order to allow a sound and reliable long-term trend assessment of specific pollutants and to achieve a sound estimation of pollutant loads being transferred across states of Contracting Parties and into the Black Sea.

Surveillance Monitoring II is based on the old TNMN and will be fitted to respond to pressures of basin-wide importance identified in the Danube Basin Analysis Report (Part A). At present, it is not possible to respond to all pressures identified at the roof level, e.g. monitoring of hydromorphological alterations has not yet been included or monitoring of some of the biological quality elements e.g. macrophytes or fish (compare also Chapter 9). In addition, the assessments methods used in SM2 may differ from those used in SM1 and OM. Where possible, WFD compliant methods will be applied, but additional classification methods will be used to allow further analyses and further comparisons.

The monitoring network is based on the national monitoring networks and the operating conditions are harmonized between the national and basin-wide levels to minimise the efforts and maximise the benefits.

5.1.2.1. Objective

Surveillance monitoring of specific pressures will be carried out to provide an assessment of long-term trends of specific pollutants and a sound basis for estimating loads being transferred into the marine environment. Monitoring will provide information for

- Supplementing and validating the risk assessment detailed in the Danube Basin Analysis (WFD Roof Report 2004) according to Annex II WFD;
- The efficient and effective design of future monitoring programmes;
- The assessment of long-term changes resulting from widespread anthropogenic activity.

The results of such monitoring will be reviewed and used, in combination with the impact assessment procedure described in Annex II WFD, to determine requirements for monitoring programmes in the current and subsequent river basin management plans.

5.1.2.2. Selection of monitoring sites

The selection of monitoring sites is based on the following criteria:

- Monitoring sites that have been monitored in the past and are therefore suitable for long-term trend analysis; these include sites
    - located just upstream/downstream of an international border,
    - located upstream of confluences between Danube and main tributaries or main tributaries and larger sub-tributaries (to enable estimation of mass balances),
    - located downstream of the major point sources,
    - located to control important water uses.

The existing monitoring sites of TNMN should be reviewed in light of the new requirements. Selection of sampling points will be based on the current TNMN monitoring sites. These will be reviewed by the countries in view of the altered objectives for pressure-specific monitoring as identified in the Danube Basin Analysis Report (WFD Report 2004). Any changes will be reported to the ICPDR. The number of sampling sites should be in the order of about 100 sites and should include selected sites from the Black Sea coastal catchments.

- Sites required to estimate pollutant loads (e.g. of nutrients or priority pollutants) which are transferred across bounders of Contracting Parties, and which are transferred into the marine environment.

The sites should be located in particular on the large primary or secondary tributaries of the Danube near crossing boundaries of the Contracting Parties. A review of the location and density of monitoring sites with respect to needed data on pressures of basin-wide importance is intended in the future (see Chapter 9). A list of monitoring sites is attached in **Annex 3**.

5.1.2.3. Selection of quality elements

The physico-chemical determinands and biological quality elements will be selected based on the current monitoring of TNMN and the monitoring needs of the WFD.

The collected data and assessments will be site-specific, not water body specific. The monitoring programme will be designed in a way in order to allow nutrient modelling with the transnational "Danube Water Quality Model".

The monitoring programmes will address the pressures of basin-wide importance identified in the Danube Basin Analysis Report (Part A):

- Organic pollution;
- Nutrient pollution;
- Hazardous substances;
- Hydromorphological parameters (site-specific only).

5.1.2.4. Frequency of monitoring

It seems reasonable to increase for selected quality elements the surveillance frequency of the monitoring cycle within the TNMN in order to provide a sound picture on the status of the basin. The sampling frequency used in TNMN at present enables to preserve the current level of long-term considerations and trend assumptions, as well as to maintain current statistical confidence interval. Continuing the operation of TNMN on an annual basis would result to achievement of a sound and stable overview on the status of surface waters in the Danube River Basin. Depending on the specific quality elements an "increase" in sampling frequency may be the maintenance of the current sampling frequency. This could be convenient for basic chemical determinands such as BOD or nutrients and maybe for macrozoobenthos. For other quality elements (e.g. some priority substances) the frequency prescribed by the WFD might be sufficient.

A list of the selected quality elements and monitoring frequencies is in **Annex 4**.

5.1.2.5. Use of Joint Danube Surveys for surveillance monitoring

In some cases on the international level it also might be acceptable to have one sample in a six-year-cycle like it is achieved by a Joint Danube Survey. The selection of quality elements for which the annual frequency would be applied should be done after an individual assessment of elements given in WFD Annex V, 1.3.4. Joint Danube Surveys could support regular monitoring every 6 years of the Danube River (and the mouths of the major tributaries). Monitoring during JDS could cover

- Hazardous substances;
- Hydromorphological parameters;
- Phytoplankton, phytobenthos, macrophytes, macrozoobenthos and fish.

