

Case study: Trans-National Monitoring Network: A transboundary long-term monitoring in the Danube River basin (#390)

Description

The Danube River basin shared by 18 countries has a long-standing history of international environmental cooperation. The first institutional framework for adopting common programmes and measures to protect water quality was established under the Bucharest Declaration in 1985. The Declaration had as one of its objectives to observe the development of water quality for the Danube river. In order to comply with this objective, a monitoring programme consisting of 11 cross-sections in upstream and downstream along the Danube River border crossings were established. The further development of the international strategy for the protection of the water resources in the Danube catchment area was based on the UNECE Convention on the Protection and Use of Transboundary Waters (Helsinki Convention). More so, the Convention on the Protection and Sustainable Use of the Danube River known as the Danube River Protection Convention (DRPC) was signed in June 1994 in Sofia. The DRPC entered into force in October 1998 and became the overall legal instrument for transboundary water management at Danube basin-wide level. In addition, the International Commission for the Protection of the Danube River (ICPDR) was legally established as the main decision making body under the DRPC. One of the main objectives of the DRPC is to achieve sustainable and equitable water management and this includes conservation, improvement and the rational use of surface and groundwater. In order to accomplish the objectives, the Danubian countries have taken appropriate legal, administrative and technical measures to at least maintain and improve the ecological and water quality conditions of the Danube River and water resources in its entire catchment area.

Action taken

The first steps towards joint water quality monitoring network in Danube River Basin (DRB) were taken when governments of the Danube countries signed the Bucharest Declaration in 1995. The monitoring network used for the purposes of the Declaration consisted of eleven monitoring locations along the Danube River itself where the river formed or crossed the border between the countries. In 1991 the Danube countries started preparations for the Convention on Cooperation for the Protection and sustainable use of the Danube River (DRPC), which was signed in 1994 in Sofia. The EU supported the Environmental Programme for the Danube River Basin (EPDRB) and a lead Task Force also started in 1991 with the main objective of strengthening the operational basis for environmental management in the DRB. The Contracting Parties committed to establish a joint monitoring system, agreed upon monitoring points sources of pollution, river quality characteristics and pollution parameters regularly to be evaluated for the Danube River and its main tributaries. A concern was also underlined regarding typical emissions of pollutants discharged within the respective catchment areas. In addition, the Parties periodically were to assess the quality conditions of Danube River and the progress made by their measures taken aiming at the prevention, control and reduction of transboundary impacts.

The Trans-National Monitoring Network of the Danube River Basin (TNMN) was designed in 1993 (under the project "Monitoring, Laboratory Analysis and Information Management for the Danube River Basin").

Lessons learned

Since its operation, TNMN is supported by a basin-wide network of National Reference Laboratories. The TNMN coordinates the entire monitoring activity at national levels and ensures the quality of the results of the analyses. However, the harmonization of working methods and improvement of data compatibility is still an ongoing process. A main lesson learnt is that a strong cooperation among all the involved parties is required. The results of the network implementation and operating activities are not a self-standing activity: on one hand, the TNMN data can be used in identification of possible weak points in the monitoring

programme. On the other hand it has to be mentioned that improvement of TNMN has to be strongly connected to continuous implementation of WFD. Other EU water related directives also entered in force in 2000 and after Danube countries agreed on their joint implementation in the river basin.

For tools C9.01, B1.02, B2.02

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References and websites

Water Quality in the Danube River Basin – Yearbooks 1996 – 2007

Five-year Report on Water Quality in Danube River Basin Based on Trans-National Monitoring Network 1996 – 2000

www.icpdr.org

The main text

Problems

The Danube River Basin which is shared by 18 countries has a long-standing history of international environmental cooperation. The first institutional framework for adopting common programmes and measures to protect water quality was established under the Bucharest Declaration in 1985. The Declaration had as one of its objectives to observe the development of water quality of the Danube. In order to comply with this objective, a monitoring programme consisting of 11 cross-sections in upstream and downstream along the Danube River border crossings were established. Later, a further development of the international strategy for the protection of the water resources in the Danube catchment area was established based on the UNECE Convention on the Protection and Use of Transboundary Waters (Helsinki Convention). More so, the Convention on the Protection and Sustainable Use of the Danube River also known as the Danube River Protection Convention (DRPC) was signed in June 1994 in Sofia.

The DRPC entered into force in October 1998 and became the overall legal instrument for transboundary water management at Danube basin-wide level. In addition, the International Commission for the Protection of the Danube River (ICPDR) was legally established as the main decision making body under the DRPC. One of the main objectives of the DRPC is to achieve sustainable and equitable water management and this includes conservation, improvement and the rational use of surface and groundwater. In order to accomplish the objectives, the Danubian countries have taken appropriate legal, administrative and technical measures to at least maintain and improve the ecological and water quality conditions of the Danube River and waters resources in its entire catchment area.

