

**Twinning Project
Implementation of Water Framework Directive
in Hungary**

Activity No. 24.

A Draft Strategy for Surface Water Monitoring in Hungary

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1. Introduction

Hungary has a long tradition and rich experience in quality monitoring of groundwater, rivers and lakes. Due to the accession to the EU in 2004 there is the need to adopt the national system(s) to the European water legislation, especially to the new requirements of the Water Framework Directive (WFD). Due to the activities and results of this Twinning project and the coordinated PHARE funding of ecological surveys for surface waters and groundwater to be executed in the next future there is a good chance for amending the existing monitoring system to a more modern, multifunctional, flexible and cost-effective tool for the main aspects of Hungarian water management.

This report is a draft proposal for a surface water quality monitoring strategy for Hungary. The strategy is targeted to the general demands of national water quality management but with special focus on the specific requirements of the European WFD and additional requirements by still valid EU-water legislation and the agreements of ICPDR. It is taking into account the results of preceding work packages of the Twinning subproject, especially the gap analyses in the field of surface water monitoring and institutional aspects and the “Terms of Reference (draft)” for the ecological surveys as well.

Based on these data and specified criteria for the establishment of measurement programmes a pragmatic proposal for a detailed programme for rivers (and lakes) in Hungary is presented. Though some specifications, for example the number of river types and the number of natural/identified/designated water bodies, are not finally decided, this proposal builds upon the state of experience already gained in Hungary. A lot of hints and pragmatic proposals resulting from different European experience and the Guidance Documents of the CIS-I-process will help by establishing a feasible starting process for the monitoring network. The development of a draft strategy on information/data management and reporting needs is enclosed as well.

The draft monitoring strategy for groundwater is – due to general differences - dealt with in another separate report (Activity 25) of the Twinning project.

Discussing monitoring it should always be reminded that reliable results of a good monitoring system are always much more cost-effective than the realisation of restoration measures based on poor monitoring data.

2. Surface Water Monitoring Programmes

Summary: *This chapter deals as a technical introduction with general questions on the strategy for surface water quality monitoring. The basis of a monitoring cycle is the development of clear tasks and objectives by the programme(s) to be gained. Modular or tiered approaches for monitoring programmes can include more than one function but not all, so it is necessary to split the activities to some sub-programmes to get a structured bundle of tailor-made and cost-effective components.*

Central tasks of water monitoring are the identification of state and trend of water quality, the characterisation of reference conditions and the quantification of pressures and impacts. Following this scheme, task-specific criteria for subprogrammes can be developed.

Though not in the focus of this report some related aspects, eg. the hydrological measurements, emission control, groundwater monitoring, and early warning are considered in their overlappings and interactions with surface water quality monitoring

2.1 Tasks and Objectives of Surface Water Quality Monitoring Programmes

Water quality is highly formed by pressures and impacts of human activities. The conservation of nature-near habitats and the different utilisation like drinking water supply and fishery demand for comprehensive water protection with regular and ongoing water monitoring as an essential basis.

The recent significant pressures for surface waters are the intakes of pollutants by point sources (esp. waste water discharges) and diffuse sources (esp. by agriculture) and the impacts by hydromorphological changes of the rivers and lakes (e.g. canalisation, flood protection, damming etc.). Due to the general principles of precaution and sustainable development the quantification of these pressures and impacts is a severe requirement for spatial covering and long-term observation of waters.

From the above mentioned topics the main tasks for monitoring as a basis of reliable decisions in water management are:

- Collection, analysis and assessment of recent water quality data (biological-ecological status, hydromorphological status and chemical concentrations in the different compartments water, sediment, suspended matter and biota),
- Long-term recording of water quality including background contamination as basis for observations over a longer time and a wider area (trend),
- Analysis of nature-like reference conditions for the variety of water types, establishing a basis for classification systems,
- Check for compliance with environmental quality standards and objectives,
- Estimation of transport or load of critical substances at defined sites,
- Control of impact of water utilisations and
- Identification and operational observation of critical states.

Monitoring as a tool of water management is a cyclic process, linking strongly the data need and data use with monitoring activities (fig 1).