5.1.3. Operational monitoring of surface water status

The design of operational monitoring is based on WFD Annex V, 1.3.2. and will be carried out at the national level.

5.1.3.1. Objective

Operational monitoring will be undertaken in order to

- Establish the status of those bodies identified as being at risk of failing to meet their environmental objectives, and
- assess any changes in the status of such bodies resulting from the programmes of measures.

5.1.3.2. Selection of monitoring sites

Operational monitoring has to be undertaken for all water bodies that have been identified as being at risk of failing the relevant environmental objectives under Article 4 (review of the environmental impact of human activities (Annex II) and/or from the results of the surveillance monitoring). Monitoring must also be carried out for all bodies into which priority substances are discharged.

The operational monitoring, however, has certain specificity; it is focused only on relevant parameters (i.e. indicating risk of failure) and it expires once a good status was achieved. On the other hand, new monitoring sites may become necessary when new pressures arise so that water bodies are no longer in the good status. EU Member States can amend their operational monitoring programmes during the duration of a River Basin Management Plan where an impact is found not to be significant or the relevant pressure is removed, and the ecological status is no longer less than good.

Another issue of concern is the number of sampling points. Even though the Directive allows similar water bodies to be grouped and representatively monitored, the number of sites will be much higher than that for the surveillance monitoring (provided all water bodies covered in the Roof report 2004 are included). At this point the cost/benefit factor arises as well.

A list of monitoring sites is attached in **Annex 5**.

5.1.3.3. Selection of quality elements

The selection of parameters for the operational monitoring is individual for a particular sampling site that represents an affected water body.

5.1.3.4. Frequency of monitoring

The sampling frequency is not constant as this monitoring is expected to be operational only for a limited time. Therefore, the overall outgoing information from an operational monitoring on a basin-wide level will be variable in time and space and its structure would not fit very well with the proposed frame for the surveillance TNMN focused on the long-term perspectives.

For these reasons it is not possible to define the needs for operational monitoring any further. The details of implementing operational monitoring are therefore strictly a national task. Overview of methods and sampling frequencies used for the operational monitoring at a national level is in **Annex 6.**

In the frame of the TNMN the following data will be collected for the water bodies defined for the basin-wide overview (Part A) (for definition see chapter 4.2.2):

- Geometry of water bodies at risk (GIS data);
- Surface water status (ecological status/ecological potential and chemical status);
- Reason for water body being at risk (identified in one of the following pressure categories: organic pollution, nutrient pollution, hazardous substances, hydromorphological alterations).

In general, there will be no collection of data on individual parameters (chemical determinands or biological quality elements) unless the need arises, e.g. for the preparation of thematic maps.

5.1.4. Investigative monitoring

Investigative monitoring will primarily be a national task. At the basin-wide level Joint Danube Surveys will be used to carry out investigative monitoring as needed, e.g. for testing new methods, checking the impact of "new" chemical substances and so on. Joint Danube Surveys will be carried out every 6 years.

The ICPDR will make use of cooperations with research and development projects in the Danube region in order to minimise the efforts and maximise the benefits.

In addition, the Accident Emergency Warning System (AEWS) of the ICPDR might trigger investigative monitoring either at the national or international level as this was the case e.g. for the Baia Mare and Baia Borsa accidents in the Tisza River. The ICPDR has also set up an inventory of old contaminated sites in potentially flooded areas. This inventory is also an important source of information for the assessment of possible risks in the event of floods.

5.2. Groundwater

The detailed description of the current status in development of the groundwater monitoring network in the Danube River Basin District is given in the TNMN Groundwater monitoring report (a separate document – Part II of the Summary Report to EU on monitoring programmes in the Danube River Basin District designed under Article 8).

6. Comparability of monitoring results

6.1. Analytical quality control

6.1.1. Analytical methodologies

The analytical methodologies for the determinands applied in TNMN are based on a list containing reference and optional analytical methods. The National Reference Laboratories (NRLs) have been provided with a set of ISO standards (reference methods) reflecting the determinand lists, but taking into account the current practice in environmental analytical methodology in the EU it has been decided not to require each laboratory to use the same method, providing the laboratory would be able to demonstrate that the method in use meets the required performance criteria. Therefore, the minimum concentrations expected and the tolerance required of actual measurements have been

defined for each determinand, in order to enable laboratories to determine whether the analytical methods currently in use are acceptable.

To ensure the quality of the TNMN data an inter-laboratory comparison exercise has been organized regularly each year since 1992. At present, the National Reference Laboratories and other national laboratories taking part in the monitoring activities of the TNMN, as well as laboratories responsible for pollution monitoring in the Black Sea area, participate in the QualcoDanube proficiency testing organized by VITUKI in Hungary.