In order to appropriately assess the progress in improvement of environmental conditions of Danube River and its catchments and further assess the effectiveness of measures under taken, the role of information from water quality monitoring is essential. Therefore the DRPC has mandated the Contracting Parties to cooperate in the field of monitoring and assessment. To realise this aim, the parties are obliged to harmonise or make comparable their monitoring and assessment methods and also periodically assess the quality conditions of Danube River when evaluating the progress of the measures undertaken. For smooth implementation of the DRPC, the Joint Action Programme for the Danube River Basin (JAP) was prepared defining the integration of measures for improvement of the environment in the Danube River Basin. In relation to basin-wide cooperation in the field of monitoring, JAP has put emphasis on the necessity to prepare data in a comparative to serve as a reliable basis for decision making throughout the Basin.

Actions taken

Initial phases of the TNMN operation

The first steps towards joint water quality monitoring network in Danube River basin were taken when governments of the Danube countries signed the Bucharest Declaration in 1995. The monitoring network used for the purposes of the Declaration consisted of 11 monitoring locations along the Danube River where the river formed or

crossed the border between the countries. In 1991 the Danube countries started preparation for the Convention on Cooperation-Protection and sustainable use of the Danube River (DRPC), which was signed in 1994 in Sofia. The EU supported the Environmental Programme for the Danube River Basin (EPDRB) and a lead Task Force also started in 1991 with the main objective of strengthening the operational basis for environmental management in the Danube River Basin and further support the Danube countries to implement the DRPC. Regarding the monitoring programmes, it was stated in the Danube Convention that the Contracting Parties needed to cooperate in the field of monitoring and assessment.

To realize this aim, the countries were required to do the following:

- Harmonize or make comparable their monitoring and assessment methods, in particular in the field of water quality.
- Develop concerted or joint monitoring systems that apply stationary or mobile measurement devices, communication and data processing facilities.
- Elaborate and implement joint programmes for monitoring the riverine conditions in the entire Danube catchment area on both water quantity and quality with particular focus associated to loads transported in the water system, the sediments and riverine ecosystems, as a basis for the assessment of transboundary impacts.

Moreover, the Parties also agreed upon on issues related to the monitoring points, river quality characteristics and pollution parameters regularly to be evaluated for the Danube River and its main tributaries. This was to be done with sufficient frequency while taking into account the ecological and hydrological character of the watercourse. Concern was also underlined regarding typical emissions of pollutants discharged within the respective catchment areas. In addition, the Parties were periodically to assess the quality conditions of Danube River and the progress made by their measures taken aiming at the prevention, control and reduction of transboundary impacts.

Therefore, in 1992 the Task Force agreed a three-year Work Plan (1992-95) with monitoring, laboratories and information management for the main Programme actions. In 1992 the Monitoring, Laboratory and Information Management Sub-Group (MLIM-SG) was in charge of dealing with the issues. The main outcome of the three-year Work Plan was the Strategic Action Plan (SAP). Its approval marked the end of the first phase of the EPDRB (1992-95) and implementation was scheduled to start in the next phase (1996-2000). The Trans-National Monitoring Network of the Danube River Basin (TNMN) was originally designed in 1993 during the time of “Monitoring, Laboratory Analysis and Information Management project for the Danube River Basin”. It was conducted by the WTV Consortium and Danube countries experts in close cooperation with MLIM-SG. The responsibility for TNMN was assigned to MLIM-SG, which consisted of three Working Groups namely; Monitoring, Laboratory Management and Information Management Working Groups. The key roles of the MLIM-SG were mainly focused on:

- Addressing the development of water quality monitoring network in Danube River Basin (*Monitoring Working Group, M-WG*).
- Introducing harmonized sampling procedures and enhanced laboratory analysis capabilities (*Laboratory Management Working Group, LM-WG*).

- Forming the core of the Danube information system on the status of in-stream (immissions) water quality (*Information Management Working Group, IM-WG*).

The Working Groups worked with the implementation plan of the TNMN which was approved by the Task Force and the MLIM-SG. At the same time as the DRPC was signed, the ICPDR was also being established on interim basis allowing implementation at the time when the convention was pending entry into force. The Task Force of the EPDRB was invited to co-operate with the Interim ICPDR and its Secretariat to contribute to the effective implementation of the DRPC.