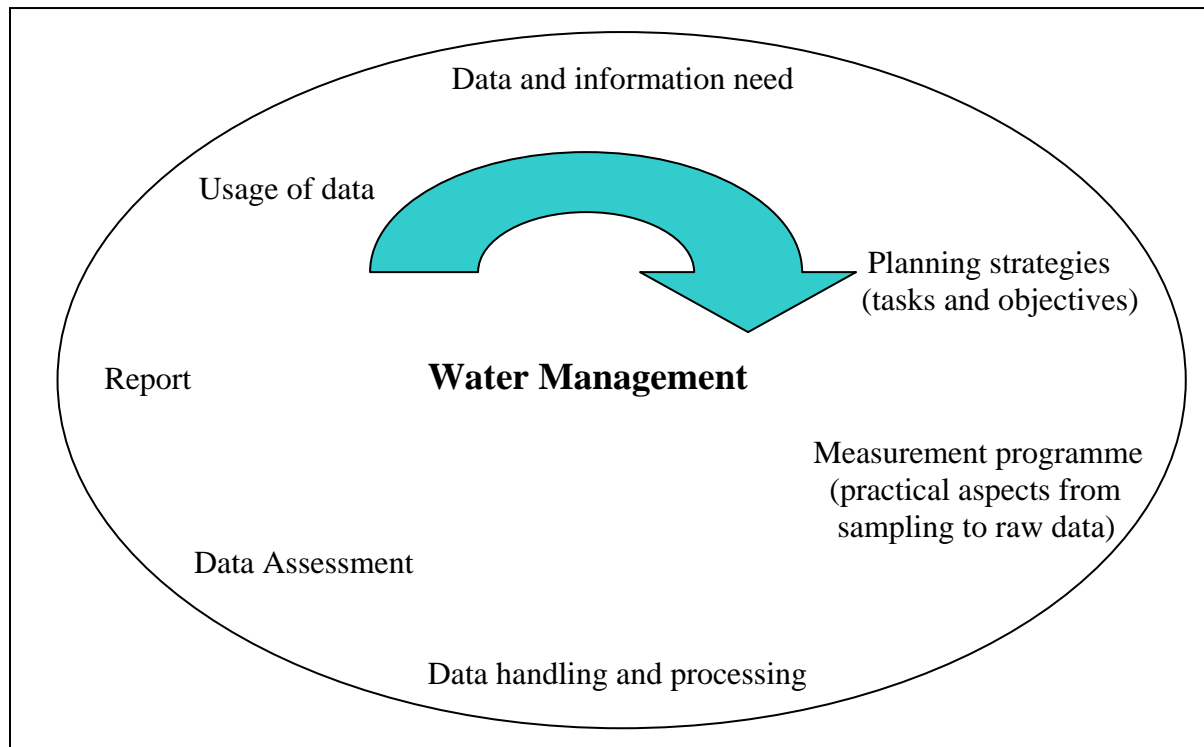


Fig. 1: The cyclic process of monitoring in water management

Based on the ascertained need for information and data each cycle must start with a thorough definition of the objective or objectives for undertaking the monitoring programme. The „why“ of monitoring must be quite clear and defined for all parties involved and should be reflected at all stages inside the monitoring cycle.

While some tasks can be handled in a common programme, other cannot and this implicates the need of different subprogrammes. To organise this matrix of task-specific stratified subprogrammes in a modular and tiered approach appears as the most effective way. The result should be a tailor-made system, thoroughly adapted to the specific situation in a country or river basin.

The monitoring strategy is practically realised by the “measurement programme“, indicating the where, what, how and how often in monitoring. The representativity of the monitoring results are mainly influenced by the intelligent selection of sampling sites, compartments and determinands (see chapter 4 and 5). The practice of measurement programmes requires in general a huge input of resources and thus needs a lot of consideration to develop a highly cost-effective set of subprogrammes, each differing in sampling sites, determinands, frequencies and so on.

Data handling and processing and the classification and assessment leads to reporting. This includes the final decision, whether to continue in a - potentially adapted and changed – new monitoring cycle.

2.2 Related Monitoring Activities

Though this report is focussing strongly to surface water quality monitoring, there are some related aspects in hydrometrical networks, groundwater monitoring, and emission control, which should be considered in this context because of high degree of interrelationship.

Essential for water quality sampling is the knowledge of water flow, because this parameter not only allows the estimation of pollution loads in rivers, but is also necessary for the interpretation of results. Short-term flood waves for example can produce the drift of biological components in a water reach and the chemical pollution during flood episodes show quite complex and time-dependent characteristics.

The water flow should be at least be known on a daily base for sampling stations established for load estimations. Thus the map of the existing hydrological network is a necessary tool for establishing water quality networks. More detailed information on the necessary correlation between sampling sites of the quality and quantity networks is given in chapter 4.