Along with the upgrade of TNMN also the AQC programme has been revised. The MLIM EG agreed that each determinand relevant to the TNMN should be analyzed in the frame of the inter-laboratory comparison study at least once a year and the concentration ranges should be at surface water levels in both the water and the sediment performance testing samples. It is expected that all determinands can be covered during three quarterly distributions and the fourth distribution can be reserved for those matrix/determinands which showed more than 30 % flagged results.

Furthermore, the possibility of incorporation of biological determinands into AQC programme is under consideration. Although the TNMN biological method - Saprobic Index based on macrozoobenthos - is not fully WFD compliant, some steps (identification of organisms, quantitative evaluation and Saprobic Index calculation) can be included into the AQC programme.

The following proposed performance testing scheme is limited to the parameters which are required by the WFD and listed in the upgraded TNMN.

6.1.2. Distribution of the performance testing check samples

The quarterly distribution of the check samples will be continued as follows:

- During the 1st, 2nd and 3rd quarter of the year, water samples and/or synthetic concentrates will be distributed, two concentration levels (surface water) for each determinand (N.B.: to ensure evaluation of the results the Youden-pair method is used). The determinands for the three distributions are selected in such a way that ensures the full coverage, at least once, of the determinands on the TNMN determinand lists.
- Sediment samples are distributed during the 2nd and 3rd quarter.
- Based on the results obtained during the 1st, 2nd and 3rd quarter distribution, matrix/determinands are redistributed during the 4th quarter for those determinands, which showed unacceptable results, i.e., double-flagged, at least in 15 % of the participating laboratories.

The matrix/determinands for the 4th quarter distribution will be identified on the basis of the evaluation, interpretation of the results of the 1st, 2nd and 3rd quarters.

If the majority of the laboratories report acceptable results during the 1st, 2nd and 3rd distributions, than there are two options: (1) abort the 4th distribution, and (2) the matrix/ determinands for the 4th distribution will be selected on the basis of the monitoring results in the TNMN, e.g. those determinands which showed the highest contamination levels among the nutrients and specific pollutants, which could be selected from the ICPDR List of Priority Pollutants. Which option will be followed is decided by the Monitoring and Assessment Expert Group.

6.1.3. Matrices, determinands and concentration levels

Up to 2004, distribution of the QualcoDanube AQC programme included distribution of synthetic concentrates representing surface water and wastewater contamination levels and were limited to selected determinands. It was also practiced that the same determinand was distributed more than once during the fourth distribution during the year.

As already mentioned, the AQC check samples during the next distributions should be as similar as possible to the samples collected and analysed during the implementation of the upgraded TNMN. Accordingly, the best approach is to distribute real-world samples. Although this approach has been partly followed in the past, it will be also practical to distribute synthetic concentrates representing surface water concentration levels only. As new analytes, i.e. specific pollutants, are added to the AQC performance testing schemes, the relevant analytical methodology will be specified.

Biological samples are based on real river samples from the spring season. The AQEM sampling method will be used and sub-samples will be prepared and preserved.

According to the new principles, each determinand will be "intercalibrated" at least once during each year. This approach will be followed for both the water and the sediment samples.

Although the distribution programme can be slightly modified (due to practical reasons) the following distribution pattern is recommended:

- During the 1st distribution:
    - General parameters, nutrients, aggregate parameters, e.g. COD, TOC, AOX, detergents, etc., in synthetic concentrates, surface water;
- During the 2nd distribution:
    - Heavy metals, petroleum hydrocarbons in synthetic concentrates, surface water;
    - Total-N, Total-P and heavy metals in sediment;
- During the 3rd distribution:
    - Trace organic pollutants in synthetic concentrates, surface water;
    - Trace organic pollutants, i.e., chlorinated hydrocarbons, PAHs, in sediment; samples of macrozoobenthos;
- During the 4th distribution:
    - Specified according to the approach described in section 6.1.2.

6.1.4. Evaluation of the performance testing

As it is expected that each TNMN determinand will be analyzed once in a distribution during the 1st, 2nd or 3rd quarter, therefore it is important that the results are evaluated at the end of each distribution and the results are communicated to the laboratories.

Information on the matrix/determinands for the 4th distribution is provided after evaluation of the results of the 3rd distribution.

At the end of the yearly distributions, an Annual AQC Report is prepared.

6.2. EU Intercalibration of ecological status assessments

Comparability of biological monitoring results will be ensured via an intercalibration process organized in line with the WFD. The CIS WG2A Ecological Status (ECOSTAT) is coordinating the overall intercalibration exercise. The ICPDR is the coordinator for the Eastern Continental Geographical Intercalibration Group (EC GIG). The common intercalibration types for the Eastern Continental GIG have been developed and agreed by the Drafting Group on Typology and Intercalibration of the Monitoring, Laboratory and Information Management Expert Group (MLIM

EG) of the ICPDR. The Eastern Continental Intercalibration Group includes (parts of) Austria (AT), Czech Republic (CZ), Slovak Republic (SK), Hungary (HU), Romania (RO) and Bulgaria (BG).

