

Summary of National Practices concerning the Monitoring of Waste Water Discharges

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Introduction

The Convention on Cooperation for the Protection and Sustainable Use of the Danube River (Danube River Protection Convention) invites by its Article 9 (Monitoring Programmes) the Contracting Parties "... to develop joint or harmonised methods for monitoring and assessment of waste water discharges including processing, evaluation and documentation of data taking into account the branch-specific-approach of emission limitations;...."

The EMISSIONS EXPERT GROUP (EMIS/EG) of the International Commission for the Protection of the Danube River has included this topic in its working programme and has decided at its 4th Meeting (Budapest, 30-31 March 1998) to evaluate the situation concerning the monitoring of waste water discharges within the States of the Contracting Parties by means of a questionnaire.

This document summarizes the filled-in questionnaires.

1. Status

All 12 countries which are now represented in the EMIS EXPERT GROUP have answered the questionnaire (cited in the 'order of flow', from source to mouth):

Germany; Austria; Czech Republic; Slovak Republic; Hungary; Slovenia; Croatia; Bosnia i Hercegovina; Bulgaria; Romania; Moldova; Ukraine.

The data represent the status in 1998 in the countries. For Bosnia i Hercegovina the given data are related to the situation before 1991. Monitoring of waste water discharges has not yet been established in Bosnia i Hercegovina after the war.

2. Do regulations exist in your State that deal with the monitoring of waste water discharges?

Generally regulations for monitoring of waste water discharges exist on different levels. Table 1 shows an overview.

It is obvious that in all countries regulations for monitoring of waste water discharges exist on the national level.

For one country (Bosnia i Hercegovina) this is the only level on which regulations for monitoring of waste water discharges exist.

In the other countries the national regulations are often completed or specified on regional or local level. In general this happens when the permit is issued or renewed.

Table 1:

State (arranged in the direction of flow of River Danube)	national	regional	local	discharge permit
Germany	x ¹	x	-	x
Austria	x ¹	x	-	x
Czech Republic	x	-	-	x
Slovak Republic	x	-	-	x
Hungary	x	-	-	x
Slovenia	x	-	x	x ²
Croatia	x	-	x	x
Bosnia i Hercegovina	x	-	-	-
Bulgaria	x	-	-	x
Romania	x	-	-	x
Moldova	x	-	-	x
Ukraine	x	-	-	x

¹ For urban waste water treatment compliance with the Urban Waste Water Treatment Directive (91/271/EEC) has to be achieved

² Issued by Ministry of Environment

The term 'regional' in Table 1 refers to its use in central Europe, i.e. a unit below the respective national scale, but actually not only a location.

3. Municipal Discharges

3.1 *Parameters, frequency and duration of sampling in case of self-monitoring and monitoring by authority*

The parameters waste water volume, suspended solids, COD (TOC), BOD, the nitrogen parameters and total P are monitored in all countries on a regular basis.

The parameters AOX (Germany, Austria, Romania, Ukraine, the Czech Republic (starting 2001)), heavy metals and toxicity testing are generally only monitored by request on special occasions, e.g. if there exists a strong influence of industrial waste waters which are discharged via the sewer system into the municipal waste water treatment plant.

The Slovak Republic, Hungary, Romania and Moldova seem to monitor heavy metals (H, RO, MD), toxicity (H, RO) and extractable organic solvents (SK,H) on a more regular basis in self-monitoring. In Germany waste water treatment plants bigger than 100,000 p.e. have to perform a bioaccumulation test (fish basin) once a year.

Self-monitoring is done more frequently than monitoring by authority. Small waste water treatment plants (1,000 - 10,000 p.e.) are monitored at least monthly or weekly, bigger plants

even weekly or daily. Germany states that total P and nitrogen parameters are monitored daily respectively continuously at plants bigger than 100,000 p.e.

Self-monitoring regulations are established either in national or regional laws, in the permit or in individual Cooperation Agreements (Hungary) between authority and dischargers.

Monitoring by authority is done in general 1 to 6 times per year (for Croatia, Bulgaria and Romania 12 times in some cases) and depends on the size of the treatment plant.