Considering groundwater and surface waters there are a lot of interactions between these categories. Roughly spoken groundwater is - under normal hydrologic conditions - generally feeding the surface waters with the chemical basic composition reflecting this aspect. In flood situations the current can turn and press surface water in the groundwater bodies.

Though the WFD demands for assessment of the interaction between groundwater bodies and surface water bodies (Annex II), in practice by now there is no widespread use for such assessments. Different results of some research projects are especially concerning quantitative aspects, sometimes groundwater-born nitrate concentrations in surface waters. More systematic assessment is needed when dealing with groundwater-dependent terrestrial ecosystems.

Independent of the gaps in knowledge and importance of interaction it should be considered to establish co-ordinated monitoring programmes, for example proximate sampling sites for corresponding groundwater bodies and surface water bodies, especially when the networks are under revision.

The emission control of (treated or untreated) wastewater from point sources of industrial or municipal discharges is a basic task of public water management as well. It is necessary to use the data, generated by the official control or the self-control of the operators, for the pressure/impact-assessments in rivers. But often downstream impact stations are used instead as a control for point sources. This should be avoided, because the pollution can be estimated more precisely by monitoring upstream and directly in the wastewater discharge.

A specialised and often high sophisticated system of early warning monitoring is used in some countries, especially at the river Rhine with its high density in shipping, industrialisation, urbanisation and drinking water supply by river bank filtration (Lower Rhine). Semicontinuous or continuous devices in compact sampling stations check the chemical composition of main pollutants by quick and semiquantitative screening methods. Continuous water sampling provides in case of accidental or illegal pollution by ships or wastewater discharges the laboratories with the corresponding water samples for further investigations. Though in the WFD the demand for alert monitoring is mentioned, it can be interpreted from Art 11 (3) 1 as part of future measure programmes in the river basin management plans.

3. Water Quality Monitoring Requirements

Summary: *The general requirements for regular monitoring and the resulting data/information are to a high amount based on legislative or similar binding specifications. In particular there are fixed tasks of existing national and regional monitoring networks with defined sub-targets and long-term data sets. The most important additional requirements accrue from the WFD. The monitoring or information requirements of the earlier EU-Directives concerning water protection, which have to be put into force by the accession states temporarily or permanently, have to be considered as well and implemented in a most streamlined way. Last but not least there are monitoring requirements agreed inside the ICPDR and maybe some international contracts with bordering countries, which have to be implemented in the general monitoring scheme too.*

3.1 National and Regional Programmes

The national and regional Monitoring Programmes for surface water quality are based on different national laws and decrees up to the year 2001. A list of relevant laws and regulations is presented in Appendix A of the “terms of reference” for the ecological survey of surface waters.

The above-mentioned document describes the existing network quite consisely:

“The present routine monitoring program is carried out in accordance with the National Standard. This Standard - No. 12749 - determines the sampling sites, the frequency of the sampling, components and the measurements to be taken in the framework of the national surface water quality-monitoring network. The water quality data from 150 sampling points of the national network and 90 points of the regional network are forwarded to the Institute of Environmental Management for annual evaluation and publication. Altogether five component groups are regularly monitored (I. Oxygen household; II. Nutrient household; III. Microbiological components; IV. Micro pollutants; V. Others). These regular data collection activities go back to 30 years and they are evidently focusing on the traditional physical and chemical compounds. There is no regular biological data collection according to the present EU Water Framework Directive (**WFD**, Council Directive 2000/60 EC) in respect to the ecological status of surface waters....“

The strength/weakness-analysis of the existing monitoring system compared with average features of European systems (Twinning Project, Activity No. 2, Gap analysys) shows

- a quite flexible approach according to frequencies of sampling and lists of determinands (intensive and extensive subsets),
- a general higher sampling frequency per year,
- a quite dense network of sampling locations but underrepresenting smaller catchments including reaches with reference conditions ,
- no regular biological-ecological characterisations,
- no extended chemical micropollutants programme on hazardous substances, and
- a high standard in hygienic characterisation of surface waters.

There is an additional local monitoring network in Hungary; if there is a need of enlargement the number of stations in future, these networks should be priorily checked for (partly) implementation in the future regional and national networks.

3.2 WFD-Requirements

The new challenge for modification of existing monitoring networks is provided by the requirements of the WFD. It should be noted before, that the WFD programme is strongly linked to river basin management plans and their time-schedules, showing some gaps especially in the long-term assessment of status and trends in river quality.