In 1996 and 1997 EU Phare Multi-Country Environmental Programme allocated substantial funds to EPDRB projects to support further development of the monitoring and assessment programme and the launch of TNMN into operation. More funds for the integration of Bosnia and Herzegovina were also planned while Moldova and Ukraine were joining MLIM projects. The EU funded program Tacis 1996 Cross-Border Environmental Cooperation allocated funds to support the MLIM activities in Moldova and Ukraine. The implementation of these projects significantly strengthened the activities of the ICPDR and also allowed the extension of TNMN in all the countries in the basins which agreed and sign the DRPC. After the entry of DRPC into force in October 1998, the MLIM-Expert Group was incorporated in the organizational structure of ICPDR and working on the basis of Terms of References (TORs) agreed in the ICPDR Plenary Meetings.

The objectives of Trans-National Monitoring Network (TNMN)

In its first phase of operation, the TNMN worked according to the objectives defined in the "EPDRB - Programme Work Plan". It was stated that the monitoring network for the Danube should:

- Strengthen the existing networks set up by the Bucharest Declaration.
- Be capable of supporting reliable and consistent trend analysis for concentrations and loads for selected pollutants.
- Support the assessment of water quality for water use.
- Assist in the identification of major pollution sources.
- Include sediment monitoring and bio-indicators.
- Provide quality control activities on regular basis in order to increase the quality and comparability of water quality data produced.

Specifically, the following were further defined:

- The monitoring network is to provide outputs compatible with those in other major international river basins in Europe.
- The monitoring network has to comply with standards used in Western Europe.
- The design is split into immediate and longer term needs, starting with practical and routine functions already performed.

The design, implementation and operation of the network were split into two phases. The first phase was seen as a period with a limited number of stations with defined objectives already included in the national monitoring networks according to defined

objectives. It further included things such as determinants lists reflecting the Bucharest Declaration and EU-Directives and an information management based on a simple Data Exchange File Format (DEFF) between the riparian countries. It was also decided that the second phase would be built upon experience gained through operation of the first phase and the organizational structures formed for discussion, planning, management procedures (Quality Assurance, Quality Control), training and applied research. The second phase has been planned to revise the number of stations, the sampling frequencies, the determinant list and the procedures for information exchange.

Principles of the Trans-National Monitoring Network (TNMN) design

The monitoring network in the frame of TNMN was based on the national surface water monitoring networks. Therefore, to select monitoring locations for the purposes of international monitoring network in Danube River Basin in relation to the above-mentioned TNMN objectives, the following concrete selection criteria for monitoring location were set up:

- Monitoring station located just upstream and downstream of an international border.
- Monitoring station located upstream of confluences between Danube and main tributaries or between main tributaries and larger sub-tributaries.
- Monitoring station located downstream of the biggest point sources.
- Monitoring station located according to control of water use for drinking water supply.

Monitoring locations included in TNMN were expected to meet at least one of the selection criteria. Information was obtained from Romania, Ukraine, Bulgaria, Croatia, Slovenia, Hungary, Slovakia and the Czech Republic, Austria and Germany among the countries included in the first design round. The information highlighted detailed description of nearly 200 monitoring stations located along the Danube River and its tributaries following the guidelines established in the above mentioned criteria.

Originally 44 of the monitoring stations were selected to be included in the TNMN. Further discussion led to an increased in the number of stations to 61 in Phase 1. In 2001 the monitoring stations from other former Yugoslavia countries were added extending the monitoring network and filling the gap in water quality data in the middle part of the Danube River and the corresponding tributaries. The final list of stations reached 78 monitoring locations. Figure 1 shows the station map.