6.2.1. Common intercalibration types

In the Eastern Continental GIG five common river intercalibration types were defined based on the typological factors ecoregion, catchment area, altitude, geology and channel substrate (see Table 2).

Table 2 Common intercalibration types in the Eastern Continental GIG

IC-type	name of type	coregion no.	catchment size [km²]	altitude [m]	type of geology	substrate	participating countries
R-E1	Carpathians: small to medium, mid-altitude	10	10 - 1000	500 - 800	siliceous	gravel and boulder	CZ, SK, HU, RO
R-E2	Plains: medium-sized, lowland	11 and 12	100 - 1000	< 200	mixed	sand and silt	RO, SK, HU
R-E3	Plains: large and very large, lowland	11 and 12	> 1000	< 200	mixed	sand, silt and gravel	BG, HU
R-E4	Plains: medium-sized, mid-altitude	11 and 12	100 - 1000	200-500	mixed	sand and gravel	AT, HU, SK, RO
R-E6	Danube River: middle and downstream	11 and 12	> 131000	< 134	mixed	gravel and sand	AT, SK, HU, RO, BG

Within the 2005/2006 Eastern Continental GIG intercalibration exercise national assessment methods using benthic invertebrates are intercalibrated. The exercise includes the pressures: organic and nutrient pollution, and hydromorphological degradation. Both biological quality parameters, macrophytes and phytobenthos will be intercalibrated for the WFD compliant assessment methods of Austria and Slovakia by May 2007. Table 3 specifies the number of sites and samples involved in intercalibration per country and intercalibration type (except R-E6). For R-E6 (Danube River) Austria, Slovak Republic, Hungary, Romania and Bulgaria took part in intercalibration.

Table 3 Number of sites and samples per country and common intercalibration type used in the EC GIG intercalibration exercise. R-E6 data include respectively 50 and 16 sites from the JDS and AQUATERRA projects.

IC type abbreviation	IC type	country	number of sites	number of samples
R-E1	Carpathians: small to medium, mid-altitude	Czech Republic	12	21
		Hungary	18	44
		Romania	52	142
		Slovak Republic	39	103
R-E2	Plains: medium-sized, lowland	Hungary	95	115
		Romania	24	41
		Slovak Republic	11	23
R-E3	Plains: large and very large, lowland	Bulgaria	32	63
		Hungary	189	231
R-E4	Plains: medium-sized, mid-altitude	Austria	46	58
		Hungary	43	76
		Romania	18	47
		Slovak Republic	18	37
R-E6	Danube River: middle and downstream	Austria	25	57

		Bulgaria	6	10
		Hungary	30	52
		Romania	34	58
		Slovak Republic	18	31

6.2.2. General intercalibration approach

6.2.2.1. Small to very large river types: R-E1, 2, 3, 4

Within the intercalibration exercise the definition of reference conditions is of major importance for the comparison of national quality assessment methods. In this regard, two problems are obvious in the Eastern Continental GIG: Either existing reference sites are not available (esp. lowland types) or reference criteria to screen for existing reference sites differ among countries.

Therefore, the EC GIG agreed to follow an alternative approach to resolve these issues by defining IC type specific, harmonised quality criteria. In general, the GIG set common high-good (R-E1) respectively good-moderate (R-E2-4) quality class boundaries for the national biological assessment methods using existing data assembled within the EC GIG intercalibration exercise. The main idea of using this approach is to overcome the difficulties of lacking (near-natural) references by defining alternative references. . The EC GIG countries commonly agreed on a specific level of impairment, which is acceptable for alternative references. The available data sets have been screened by defined threshold values of selected biotic and abiotic criteria.

This practical approach comprises two steps outlined below:

Step 1: Harmonised definition of quality criteria/thresholds for the high and good ecological status

Based on criteria for saprobiological quality - commonly agreed for monitoring purposes in the Danube River Basin - biological threshold values are derived using the common metric ASPT (Average Score Per Taxon). Sites with samples showing ASPT values above these thresholds (=better values) are screened by additional chemical, morphological and land use parameters. The set of sites complying with all criteria/thresholds are regarded as of being in a commonly agreed, ecologically high (R-1) respectively high and good status (R-E 2, 3, 4). .

Step 2: Class boundary setting based on 25th percentile value of common metrics using all sampling sites meeting the criteria defined in section A

The ecological quality class boundaries are expressed on an ICMi-EC scale – Intercalibration Common Metric Index for the Easter Continental Region to comply with the normative definitions of the WFD. These boundaries are derived by selecting the 25th percentile values of each common metric from the set of sites in high respectively high and good status. By means of regression analysis the boundary values are translated into values of the national assessment method (= final result).