The monitoring requirements of the WFD for surface waters, groundwater and protected areas are laid down in Article 8. Their main task is to give a coherent and comprehensive overview of the water status within the river basin districts. Following the first basic assessment (to be finalised at the end of 2004) which should, based on existing information, estimate the risk of water bodies failing to meet the environmental objectives (especially “good status” or deterioration of state), the “new” monitoring systems have to be established and should be operational in December 2006. Due to the different natural, physical and geological conditions and man-made pressures in Europe, the European Commission does not build on a common descriptive monitoring system, but supports the different national monitoring approaches if they fulfil some key criteria, especially if the system is reliable in assessing the deviation of observed conditions to those that would normally be found under reference conditions. In other words “the Directive seeks ways of harmonising the results of monitoring systems and ecological assessments rather than imposing a common ecological quality assessment system in each country” (CIS-Guidance Document on Monitoring).

More detailed information on monitoring is given in Annex V of the Directive. The new approaches relate to the introduction of

- a wide range of prioritised biological-ecological assessments and
- the classification of surface waters according to type-specific reference conditions.

The information gathered from surface water monitoring is mainly required for the classification of ecological and chemical status, because a status lower than good indicates the need for measures (and extended monitoring).

Furthermore monitoring results

- should supplement and validate the basic risk assessment,
- should show the trend of long-term changes under natural conditions or ubiquitous anthropogenic pressure,
- can be used in the quantification of reference conditions and the intercalibration exercise (see 2.5),
- enable the estimation of pollutant loads at sites near international boundaries or at the sea,
- should show changes due to measurements and
- help to detect the extent and impact of accidental pollution.

Due to the general framework character the Directive introduces a flexible three-stage monitoring system:

The **surveillance monitoring** is a type of overview monitoring. It should be established for comprehensive catchment areas in general at a scale up to 2500 km². The main purpose of this type of monitoring is to supplement and validate the basic risk assessment, show the trend of

long-term changes under natural conditions or ubiquitous anthropogenic pressure and help to establish the effective and efficient design of future monitoring programmes.

Additional requirements are to include sampling sites

- where the rate of water flow (for rivers) or volume (for lakes and reservoirs) is significant within the river basin district,
- where significant rivers cross Member State boundaries or flow into the sea (load of pollutants should be estimated as well),
- which are identified under the Information Exchange Decision 77/795/EEC.

The **operational monitoring** should be carried out on all water bodies which in the basic assessments have shown the risk of failing to meet their environmental objectives according to WFD Article 4 including the fact that priority list substances are discharged. The main target is to establish the water status and to detect any changes, which result from programmes of measures. Due to the river basin management plans this type of monitoring will be the most remarkable because it will show the success of the implemented measures. Nevertheless it is not helpful to establish some fixed programme, because the monitoring should be very problem-orientated and case-specific: general help can be found in the Guidance Document on Monitoring of EU-CIS-Working Group 2.7.

In some highly specific cases **investigative monitoring** should be carried out, especially if the reasons for any exceedances are unknown or as a temporary intermediate measure between surveillance and operational monitoring. Alarm monitoring, working with chemical quick analysis and biological effect monitoring (biomonitors), can be seen as a type of investigative monitoring, trying to detect the magnitude and impact of accidental pollution. All details of this monitoring type are highly specific for each case and problem, too, and thus a general network can't be proposed.

To strengthen the importance of protected areas under the umbrella of the WFD the specialised **monitoring programmes for protected areas** registered under WFD Article 6 are supplemented and mentioned separately: Drinking water abstraction points which supply more than 100 m³ per day shall be designated as sampling sites and assessed thoroughly for chemical substances which are subject to the European or river basin substance lists or which have to be controlled under the provisions of the Drinking Water Directive. The required frequency of monitoring increases with the rate of abstracted water. Habitat and species protection areas should be included in the operational monitoring when the basic assessments have shown the water-related parts to be "at risk".

3.3 Requirements of earlier EU-Directives

Within the accession to the EU, Hungary has to fulfill the requirements of the other existent directives as well. According to water protection there are two groups to consider, the directives to be repealed in 2007/2013 (by integrating the aim of these directives under the umbrella of WFD) and the directives continuing to be in force.

Some of these directives include specific monitoring requirements. While for the first group there is a need just for a transitional implementation, the demands of the other group has to be integrated tighter in the monitoring programmes.

- Directives to be repealed (WFD, Art. 22):**Freshwater Fish Directive (78/659/EEC)**

Since the biological quality component fish is one of the central elements of the WFD, some of the monitoring requirements of the Freshwater Fish Directive - though repealed in 2013 - have to be implemented in the future monitoring system.