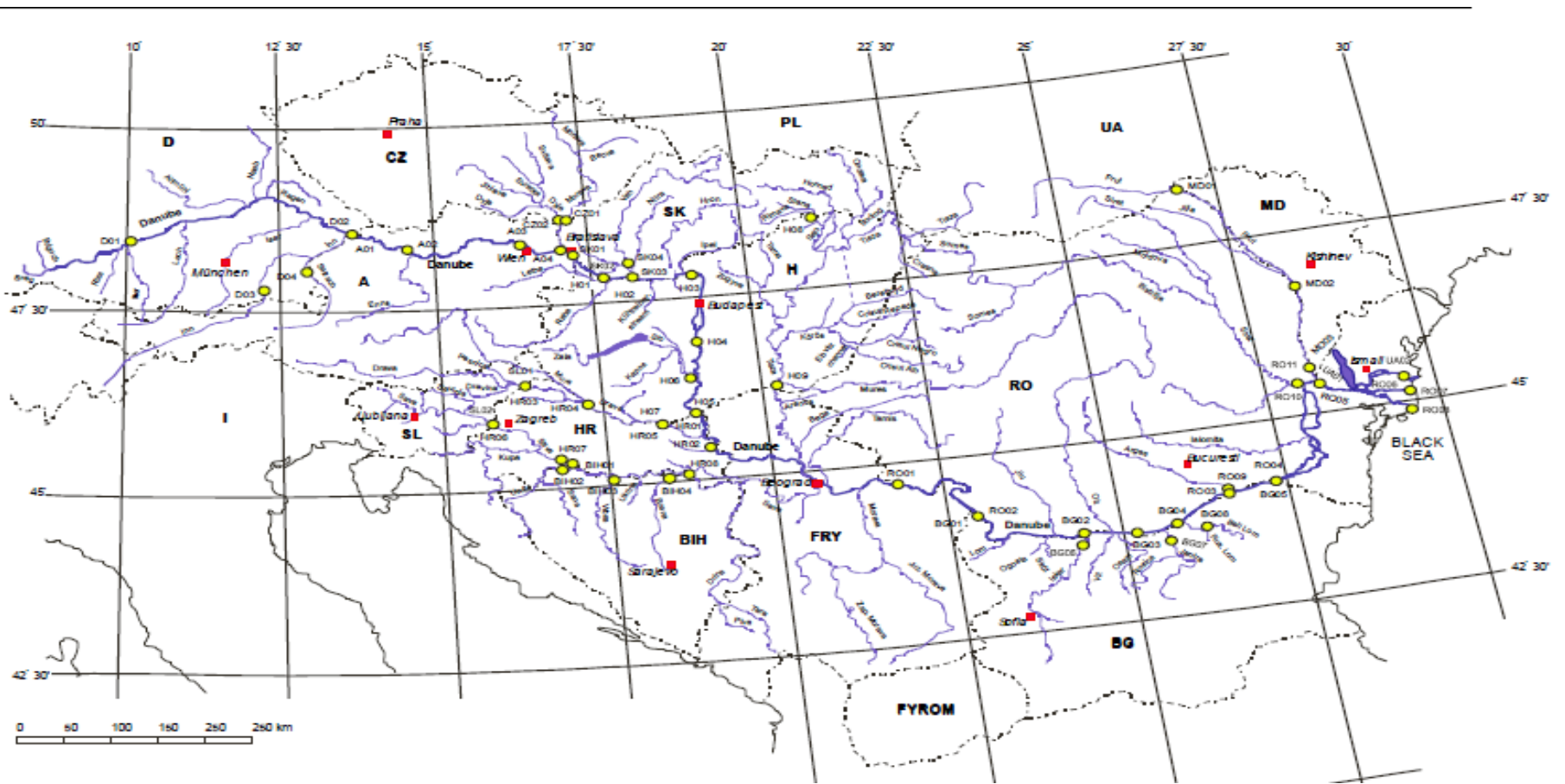


Figure 1: The Danube station map TNMN – Phase 1 (www.icpdr.org)

The determinants list was based on the list from the Bucharest Declaration extended with determinants recommended according to EU water directives and the riparian country's own demand. The list was divided into 10 groups, each group given a sampling frequency according to the different locations as mentioned earlier. Furthermore, the number of sampling points were specified (Left, Middle, Right) in each station included. This together with allocation of determinant groups and sampling frequencies provided a full definition of each of the stations. Following the discussions in the Working Groups during the implementation phase a more simple approach was adopted and therefore the determinants list was reduced. All stations were given the same minimum sampling frequency of 12 per year for determinants in water and 2 per year for bio-monitoring and for determinants in sediment. In addition, sampling and analysis were carried out on the national level while maintaining the agreed quality system for all monitoring stations.

In 2003, data from the monitoring locations from Bosnia and Herzegovina were provided to the TNMN database for the first time. This expanded the coverage of the network and increased the number of locations to 76 (105 sampling sites) distributed as follows: 38 monitoring stations (65 sampling sites) located on the Danube River itself and 38 monitoring stations (40 sampling sites) in major tributaries.

Trans-National Monitoring Network (TNMN) data management

The primary aim of the TNMN data management was to transform raw data to synthetic information to fulfill the monitoring objective. The basic assumption for this process was to follow the standard procedure for collection, validation, merging, storage and processing of the raw data. The importance of TNMN data management was recognized in a very early stage of TNMN operation and consequently well-defined structure for data storage was prepared. The data was organized in a system of joined tables which contains information related to monitoring locations, determinants, methods of sampling, methods of analysis, remarks and information taken on samples and results of analysis. From 1996, several parts of the database had been modified to adjust the system to the new needs, or to increase efficiency of the system.