Concerning the duration of sampling it was not possible to identify uniform standards in the countries. Nevertheless for smaller waste water treatment plants a short duration period for sampling (grab sampling or 2h-composite sampling) is favoured in general, while for bigger plants 2h-to 24h-composite sampling is practised. This is certainly due to the increased use of automatic samplers at bigger municipal waste water treatment plants.

Since monitoring by authorities includes travelling of the sampling staff to the location of discharge, the duration of sampling by authority is smaller than by self-monitoring and does not exceed 8 hours in general.

According to European Norms only grab sampling is foreseen for the parameter AOX. Waste water volume is monitored continuously in general.

3.2 Who takes samples in self-monitoring and who in case of monitoring by authority?

In self-monitoring samples are usually taken by the staff of municipal waste water treatment plants. In Austria, Hungary, the Czech and the Slovak Republic (for smaller treatment plants) authorized or accredited (commercial) laboratories are often involved in sampling. In Romania samples are mostly taken by municipal water authorities.

In monitoring by authority samples are taken in general by the staff of the regional authority for water management (in Bulgaria and Romania also by the local water authority). In Austria, the Czech Republic, Croatia and Slovenia there exists the possibility that accredited or authorized (commercial) laboratories take the samples. The authorisation of the laboratory can be issued by the Ministry of Environment or State Water Directorate (e.g. Croatia, Slovenia); the authorized laboratory should be independent (Croatia).

3.3 Who analyses the samples in self-monitoring and who analyses in case of monitoring by authority?

Which analysing methods are used?

In general in self-monitoring the staff of the municipal waste water treatment plant analyses the samples. In Romania analysing is done by the municipal water authorities. In other countries (e.g. Austria, Hungary, Czech Republic, Slovak Republic and Bulgaria) accredited (authorised) commercial laboratories are involved in analysing of the samples.

The authorisation for municipal plant laboratory or commercial laboratory is often issued by the Ministry of the Environment (e.g. in Hungary and Slovenia). In Germany the municipal plant laboratories are controlled by commercial laboratories 1-4 times per year. In monitoring

by authority the samples are analysed in general by the laboratories of the regional authorities. Mainly in Germany, Austria and the Czech Republic accredited commercial laboratories play a certain role in the analysing of samples. Often the laboratories of the state authorities have also to be accredited or authorised.

Many countries use international standardised analysing methods (e.g. ISO, EN, DIN). National standards are often in line with these international standards. In Bosnia i Hercegovina American Standard Methods have been used.

In Germany, Austria, Hungary and Slovenia the analysing methods are laid down particularly in the national waste water regulations. In Romania, Slovenia and Germany sometimes simple (but equivalent) analysing methods are used in self-monitoring.

3.4 Are samples stored for later cross-checking? Time period for storing samples?

Usually samples are not stored in the countries for later cross-checking.

In Romania samples are stored for one month. In Bulgaria samples are stored if limit values are exceeded. In Germany in self-monitoring for treatment plants bigger than 20,000 p.e. samples are stored for at least 7 days. In Hungary laboratories store samples for repetition of analysis for a period of time that is regulated in the National Standard. In Austria, the Czech Republic and the Slovak Republic samples might be stored in special cases.

3.5 How often does authority (or do authorities) receive the results of self-monitoring?

In the majority of countries the authorities receive a report on self-monitoring from the municipal treatment plant 1-12 times per year. In the other countries reports could be demanded by the authority by request. The answers of the countries show the big variety of proceedings:

Germany: Annual summary report for plants bigger than 1,000 p.e. is obligatory; by request all data at any time.

Austria: Usually monthly report to the authority.

Czech R.: River basin and water management authorities received the results of self-monitoring twice a year. Since January 1, 1999, according to new Law No. 58, the Czech Inspectorate of Environment is established.

Slovak R: River basin authorities receive the results of self-monitoring 1-2 times per year. Water management authorities and the Slovak Water Inspectorate receive the results on the basis of their needs.

Hungary: The authority gets the results of the self-monitoring with the frequency laid down in the Cooperation Agreements. The usual frequencies are: monthly, quarterly, twice a year.