The aim of the Freshwater Fish Directive is to protect or improve the quality of those running or standing fresh waters, which support fish life. According to the Directive salmonid waters and cyprinid waters have to be designated. The annexes contain lists of physico-chemical determinands to be monitored and corresponding quality objectives, which have to be fulfilled. If water quality does not comply with the standards, reduction plans have to be established. The determinands to be monitored monthly are dissolved oxygen, pH, non-ionized ammonia, total residual chlorine, petroleum hydrocarbons and total zinc as statutory components.

Some of the parameters are still in the existing monitoring programmes, but the total range of determinands has to be taken over at selected sites of the future programme. Like in other directives with monitoring requirements the Freshwater Fish Directive allows to reduce or stop monitoring, when the absence of pollution or its risk can be proved. In a longer view the abiotic assessment of the Fishwater Directive should be replaced by direct assessments of quality and quantity of fish.

The **Shellfish Water Directive (79/923/EEC)** does not apply to the Hungarian geographic situation having no coastal line.

The **Dangerous substances Directive (76/464/EEC** and “daughter directives“ 86/280/EEC, 88/347/EEC and 90/415/EEC) contains two lists of substances or groups of substances with the general objective to reduce or eliminate the pollution of waters by these hazardous substances. For 18 substances out of List I the Council laid down emission limit values and environmental quality standards in the so-called ”daughter directives”, the residual limits are still missing.

A similar approach has been established in the WFD with the concept of priority substances and substances relevant on river basin level. There is strong activity in the Commission to streamline the - even partly contradictory - requirements to get a quite smooth transition between the two regulations.

Nevertheless there is the need for immediate action: Quality objectives for the remaining List I substances (and perhaps List II substances as well) have to be derived on a national or Danube-wide level.

Furthermore an initial screening monitoring programme for the dangerous substances at some most important sampling points is proposed to get information of the presence of these substances in the aquatic environment, possibly excluding substances which general absence can be expected. The results of this pilot programme serve as a basis for the necessity of extending the programme, and the information can be used within the three-annual report to the Commission.

The **Directive for quality of surface water intended for abstraction of drinking water (75/440/EEC)** is forwarded for protection of waters with direct abstraction for drinking water supply. In general the necessary testing is done by the operators in the drinking water plants. Again as a specialised operational monitoring it should be separated from the aspects of national environmental monitoring.

Furthermore the **Decision for Exchange of Information on the Quality of Surface Freshwaters (77/795/EEC)** sets up an overview monitoring programme with a small set of mostly basic parameters. Some 5 to 10 stations of the intensive monitoring programme should be selected for this purpose. With small additional effort the annual reporting obligations to the Commission can be fulfilled.

- Directives not to be repealed by WFD, Art. 22:

The **Bathing Water Directive (76/160/EEC)**, currently under major revisions, has to be approved in Hungary as well. But the sampling points in the waters to be designated (particularly lakes and reservoirs) will probably not overlap with sampling stations for ecological assessment. Therefore the monitoring requirements of the bathing water directive should be taken separate as a specialised operative programme and not included in the regular national monitoring programme scheme.

The **Urban Waste Water Directive (91/271/EEC)** defines the need for Member States to monitor the recipients for wastewater, if a significant impact on the water bodies can be anticipated. It is assumed that fulfilling of WFD monitoring requirements will cover this obligation.

The control of wastewater as discharge of the wastewater plants is part of the emission control programme and is not dealt within this context.

It should be kept in mind, that a lot of point sources are not covered by the Urban Wastewater Directive (particularly smaller plants < 2000 equivalents, discharge of stormwater or overflow, specific industries, fish farming etc.) which can significantly contribute to the total pollution by point sources.

The **Nitrate Directive (91/676/EEC)** concerns the protection of waters against pollution caused by nitrates from agricultural sources, i.e. chemical fertiliser and livestock manure. The main aims are the safeguarding of drinking water supplies and the protection of fresh and marine waters from eutrophication. Vulnerable areas (possibly the country as a whole) have to be designated and measures aiming at the introduction of good agricultural practice have to be established. Corresponding monitoring networks for groundwater and surface waters are specified in the Directive. The need of measures is determined by results of monitoring programmes on nitrate and eutrophication.

3.4 Additional International Requirements

The agreed water quality monitoring programme inside the ICPDR is determined in the TransNational Monitoring Network (TNMN). It sets up the list of monitoring sites (nine stations for Hungary at the Danube and main tributaries) and the lists of determinands to be analysed in water and sediments. Minimum sampling frequencies were determined to 12 a year, respectively 2 per year for sediment analysis.