The procedure of TNMN data collection starts at a national level in every country. Nominated National Information Managers (NIMs) are responsible for collection of the data from National Reference Laboratories and other national laboratories involved with TNMN where the data from sampling and analysis are generated. In the next step the NIMs are responsible for cross checking the data, preparation in agreed Data Exchange File Format (DEFF) and sending it to TNMN data management centre located in Slovak Hydrometeorological Institute in Bratislava. The centre performs a secondary check of the data and suspicious data is cross-checked or consulted with NIMs. After the consultation process, the data from TNMN are merged and stored in one database for further use and for uploading into the central TNMN database. In cooperation with the ICPDR Secretariat, the TNMN data is uploaded into the ICPDR website (www.icpdr.org).

The collection of TNMN data started in 1996 and till are regularly collected in Germany, Austria, the Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Bulgaria and Romania. Data from Ukraine and Moldova have been available since 1998. In a

similar way, the data generated by the countries that have newly entered in the ICPDR have also been collected and processed. For instance data from Serbia, Bosnia-Herzegovina and Montenegro are the most recent from 2010. Basic processing and presentation of the TNMN data is done on a yearly basis in the form of *Danube Yearbook* and the first one was prepared in 1996 while the last was approved in 2007.

Analytical Quality Control (AQC)

The most difficult issue in the monitoring of transboundary waters from international rivers is to obtain reliable information, comparable data on different pollutants. Therefore, implementation of monitoring programmes in international river basins requires harmonisation and coordination. First of all harmonization need to start right away during the design period when target determinants and matrices for monitoring are identified. It should then continue to sampling locations and frequencies, sampling and analytical methodologies and when the quality control measures particularly for the Analytical Quality Control (AQC) are selected and agreed upon. Important to note during the process is that all evaluation of the quality of the river system, the realistic description of the concentrations and trends of pollution, the analytical results should be of the same high quality irrespective of the laboratory that provided the results. The appropriate operation of the TNMN was an important part of the monitoring strategy which was observed throughout harmonization sampling and analytical methodologies, establishment of quality targets and appropriate quality assurance scheme. It was a prerequisite for the proper operation of the monitoring network which included a selection of monitoring sites along the Danube and its tributaries.

In each country, a National Reference Laboratory (NRL) was nominated and additional national laboratories were involved in the implementation of the TNMN. The LM Working Group took the responsibility to harmonize the monitoring methodologies and coordinate the AQC among the 13 NRLs and the additional 18 national laboratories.

In addition to the preparation of Standard Operational Procedures (SOPs) to be followed during sample collection and analysis, the quality assurance program in the Danube river basin laboratories included the following:

- a) recommendations for similar laboratory facilities,
- b) provision of necessary analytical instrumentation in the laboratories,
- c) implementation of integrated training programs, and
- d) proficiency testing carried out in inter-laboratory comparison studies.

The TNMN implementation plan was developed and agreed. It includes provision of sampling equipment and analytical instruments for the eligible countries from the EU PHARE programme. As far as the laboratory work is concerned, harmonization of the related activities, coordinated by the LM Working Group included:

- Selection of determinants and matrices for the TNMN in the Danube river basin.
- Selection of appropriate sampling and sample handling procedures for water, sediment and biota.
- Selection of reference and optional analytical methods for determination of the identified physical, chemical, radiochemical, biological and microbiological determinants.

- Establishment of the AQC, performance testing system and regular revision of the methodologies.
- Harmonization of laboratory facilities, instrumentation.
- Identification of training needs and implementation.
- Co-ordination of the laboratory work through regular meetings of the National Reference Laboratories.

Between 1998-2000 in the frame of EU supported projects on “Water Quality Enhancement in the Danube River Basin” and “Strengthening Capabilities in the Danube River Basin”, significant efforts were devoted to the development of the quality assurance elements of the Danube TNMN. In the following project, the Volume 2 of the Guidance Notes dealt with all quality assurance issues pertaining to the sampling, sample preparation and analysis of TNMN determinants.

Quality Assurance in Water Quality Data Collection

The TNMN laboratories are free to choose any analytical method but they must demonstrate that the method in use meets the required performance criteria. Therefore, the minimum concentrations expected and the tolerance required of actual measurements has been defined for each determinant so as to check method compliance. The measurement cycle for the implementation of the monitoring starts with the collection of samples and closes with reporting the analytical results while the reliability of the results depends on the effectiveness of the quality assurance as shown in Figure 2.