Slovenia:	Not required on a regular basis, but demanded by the authorities if there is a special need.
Croatia:	This is regulated in the permit, usually 4-12 times per year depending on waste water quantity and quality; not later than one month after analysis.
Bosnia i Hercegovina:	Every three months.
Bulgaria:	Not on a regular basis but possible by demand.
Romania:	The results of self-monitoring are available for the water or environmental authorities. The authorities receive results of sampling on special occasions.
Moldova:	Every three months.
Ukraine:	Regional authorities receive the results monthly.

4. Industrial Discharges

4.1 What is the procedure to industrial discharges concerning frequency of sampling and duration of sampling: Distinguish between self-monitoring and monitoring by authority.

The system for monitoring of industrial discharges in the countries is similar to that of municipal discharges.

Self-monitoring depends on the kind of industry and waste water treatment, the amount of flow and the load of pollutants. The self-monitoring is in general regulated in the permit on the basis of national regulations.

In Germany self-monitoring is regulated by regional laws and in the permit if necessary. In Hungary self-monitoring is not compulsory throughout the country, only part of industry is obliged to do self-monitoring, while in Croatia the self-monitoring data have to be sent to the authority not later than one month after the analysis and in Germany the quality of self-monitoring is inspected by authorities.

The frequency of sampling varies from several times per day (on-line measurements) up to 4 times per year. The duration of sampling in self-monitoring includes the whole range of different possibilities: 24h-composite-sampling, 8h-composite-sampling (Slovak Republic), 4h-composite-sampling (Hungary), 2h-composite-sampling, grab sampling.

In monitoring by authorities authority laboratories or accredited commercial laboratories take samples 1-4 times per year as an average (1-12 times per year in Romania and once per two years in Bosnia i Hercegovina). The duration of sampling is favourably 2h-composite-sampling or grab sampling.

4.2 Which parameters are usually monitored in relevant discharges of the following sectors?

Besides waste water flow and the p_H -value the following parameters are monitored in the different sectors. These parameters are listed according to the number of naming by the countries. The parameters listed have been named by at least two countries.

1. Food Industry: COD, BOD, NH_4 -H, fat, suspended solids, total P, total N, detergents, total dissolved solids, AOX, hydrocarbons, phenols
2. Chemical Industry: COD, BOD, Suspended solids, heavy metals, phenols, NH_4 -N, total N, total P, total dissolved solids, toxicity tests, AOX, detergents, hydrocarbons, oil
3. Pulp and Paper: COD, suspended solids, BOD, NH_4 -N, total P, toxicity tests, total dissolved solids, total N, heavy metals
4. Fertilizer Industry: Total N, COD, BOD, total P, suspended solids, NH_4 -N, total dissolved solids
5. Mining industry: Suspended solids, COD, heavy metals, toxicity tests, NH_4 -N, phenols, non polar extractable substances
6. Iron and steel industry: Suspended solids, COD, heavy metals, Fe, hydrocarbons, total dissolved solids, total P, AOX, oil, toxicity tests, phenols
7. Metal surface treatment: Suspended solids, heavy metals, cyanide compounds, COD, NH_4 -N, toxicity tests, total N, total P, fluoride, nitrite, oil, AOX, sulphide, total dissolved solids, free chlorine, volatile organic carbon, organic solvent extract, Fe, salt content, detergents
8. Textile industry: COD, BOD, suspended solids, heavy metals, salt content, total N, NH_4 -N, total dissolved solids, total P, oil, hydrocarbons, colour, AOX, sulphide, detergents
9. Leather industry: COD, BOD, sulphide, chromium, total P, suspended solids, salt content, AOX, toxicity tests, NH_4 -N, total N, detergents, organic solvent extract
10. Agriculture: COD, BOD, NH_4 -N, total P, suspended solids, total N, total dissolved solids, sulphides, detergents, phenols
11. Other industries: Glass industry, uran mining and nuclear energy plants have been named as relevant under this category.

4.3 *Who takes the samples in self-monitoring and who in case of monitoring by authority?*

The proceedings in the countries are in general the same as for the municipal discharges (see answers to 3.2).

In Germany and Austria in monitoring by authority the possibility exists that authorised (commercial) laboratories by order of the regional authority take samples while in Romania this proceeding happens (sometimes) only for municipal discharges and also for industrial discharges. It is supposed that in Bosnia i Hercegovina monitoring by authority was formerly done by authorised laboratories.