[Are there additional bilateral or international agreements/contracts with neighbouring states?](#)

4. Criteria for Measurement Programmes

Summary: *Inside the monitoring Cycle the practical tasks are dealt with in the measurement programmes. These complex dependences in matrix-like structures consist of task-specific sub-programmes, sampling station networks, quality components, determinands (different in water or sedimen/suspended matter), sampling procedures, and sampling frequencies (per year and management cycle). Based on the different situation for standing and flowing waters the criteria for measurement programmes are discussed separatly and successively for rivers and lakes. The discussion of selection criteria serve as the basis for derivation of the detailed measurement programme in chapter 5.*

According to chapter 2 the "measurement programme" is defined as the practical part inside the monitoring cycle. The measurement programme consists of different components determining the how, where, what and how often of monitoring. Based on the modular character of the different groups of components the programme as a whole can be presented more like a matrix instead of a flowchart.

The following chapter discusses subsequently the different aspects for the selection and combination of subprogrammes, sampling sites, quality elements, determinands, frequencies and other practical issues of sampling, including pragmatcal proposals for effective realisation.

According to the different categories of surface waters defined by the WFD in Hungary in absence of a coastal line only rivers and lakes have to be considered.

4.1 Rivers

4.1.1 Subprogrammes

Due to the different tasks and objectives mentioned in the chapters above, task-specific subprogrammes can be defined with the aim to construct a modular entity. For practical feasibility they should not be individualised, as well.

Nation wide or river basin wide monitoring programmes shall represent a general and comprehensive overview of the conditions, pressures and impacts, that are significant for the considered region. Therefore each region has to cover subsets of **reference and impact programmes**, where the main impacts are determined as wastewater discharges (point sources), agriculture (diffuse sources) and hydromorphological changes.

In the concept of WFD the ecological assessment and classification is fundamentally depending on the determination of reference conditions for each type of river derived for the region. The **reference condition** quantifies the high status and any deviation has to be compared to this level. While earlier monitoring programmes have been more tightly focused on impacted sites for more representativeness of threats, there is now a need for an extended reference network.

In general not all tasks can be executed by just one compact programme. But strict resources management and many overlaps impose a combined set of modular and flexible subprogrammes. Due to different tasks and resources these can differ by intensities of stations, parameters, annual sampling frequencies or cycle frequencies. Following this

scheme **differentiated intensive, extensive and rotating subprogrammes** should be established.

Concerning the three types of monitoring in the WFD the different tasks of monitoring can be grouped as shown in table 1:

Types of monitoring Tasks	Surveillance monitoring (permanent sampling sites)	Operational monitoring (temporary sampling sites)	Investigative monitoring. (temporary sampling sites)
Representativity for larger areas	X		
Impact sites	X	(X)	
Loads	X	(X)	
Natural trends	X		
Anthropogenic trends	X		
Reference sites	X	(X)	
Border sites	X		
Quantification of pressures and impacts by point sources	X	(X)	
Quantification of pressures and impacts by diffuse sources	X	(X)	
Planning of measures		X	
Controll of effects of measures		X	
General reasons for risks			X
Specific reasons for risks			X

Table 1: Correlation between monitoring tasks and type of monitoring according to WFD

flexible approaches for national/regional(scheme of subsets)
discussion of surveillance, operational and investigativ monitoring.
Integrated monitoring (assessment of total environment in a region)
Protected areas monitoring (especially drinking water)???
(Local reqirements; integration of data and or information)

4.1.2 Sampling Stations

This chapter is directed to permanent sampling networks, because the variability of specific aspects for operational and investigative monitoring (see table 1) does not support the determination of fixed selection criteria for those.

For surveillance monitoring, according to national networks and WFD requirements as well, representative sampling points are located in general at rivers

- inside river systems covering a catchment area from 500 – max. 2500 km²
- before entering relevant lakes or coastal waters (espec. for load estimation),
- crossing national borders (including load estimations),
- upstream and downstream of urban and/or industrial complexes,
- upstream and downstream of areas which are mostly impacted by diffuse sources from agricultural pressures
- which enter as significant confluent to larger rivers,
- which are designated according to the Information Exchange Decision 77/795/EEC and
- in reaches with anthropogenic unpolluted or just slightly polluted reference sites including intercalibration sites).