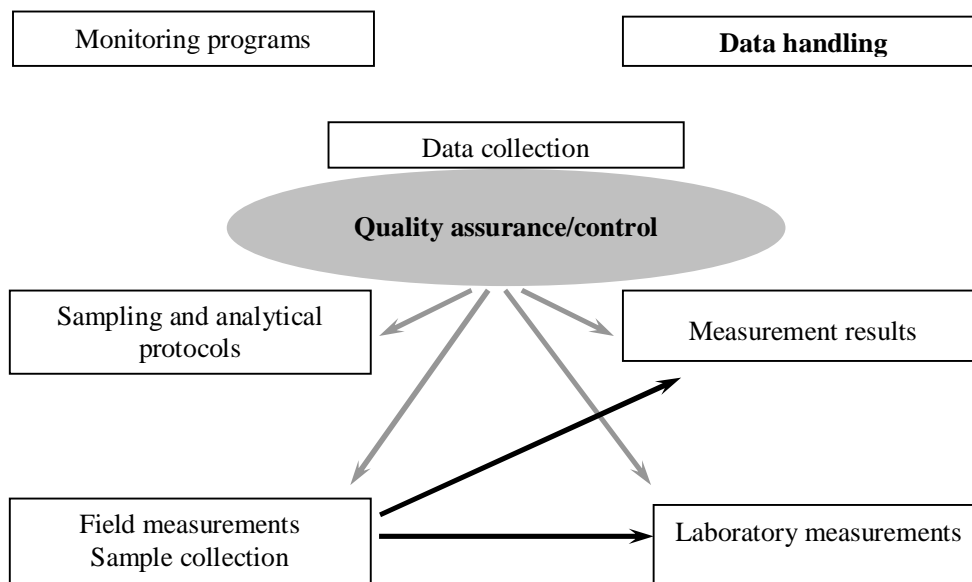


Figure 2: Quality assurance/control in the data collection/measurement cycle

Performance testing in the laboratories

The organisation of inter-laboratory comparison was agreed in 1992 and then later transferred to ICPDR. The Institute for Water Pollution Control of VITUKI, Budapest, Hungary offered and took the responsibility for organising the first study of AQC under the name of *QualcoDanube*. The first distribution in 1993 included samples for

the analysis of three determinants: pH, conductivity and total hardness. By the end of 1995, four more elements had been added for the analysis of chlorides, chemical oxygen demand and nutrients (ammonium, nitrate, Kjeldahl-nitrogen, orthophosphate and Total Phosphorous) as well as different metals such as Fe, Mn, Ca, Mg, Cd, Cu, Hg, Pb, Ni and Zn.

In 1996, the QualcoDanube proficiency testing scheme was extended to the NRL in the TNMN and the second distribution from 1996 already comprised of all Danubian laboratories i.e. 11 NRLs and 18 national laboratories implementing the TNMN. This distribution was further extended to 6 Black Sea laboratories responsible for pollution monitoring in their areas. Since 1996, QualcoDanube check samples are distributed quarterly in every year.

Load calculation

The long-term development of loads of relevant determinants in important rivers of the Danube Basin is one of the major objectives of the TNMN. It is the main reason for starting the load assessment programme in the DRB in 2000. For the calculation of loads, a commonly agreed standard operational procedure is used which is based on the following principles:

- Load is calculated for the following determinants: BOD₅, inorganic nitrogen, ortho-phosphate-phosphorus, dissolved phosphorus, total phosphorus, suspended solids and voluntary basis-chlorides. Based on the agreement with the Black Sea Commission, silicates have been measured at the Romanian load assessment sites since 2004.
- The minimum sampling frequency at sampling sites selected for load calculation is set at 24 per year.

The load calculation is processed according to the procedure recommended by the Project “Transboundary assessment of pollution loads and trends”. Additionally, countries can calculate annual loads by using their national calculation methods, results of which should be presented together with data prepared on the basis of the agreed method. Countries should select for load assessment those TNMN monitoring sites for which valid flow data is available. Altogether 21 monitoring locations from nine countries are included in the list. Two locations have been included by two neighbouring countries hence the actual number of locations is 19, with 10 locations along the Danube River and 9 locations along tributaries.

The revision process of TNMN in order to meet the objectives of EU Water Framework Directive

General objective of the TNMN revision

As already mentioned above, acting as the main tool for cooperation in the field of monitoring and assessment, the TNMN was formally launched by the ICPDR in 1996. In its first phase, the original objective of the TNMN was to strengthen the existing network put forward by the Bucharest Declaration. More so, to carry out a reliable and consistent trend analysis for concentrations and loads of priority pollutants as well as support the assessment of water quality for water use and to assist in the identification

of major pollution sources. After five years of operation, in 2000 the main objective of the TNMN was reformulated. This was meant to provide a structured and well-balanced overall view of the status and long-term development of quality and loads for the relevant constituents in the major rivers of the Danube Basin in an international context. Since the ICPDR's current water management policy is driven by the EU WFD (2000/60/EC) like all EU member states, the revision process of the TNMN in the Danube River Basin District was completed in 2007.