6.2.2.2. Danube River: R-E6

Biological assessment of the Danube River based on the benthic macroinvertebrate community is limited to the application of Saprobic Systems or Biotic Indices to evaluate the degree of organic water pollution. So far, the ecological quality/status of the Danube River using benthic macroinvertebrates is assessed by classification method, which is not WFD compliant. The development of WFD compliant methods for large rivers is a European wide challenge and is underway. Therefore, the intercalibration exercise performed for the Danube River (R-E6) focused on

the comparison of national methods, which have been used in regular water quality monitoring of the Danube River.

Note: The results of Joint Danube Survey 2 will contribute to the improvement of the intercalibration results of the Danube River. As soon as the results will be available the respective analysis will be performed.

6.2.2.3. Activities within other GIGs in the Danube River Basin

Europe wide the intercalibration exercise for rivers has been performed by five Geographical Intercalibration Groups (GIGs): Alpine GIG, Central/Baltic GIG, Eastern Continental GIG, Mediterranean GIG and Northern GIG. Further GIGs have been established for the intercalibration of lakes and coastal waters. All river GIGs delivered intercalibration results for the biological quality element macroinvertebrates by the end of 2006. However, as of mid 2007 the GIGs – icluding the Easter Continental – will supplement their intercalibration results regarding the other biological quality elements as far as possible. The continuation of the intercalibration exercise beyond 2007, will serve the filling of still existing gaps and enable the improvement of the current results for all GIGs.

7. Presentation of monitoring results

As in the past, data from TNMN (monitoring of specific pressures, SM2) will be presented in maps giving point information, while the results on ecological status and chemical status will give information related to the water body.

It is intended to prepare the maps listed in the CIS GIS Guidance document (see Table 4), subject to change if there are new developments. For both kinds of maps it is proposed to use the design of the WFD Roof Report maps.

Table 4 List of maps for reporting on monitoring and assessment results

Map content / name	WFD reporting (RBM plans)	ICPDR reports
Upgraded TNMN		**TNMN reporting (yearbook)**
WFD requirements (according to CIS GIS Guidance document)		
Surface water bodies of basin-wide importance including artificial and heavily modified water bodies (GIS Map No. 3)	x	
Important transboundary groundwater bodies of basin-wide importance	x	

Map content / name	WFD reporting (RBM plans)	ICPDR reports
(GIS Map No. 5)		
TNMN Monitoring sites on surface waters • surveillance monitoring sites • operational monitoring sites (including sites for habitat and species protected areas if relevant at the basin-wide scale) • investigative monitoring sites (JDS) (GIS Map No. 6)	x x x	x
TNMN Monitoring sites on groundwater • groundwater level monitoring sites • surveillance monitoring sites for chemical status • operational monitoring sites for chemical status (GIS Map No. 10)	x x x	
Ecological status / ecological potential of surface water bodies of basin-wide importance (including bad status or bad potential caused by (non-)synthetic pollutants) (GIS Map No. 7)	x	(x)
Chemical status of surface water bodies of basin-wide importance (GIS Map No. 8)	x	(x)
Status of important transboundary groundwater bodies • quantitative status • chemical status • pollutant trend (GIS Map No. 9)	x	(x)
Additional (traditional) maps of ICPDR:		
Monitoring sites of TNMN	-	merged with GIS Map No. 6
Monitoring results of selected determinands and biological quality elements of TNMN (see current list; to be reviewed)	(x)	x
JOINT DANUBE SURVEYS		JDS reporting
Monitoring sites of Joint Danube Survey	-	merged with GIS Map No. 6

Map content / name	WFD reporting (RBM plans)	ICPDR reports
Monitoring results of selected determinands of JDS (list to be determined)	(x)	x
ACCIDENT EMERGENCY WARNING SYSTEM		AEWS reporting
Map of PIACs* for Accident Emergency Warning System	(x)	x

*Principle International Alert Centers

Maps for monitoring sites on drinking water abstraction points from surface water (as referred to in GIS Map No. 6 of the GIS Guidance document) will not be dealt with at the basin-wide level, but must be included in the national reports.

Location and status of protected areas (as referred to in GIS Map No. 11 and 12 of the GIS Guidance document) will not be dealt with at the basin-wide level with the exception of water bodies in protected areas for species and habitat protection situated on the river network defined as basin-wide importance (i.e. on rivers > 4000 km²). This information will not be part of the Roof Report / Roof RBM Plan, but must be included in the national reports (national RBM Plans).

8. Reporting on results

8.1. Reporting to ICPDR

All data reported to ICPDR will be integrated in the ICPDR databases. The major tool for this purpose will be the Danube GIS as soon as it is ready for integration of such data. The interoperability with the European Information System on Water (WISE) is foreseen through the work of the Ad hoc Information Management and GIS Expert Group of the ICPDR.