The number of stations is mostly dependent upon the variability of conditions in the considered area. Representative networks should quantitatively reflect different aspects like

- the number of ecoregions according to Illies (or some further differentiation to according to expert knowledge),
- the number of river types in the country,
- the number of delineated water bodies,
- the distribution of the total river network in different sized catchments (e.g. areas of 10, 10-100, 100-1000 and >1000 km²) and
- an extended set of reference stations (because of their fundamental importance for reliable and type-specific classification of rivers).

Some additional aspects concerning the selection criteria for monitoring stations are:

As far as possible the already existent network should be used, to restore the value of long-term data series, which are essential for trend estimations.

Each sampling point should be characterised by a passport, indicating fixed data like geographical and hydrological information, but additional aspects like land-use in the catchment, different pressures, corresponding sampling points for emission, groundwater and nature conservation etc. as well.

For practical reasons the locations for biological and physical-chemical sampling are not identical (e.g. bridges are very helpful for sampling of water probes out of the middle of a river), but their location should be as near as possible, so that the results of both quality components can be correlated.

In any case the chosen sampling station should reflect the state of a longer reach instead of a local impact. Similar representativeness is necessary for the cross section of the river. Because of the higher operating expense of measurements at different points of the cross section in larger rivers the need should be thoroughly assessed. Quite often the difference in analysed concentrations lies within the variability of the data sets and cross sectional sampling gives no additional information.

For representative stations the flow of water should be known (by measurement or derivation from near-by gauges. For estimation of loads at special sampling sites the best available data quality for flow is quite essential for reliable estimations.

Due to some international agreements in Europe stations at country borders can be operated jointly. Though some more initial work in harmonising the programmes the burden of monitoring can be shared and the political and public benefit of joint actions should be considered as well. The latter data should be updated in regular intervals.

At exposed places sometimes sampling locations are fully developed to immobile station buildings including, for example, (automatic) devices for sampling, direct analysis and early warning systems. Examples at the River Rhine (the Swiss-German station at Weil and the International Water Control Station Bimmen-Lobith at the German-Dutch border) show the benefit of these stations for public participation as well.

As mentioned before the monitoring networks for surface water, emission control and groundwater should be established and revised co-ordinatedly.

4.1.3 Quality Elements

Due to the ecological-biological focus of the WFD the main quality components are biological elements (WFD, Annex V) considering composition and abundance of aquatic flora, benthic invertebrate fauna and fish (including age structure). Hydromorphological elements (hydrological regime, river continuity and morphological conditions) and partly physico-chemical elements are so-called supporting elements, indicating the ecological focus mentioned above. Despite this there is a specific effort against hazardous substances both on European level (priority substances) as on river basin level (specific pollutants) as well.

Biological elements

Reviewing international experience on biological classification it is obvious, that the assessment of macroinvertebrates will play the key role in ecological assessment in the next years, subsequently followed by fish and macrophytes as used biological elements. Phytoplankton assessments will be restricted to the largest rivers with a long flow time, thus allowing the generation of significant populations. To follow this subsequent pattern in the Hungarian biological monitoring programme is proposed (see chapter 5).

Hydromorphological elements

As stated in WFD, Annex V the hydromorphological quality element is normatively described just for the high status, whereas the other four classes of status are defined just by the values for the biological quality elements (except chemical element and good status). Besides this supporting character of hydromorphology there is the need for surveys, because deficits in biology more and more often are caused by hydromorphological changes. But besides the

high class reference sites and intercalibration sites only those elements should be included, which are significant for the ecological status of waterbodies.

The hydrological regime monitoring demands for a rather fixed network of hydrometrical stations. Again the national network should be representative in view to ecoregion(s), meteorology, geology, topography, land use and catchment sizes. Detailed Information on the existing network for this report was not available, but it can be expected, that particularly the larger rivers are overrepresented. Besides information on water abstraction, especially data on high and low flow have high importance for the support of interpretation of biological data. If revising the national networks, new gauges should in first priority proximate to surveillance monitoring stations; in special cases existing surveillance monitoring stations should be moved to the nearest gauge.

Information on river continuity is a key indicator for the characterisation of river basins as well for they determine the migration of aquatic organisms and refer to the identification of heavily modified water bodies. The sequential mapping and characterising of barriers like reservoirs, dams and weirs is therefore a job for the near future.

The assessment of morphological conditions plays an important role in the understanding of biological deficits. According to system B of the WFD typology, commonly used nearly everywhere in Europe, the subparameters of the morphological quality element has to be surveyed, especially for determining the biotic and abiotic reference conditions of rivers in Hungary.