The major objective of the revised TNMN is to provide an overview of the overall status and long-term changes of surface water and where necessary groundwater status in a basin-wide context with a particular attention paid to the transboundary pollution load. This is key for observing the link between nutrient loads of the Danube and eutrophication of the Black Sea. It has therefore become necessary to monitor the sources and pathways of nutrients in the Danube River Basin District and the effect of measures taken to reduce the nutrient loads into the Black Sea.

In order to meet the requirements of both EU WFD and the Danube River Protection Convention, the revised TNMN for surface waters consists of following programmes:

- Surveillance monitoring I: Monitoring of surface water status (SM I)
- Surveillance monitoring II: Monitoring of specific pressures (SM II)
- Operational monitoring (OM)
- Investigative monitoring (IM)

Surveillance monitoring II is a joint monitoring activity for all ICPDR Contracting Parties that produce annual data on concentrations and loads of selected parameters in the Danube and major tributaries.

Surveillance monitoring I and the operational monitoring is based on collection of data on the status of surface water and groundwater bodies in the DRB District to be published in the DRBM Plan once in six years.

Investigation and monitoring are primarily a national task but at the basin-wide level the concept of *Joint Danube Surveys* was developed to carry out investigative monitoring as needed. For example, harmonization of the existing monitoring methodologies, filling the information gaps in the monitoring networks operating in the DRB, testing new methods or checking the impact of "new" chemical substances in different matrices and Joint Danube Surveys are carried out every 6 years¹.

This is a new element of the revised TNMN is monitoring of groundwater bodies of basin-wide importance. The *Danube Yearbooks* present the results of the Surveillance monitoring II: Monitoring of specific pressures and when the countries decide the results of the other programmes included at least once in 6 years.

TNMN Surveillance monitoring II: Monitoring of specific pressures

Surveillance Monitoring II focuses on long-term monitoring of specific pressures of basin-wide importance. Selected quality elements are monitored annually. Such denser monitoring programme is needed to identify the specific pressures in the Danube River

¹ For details see the GWP ToolBox case study #306

Basin District in order to allow a sound and reliable long-term trend assessment of specific quality elements. The aim is 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 set-up of the original TNMN and is fitted to respond to pressures of basin-wide importance. 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 bottlenecks and maximise the benefits.

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 the sites:
 - Located just in upstream and downstream of an international border.
 - Located upstream of confluences between Danube and main tributaries or between main tributaries and larger sub-tributaries.
 - Located downstream of the major point sources.
 - Located to control important water uses.
- Sites required to estimate pollutant loads (e.g. of nutrients or priority pollutants) which are transferred across boundaries of Contracting Parties, and which are transferred into the marine environment.

Such sites are located in particular on the Danube and its major primary or secondary tributaries near crossing boundaries of the Contracting Parties. Localisation of monitoring sites is shown in Figure 3. As regards the investigated quality elements, in order to cover the pressures of basin-wide importance as organic pollution, nutrient pollution and general degradation of the river, 33 physico-chemical and chemical determinants as well as 3 biological quality elements have been agreed to be monitored for SM II.

Outcomes

The main outcome in the frame of TNMN is the basin-wide assessment of water quality based on a homogenous and comprehensive data set, annually presented in the *Danube Yearbooks*, focused on the following aspects:

- Presentation of results of the basic statistical processing.
- Identification of water quality changes along the Danube River.
- Presentation of profile and trend assessments in water quality.
- Assessment of dangerous substances content in accordance to EQS established or proposed for use in EU.
- Assessment of selected pollutants loads.

In addition to the already mentioned annual report (Yearbooks), there is also a *Five-year Report on Water Quality in Danube River Basin Based on TransNational Mentoring Network* prepared in 2003. The other uses of TNMN data were the substations (according to EU WFD Article 5 report “Characterization of pressures and impacts at the basin wide level). The special relevant chapters of “Danube River Basin Management Plan” where the status of water bodies were presented including the

impacts and their causes and results of this assessment, the relevant measures for impacts mitigation among others.

Lessons learned

Since the operation of TNMN is supported by a basin-wide network of National Reference Laboratories which coordinates the entire monitoring activity at national levels and ensure the quality of the results of the analyses, many lessons have been learned as a result of designing and implementing the monitoring network at the basin-wide scale. However, the harmonization of working methods and improvement of data comparability is still an ongoing process. Therefore the achievement of a sound common platform of water quality monitoring and long-term assessment need a strong cooperation among all the involved parties.

Among the problems and challenges encountered, the below are most important and worth mentioning:

- Continuing the already gained experience during the Bucharest Declaration, complementing and sharing expertise and resources.
- Assuring adequate and flexible resources both financial and human in order to avoid gaps in data production and collection.
- Issuing of the *Danube Yearbooks* in due time as it is the most reliable information dissemination activity for all the stakeholders involved.