The monitoring results will be used to prepare the annual TNMN Yearbooks as well as the Annual Reports, which include a chapter on water quality in the Danube River Basin.

8.2. Reporting to ICPBS

In reference to the Memorandum of Understanding between the ICPDR and the Black Sea Commission, there is a regular exchange of information on Danube loads vs. the quality of the Black Sea foreseen. The technical supervision of this process is performed by the Danube-Black Sea Joint Technical Working Group (DBS JTWG).

For future reporting to the DBS JTWG, the ICPDR agreed to include all parameters proposed by the Black Sea Commission into the TNMN load assessment programme starting from 2005 (only for the sampling site Reni). These parameters are as follows: Suspended solids, $N\text{-}NH_4$, $N\text{-}NO_3$, $N\text{-}NO_2$, N-inorg, N-org, N-total, $P\text{-}PO_4$, P-total, BOD_5, Cd, Cu, Pb, Hg, Silicates.

8.3. Reporting to the European Commission

According to Art. 15.2. WFD Member States shall submit summary reports of the monitoring programmes designed under Article 8 undertaken for the purposes of the first river basin management plan within three months of their completion. The monitoring programmes must be operational by the end of 2006.

Due to the large number of states and the coordination requirements in the DRBD the reports to the European Commission on Art. 8 WFD have been divided into two parts. Part A (Roof Report on ICPDR international monitoring programmes) gives the basin-wide overview; Part B (National Reports on national monitoring programmes) gives all relevant further information on the national level as well as information coordinated on the bilateral level (see Figure 1).

Each EU Member State will send the Roof Report (Part A) together with its own National Report (Part B) to the European Commission.

This first report on monitoring for fulfilling the requirements of Art. 8 WFD, which is due 22 March 2007, is divided in

- Part A, Summary of basin-wide monitoring programmes, and
- Part B, national report.

The Roof Report (Part A) has been prepared by the ICPDR. The report has two integral parts describing monitoring networks for surface and groundwaters. The description of surface water monitoring network consists of:

- Strategy for the development of WFD compliant monitoring programmes for the Danube River Basin District (this document)
- Annexes to the Strategy paper containing a summary from the UNDP/GEF report showing the list of monitoring sites, parameters, frequencies and analytical methods for the surface water monitoring networks
- Map of the surface water monitoring network in the Danube River Basin District

The description of the groundwater monitoring network consists of:

- Groundwater Monitoring Report (status report)
- Annexes to the report containing the description of monitoring sites, parameters, frequencies and analytical methods for the groundwater monitoring networks as well as a detailed characterization of the monitoring programmes and the network design in particular groundwater bodies.
- Map of the groundwater monitoring network in the Danube River Basin District

9. Outlook on future needs

The design of the monitoring networks in the Danube River Basin District, which have to be operable by 22 December 2006, is based on the provisions of the EU WFD and on the principles given in the WFD CIS Monitoring Guidance. The ICPDR Contracting Parties took their best efforts in

development of joint monitoring programmes under the ICPDR (Transnational Monitoring Network, TNMN) to be compliant with the EU WFD.

The current design, however, will undergo periodic revisions with the view of adjusting the monitoring structure and variables to get optimal information which is fit for purpose. This is in line with one of the specific objectives of the TNMN (see 4.1) to serve for an efficient and effective design of future monitoring programmes. In future, the results of TNMN may be reviewed and used, in combination with the risk assessment described in WFD, Annex II, to determine requirements for monitoring programmes in the future River Basin Management Plans.

The priority areas of future exploration with the aim of improving the monitoring networks in the Danube River Basin District are defined as follows:

9.1. Update & review water bodies

The feedback received from the results of the monitoring programmes as well as from the risk assessment may lead to considerations on revising the currently delineated water bodies both at the national and international level. The changes in the delineation may then result in changes in the selection of monitoring sites.

9.2. Review density of monitoring networks for overview

The principles for selecting the density of monitoring networks for both types of the surveillance monitoring described in chapter 5.1 are considered as a best compromise between sufficient quantity of information and the needed capacities & costs. The assessment of the results from both SM 1 and SM 2 will reveal the appropriateness of the current network set-up and will highlight the gaps in data acquisition caused by the insufficient number of TNMN monitoring sites.

9.3. Review data collection for SM1 and OM and its sufficiency for getting correct overview

Those parts of TNMN based on collection of aggregated data have to be periodically reviewed as to the adequateness of the collected information on the water status for its utilization in the future River Basin Management Plans.