Physico-chemical elements

These large groups of determinands are mainly needed for assessment of concentrations of hazardous substances in waters and for estimating loads of substances to neighboring countries, lakes and coasts. The general chemical parameters are supporting the biological classification so far, as only specified chemical reference conditions are determined for high status.

But there is additional European effort to reduce or phase-out hazardous substances in two respects: The priority substance approach (WFD, Art. 16) lists a group of 33 pollutants to be considered over Europe in total, developing common strategies for emission limit values and environmental quality standards. The second group are the relevant substances (WFD, Annex V), which have to be dealt with by the Member States inside the river basin catchments. Compliance with environmental quality standards contributes to the good ecological classification.

chemphys; correlation to flow;
Special situation of microbiology;

4.1.4 Parameters / Compartments

Water, sediment= only recent sediments; sps= better than sediment (biota);
Residues in fish (special effect)
measurability of determinands; groups of parameters and the flexible requirements;
minimum set according to Muster Vo II/V; purpose of older determinands to be newly reflected
Use knowledge of fishery associations (Fish Rhine 2000, round fish).
Microbiology extra
8 chemical subprogrammes covering water and sediment
flexible approach for each subprogramme (decision support tree)
homogenous data sets for comparability

Major ions-monitoring-reduction

Chemiemessung durch parallele Abflussmessung/-schätzung ergänzen.

4.1.5 Frequencies

General frequencies per management cycle and per year; discussion of minimum and sound frequencies per year.

Reduce cross section sampling (different aspects)

Comparing list of minimum and technical recommended frequencies

4.1.6 Sampling

Central/decentral; spot sampling/ composite samples

Flow-dependent or event-dependent sampling (see for load examination with floods)

4.2 Lakes

4.2.1 Subprogrammes

4.2.2 Stations

4.2.3 Quality Components

4.2.4 Parameters / Compartments

4.2.5 Frequencies

4.2.6 Sampling

(similar as rivers)

5. Proposal for a Detailed Measurement Programme in Hungary

Summary: *Based on the results of the preceding chapters and general European experience a proposal for a national surface water quality monitoring network is presented. Though some essential input requirements especially for quantification of the numbers of necessary stations and samples are still missing, e.g. the decision on river typology and water bodies, quantified proposals are given due to the recent state of knowledge. This can support a clearer idea of the estimated range of necessary monitoring activities, though the figures have to be evaluated iteratively due to the final decisions in the above mentioned issues. A couple of ideas are implemented in the chapter, how some monitoring activities can be intermediately reduced in particular in the starting procedure of monitoring according to WFD.*

The idea is to establish a structure of a national monitoring programme which covers all activities, which can be executed in similar systems.

So it represents more a scheme for it, but should be as konbkret as possible to allow an estimation on the total amount of monitoring activity.

Lists and tables for a recommended programme with estimated numbers of stations and analyses

Usage of earlier information

Downgraded biological network as a start

Flexible taxonomic resolution in different biology assessments

Need for new typology after first biological assessment action?! Iterations all the way?!

Assumptions for type-number and wb numbers

Grauzonen des ersten Assessments brauchen dringend messdaten

Corresponding registration of hydromorphology while biological measurements

6. Correlated Aspects

Summary: *In this chapter the monitoring processes, which surround the measurement programmes are discussed in more detail. Again based on the preceding gap analysis, further experience and according to the guidance documents of the EU-CIS-process different questions are considered. Institutional responsibilities, information/data handling, quality management and some other “miscellaneous” issues (assessment, classification, intercalibration...) are x-rayed and proposals for streamlined approaches are given.*

Introductory text

6.1 Institutional responsibilities

Administrative respons; gap-analysis Kessler; pro and contra for central or decentral organisation of monitoring; inclusion of data of third parties (associations, self-control); has to be cleared early because of preparation time
General text on QM in all steps of monitoring
Fishery associations

??sampling

central or decentral (cost, work distribution, specialisation; transport problems; organisational aspects...)

6.2 Quality Management

Standardisation of all methods from sampling to report

6.3 Information and data handling

Integration of flow, quality + pressure information
Reference to CIS-GIS-guidance
EDS-finland modell (9 integrated data fields)
Transfer of individual data and aggregated data
Effectiveness by central holding but always evaluation by decentral data owner
Universal data structure
Integration of data by local networks?

6.4 Reporting obligations

6.5 Training of staff

6.6 Any other business

Adaption to new assessment methods
Classification of results
Intercal procedure
Assessment and classification of monitoring data
Translation of key documents