The results of the network implementation and operating activities should not be seen as a self-standing activity but should be seen in a broader context to recognise the needs for TNMN permanent improvements according to the needs and changes. On one hand, the TNMN data can be used in identification of possible weak points in the monitoring programme and the mentioned suggestions for future TNMN improvement. On the other hand it has to be mentioned that improvement of TNMN has to be strongly connected to continuous implementation of WFD. Other EU water related directives also entered in force in 2000 and after Danube countries agreed on their joint implementation in the river basin.

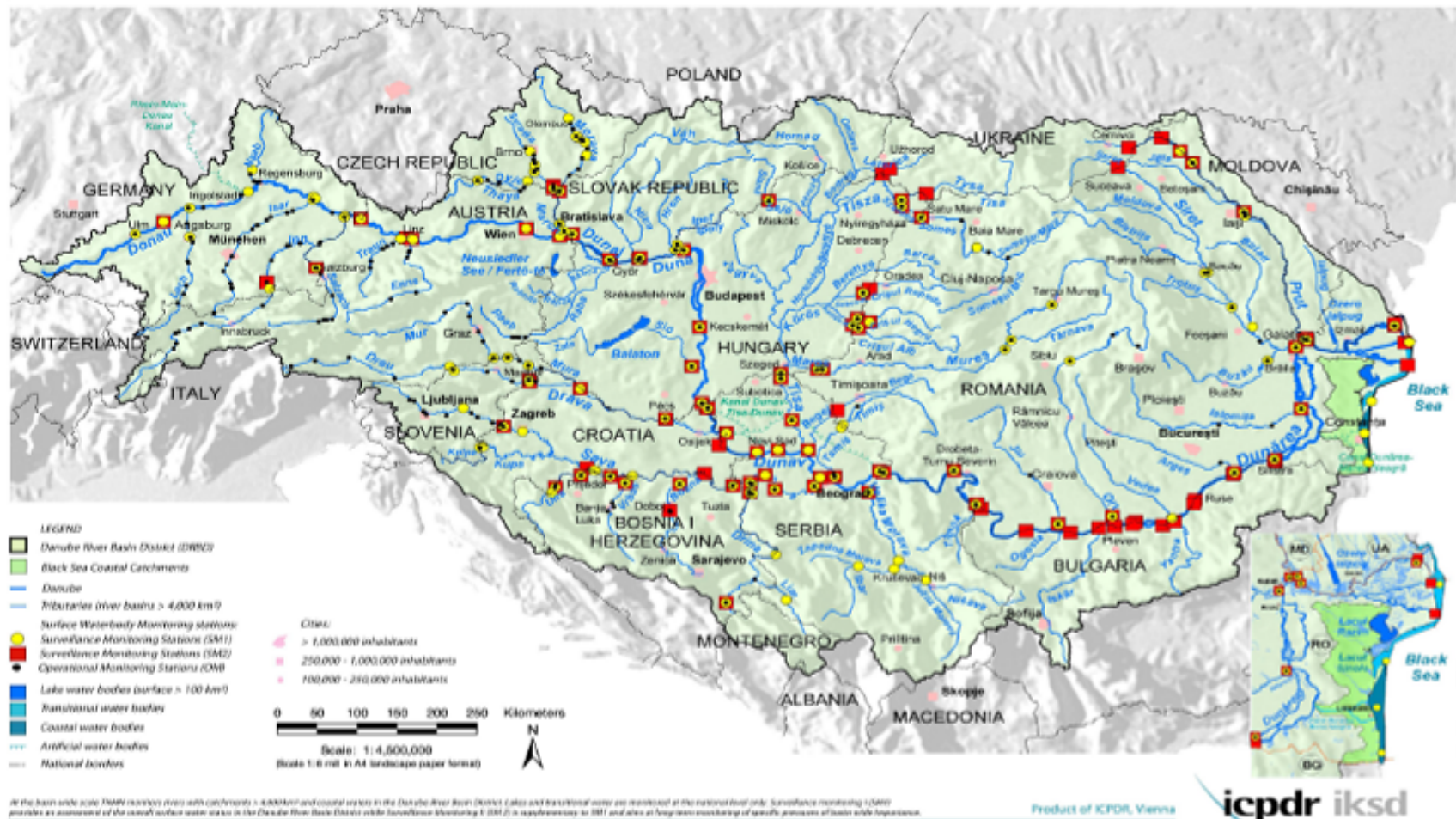


Figure 3: The Danube Station map TNMN (from www.icpdr.org)

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