9.4. Review SM2 for possible refinement

The Surveillance Monitoring of Specific Pressures is a joint monitoring exercise under the ICPDR and its ambition is to continue with a long-term data collection on relevant quality elements. Due to its high frequency (annual exercise with 12 or 26 samplings per year) the selection of determinands was limited to the most relevant ones. Future reviews of SM 2 should reveal the needs for its revision leading to an increase (or reduction) of the number of determinants or the frequencies of sampling as well as a review of the monitoring sites needed to detect changes in pressures of basin-wide importance.

9.5. Develop further guidance on definition of confidence and precision

Monitoring Guidance explains that choosing levels of precision and confidence would set limits on how much uncertainty (arising from natural and anthropogenic variability) can be tolerated in the results of monitoring programmes. In terms of monitoring for the Directive, it will be necessary to estimate the status of water bodies and in particular to identify those that are not of 'good' status or good ecological potential or are deteriorating in status. Thus, status will have to be estimated from the sampled data. This estimate will almost always differ from the true value (i.e. the status which would be calculated if all water bodies were monitored and sampled continuously for all components that define quality). The level of acceptable risk will affect the amount of monitoring required to estimate a water body's status. In general terms, the lower the desired risk of misclassification, the more monitoring (and hence costs) required to assess the status of a water body. The Directive has not specified the levels of precision and confidence required from monitoring programmes and status assessments. At present, the issues on confidence and precision of biological monitoring are dealt with within the EU intercalibration exercise under the ECOSTAT Working Group. To assure the confidence and precision of chemical measurements is the major task of the ongoing WFD Chemical Monitoring Activity (CMA). TNMN will use the results from both these processes to develop further guidance on definition of confidence and precision and to increase the data comparability in future.

9.6. Explore possibilities for joint monitoring of hydromorphological elements

The present design of the Surveillance Monitoring of Specific Pressures does not include the measurement of the hydromorphological elements; they are included in SM 1 and in the operational monitoring. The results of the hydromorphological analyses obtained from the second Joint Danube Survey planned for summer 2007 will lead to reconsideration of the necessity to perform the joint monitoring of hydromorphological elements within SM 2.

9.7. Explore possibilities for merging EIONET and TNMN Networks

The current efforts of EC and EEA aim for a shared pool of common and timely data and information on the state of, and pressures on, Europe's water (WISE = Water Information System for Europe) that meets the needs of all those organisations requiring to report and make assessments at the European level. In the past, EUROWATERNET (EIONET-water) was developed and implemented to provide much of the data and information on the state and trends of Europe's waters needed by the EEA. Currently, the ICPDR Contracting Parties report water quality data to the EUROWATERNET separately from the TNMN reporting.

It is now recognised by Member States, the European Commission, the EEA and other bodies with a stake in reporting procedures that there is a need for "streamlining" the reporting process, gathering more useful and relevant information and making the exchange process as efficient as possible using modern technology.

The ultimate aim of the new proposed information system is to get a true appreciation of the real situation of the environment at the European level and to facilitate the use of information supplied for the legal obligations of compliance checking for use in other environmental reporting systems. This will be achieved through transparent and manageable procedures where data quality, treatment, delivery, access and use are clearly addressed. The scheme also indicates where the responsibilities of the Commission and Member States lie. Ultimately, proper sharing of information should lead to Member States being able to operate consolidated monitoring programmes that can provide the correct data and information for a number of different purposes, including those of the Member States themselves.

The European Commission (DG ENV, Eurostat and JRC) and the EEA are committed to continue the development of a new, comprehensive and shared European data and information management system for water, including river basins, following a participatory approach towards the Member States, in order to have it operational as soon as possible and to implement it, including all the various elements set out in this document, by 2010.

Current situation regarding the overlap of monitoring points between TNMN and EIONET-Water was assessed within the UNDP-GEF Danube Regional Project. The report on "Harmonisation and streamlining the ICPDR reporting and information collection needs in line with the EU directives and national obligations" compared the current TNMN stations with those stations included in the EEA's EIONET-Water system. It was found that of the 124 TNMN stations, 62 are also included in EIONET-Water, 31 are not, and there are 31 stations where the location is included in EIONET-Water but not including all the stations at that location (e.g. where there are three stations across the river at a location, EIONET-Water may only have one of the three). There are also 669 stations in the Danube catchment included in EIONET-Water and potentially another 37 stations, which would need their exact location checked against the geographic limits of the Danube catchment.

There will have to be future efforts of the ICPDR to avoid reporting from different networks on the same issues and to explore the possibilities of merging the data flows to TNMN and WISE.

9.8. Explore possibility to address climate change

The impact of the climate change on the character of the hydrosphere and the related processes is frequently emphasized. The imposed changes in the water balance may lead to severe alterations of the status of surface and groundwaters. The appropriate indicators of such processes may be considered for adoption into TNMN in future.

10. Summary

This document reviews monitoring requirements of the Water Framework Directive and describes the design of the future EU WFD compliant monitoring programmes in the Danube River Basin District (so called Transnational Monitoring Network, TNMN).

The major objective of the 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.

In the focus of TNMN are the surface waters and groundwater 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:

	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

10.1. Surveillance monitoring I: Monitoring of surface water status

The design of surveillance monitoring I (SM 1) is based on WFD Annex V, 1.3.1. The monitoring network is based on the national surveillance monitoring networks and the operating conditions are harmonized between the national and basin-wide levels to minimise the efforts and maximise the benefits. Surveillance monitoring will be carried out to provide an assessment of the overall surface water status in the Danube River Basin District. The monitoring sites were selected primarily using a criterion of rate of water flow being significant within the river basin district as a whole; each river shown in the Danube River Basin District overview map shall have at least one monitoring site:

- Rivers with catchments of 4000 km² < x < 8000 km² shall have one surveillance monitoring site;
- Rivers with catchments > 8000 km² shall include one monitoring point per 8000 km²;
- The Danube River shall have at least one monitoring site in each Danube river section type.

The selection of quality elements results from the requirements for surveillance monitoring as defined in Annex V, 1.3.1. WFD. Surveillance monitoring I will be carried out for each monitoring site for a period of one year during the period covered by a river basin management plan for all quality elements.

10.2. Surveillance Monitoring II: Monitoring of specific pressures

Surveillance Monitoring II (SM 2) is supplementary to Surveillance Monitoring I and aims at monitoring of specific pressures of basin-wide importance[6]. Selected quality elements or specific determinands will be monitored at higher frequencies than in Surveillance Monitoring I while other quality elements will not be monitored at all. A denser monitoring programme is needed on specific

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

[6] This monitoring programme has somewhat the character of operational monitoring sensu WFD, since it is geared to monitor specific pressures and trends. On the other hand it is conceived as a long-term monitoring scheme (in general no dropping of sites as is foreseen for operational monitoring of WFD). It is, therefore, classified as pressure-specific surveillance monitoring.

pressures in the Danube River Basin District in order to allow a sound and stable long-term trend assessment of specific pollutants and to achieve a sound estimation of pollutant loads being transferred across states of Contracting Parties and into the Black Sea.

Surveillance Monitoring II is based on the old TNMN and will be fitted to respond to the pressures of basin-wide importance identified the Danube Basin Analysis Report (Part A).

The monitoring network is based on the national monitoring networks and the operating conditions are harmonized between the national and basin-wide levels to minimise the efforts and maximise the benefits.

Surveillance monitoring of specific pressures will be carried out to provide an assessment of long-term trends of specific pollutants and a sound basis for estimating loads being transferred into the marine environment

Selection of sampling points was based on the current TNMN monitoring sites. These were reviewed by the countries in view of the altered objectives for pressure-specific monitoring as identified in the Danube Basin Analysis Report (WFD Report 2004).

The specific physico-chemical determinands and biological quality elements were selected based on the current monitoring of TNMN and the monitoring needs of the WFD. SM 2 keeps the annual frequency of the previous TNMN.

There will be joint collection of raw data under SM 2 produced at the national level using the harmonized sampling and analytical methods. An regular analytical quality assurance programme will ensure confidence & precision & accuracy & comparability of collected data.

10.3. Operational Monitoring

The design of operational monitoring is based on WFD Annex V, 1.3.2. and will be carried out at the national level. The operational monitoring will be undertaken in order to

- establish the status of those bodies identified as being at risk of failing to meet their environmental objectives, and
- assess any changes in the status of such bodies resulting from the programmes of measures.

Operational monitoring has to be undertaken for all water bodies that have been identified as being at risk of failing the relevant environmental objectives under Article 4 (review of the environmental impact of human activities (Annex II) and/or from the results of the surveillance monitoring). Monitoring will also be carried out for all bodies into which priority substances are discharged.

The selection of parameters for the operational monitoring is individual for a particular sampling site that represents an affected water body.

In the frame of the TNMN the following data will be collected for the water bodies defined for the basin-wide overview (Part A) (for definition see chapter 4.2.2):

- geometry of water bodies at risk (GIS data)
- surface water status (ecological status/ecological potential and chemical status)
- reason for water body being at risk (identified in one of the following pressure categories: organic pollution, nutrient pollution, hazardous substances, hydromorphological alterations)

In general, there will be no collection of data on individual parameters (chemical determinands or biological quality elements) unless the need arises, e.g. for the preparation of thematic maps.

10.4. Investigative monitoring

Investigative monitoring will primarily be a national task. At the basin-wide level Joint Danube Surveys will be used to carry out investigative monitoring as needed, e.g. for testing new methods, checking the impact of "new" chemical substances and so on. Joint Danube Surveys will be carried out every 6 years.