**4.4 *Who analyses the samples in self-monitoring and who analyses in the case of monitoring by authority?
Which analysing methods are used?***

The proceedings in the countries are in general the same as for municipal discharges (see answers to 3.3).

In addition to laboratories of the regional authorities in Bulgaria, Austria and Germany accredited (commercial) laboratories may analyse samples by order of the authorities.

**4.5 *Are samples stored for later cross-checking?
Time period for storing samples?***

The proceedings in the countries are in general the same as for municipal discharges (see answers to 3.4).

In Germany for industrial discharges samples are stored if more than 50m³/d is discharged. In Bulgaria samples are stored not only in the case of exceeded limit values but also in the case of contradictory laboratory results.

4.6 *How often does authority (or do authorities) receive the results of self-monitoring?*

The proceedings in the countries are in general the same as for municipal discharges (see answers to 3.5).

In Germany an annual reporting is obligatory. In Austria the reporting shall be monthly, yearly or by request. The circumstances are laid down in the permit. In Ukraine only the main parameters have to be reported. In Bosnia i Hercegovina self-monitoring results were not submitted to any authority.

4.7 *Specify how dischargers are monitored which discharge into the sewer system.*

Discharges of waste water into the public sewer system are monitored in all countries. One of the main purposes of monitoring is to prevent overloading of the municipal waste water treatment plants and to avoid the inflow of hazardous substances which can damage the purification process.

In Germany easily biodegradable substances (e.g. from food industries) can be discharged according to the rules of the municipality, which arranges also monitoring by authority (municipality or accredited commercial laboratory) and self-monitoring. Monitoring is also the basis for the calculation of the sewage charges.

For industrial waste waters including hazardous substances (e.g. heavy metals and AOX) an additional discharge permit of the regional authority is needed. These discharges, which are usually pretreated at the industrial plants are monitored according to No. 4.1 - 4.6.

In Austria large and relevant discharges into the sewer system are permitted, e.g. discharges from chemical industry, iron and steel industry, metal surface treatment. The permit includes obligations for self-monitoring. The self-monitoring is often accompanied by monitoring by a commercial laboratory.

Large and relevant discharges are usually monitored once a year (grab samples) by authority.

In the Czech Republic, all dischargers to the sewer system need a discharge permit issued by the regional environmental authority. These permits have to respect the "Sewerage Operational Order (SOO)", which includes limit values. All discharges are monitored.

In the Slovak Republic discharges into the sewer system are based on the "Sewerage Order" which establishes e.g. limit values for individual parameters. In case that the obligations in the "Sewerage Order" are not met by the industrial discharge, the water management authority intervenes.

In Hungary the discharge into the sewer system is regulated on a national level. The regulation is similar to that for direct discharges.

Competent authority is the municipality, where the discharge occurs. Discharges into public sewers are monitored by the laboratory of the municipal waste water treatment plant. Minimum sampling frequency is twice a year. Cooperation agreements between municipal waste water treatment plant and the industrial plant regulate the details of monitoring. Self-monitoring is not yet compulsory.

In Slovenia discharges into municipal waste water treatment plants are regulated on a national and/or on a local level (national level is obligatory, local level could be more restrictive). The regulations are in line with the answers 4.1 to 4.6.

In Croatia there is no difference to the monitoring procedure for industrial plants discharging directly to waters.

In Bosnia i Hercegovina no regulations on national or regional level exist. On local level, municipalities sometimes enforced regulations for self-monitoring in the industrial plants.

In Bulgaria the owner of the sewer system (water supply, sewerage company and waste water treatment plant) monitors the industrial dischargers. In some special cases the monitoring is done by authorities.

In Romania the industrial dischargers are monitored by the municipal water authority.

In Moldova the sampling and analysis of industrial plants is being implemented jointly by the inspector from national authority and the municipal laboratory.

In Ukraine monitoring is usually done by the laboratory of the municipal waste water treatment plant. Responsibility for discharges into the sewer system lies within the State Committee for Householding and Construction Policy while the Ministry for Environmental Protection is responsible for direct discharges into waters.

5. How are monitored data used and documented?

Monitored data serve e.g. as basis for decision if permitted concentrations, loads and further requirements have been implemented and for reports on the status of water protection. Data from self-monitoring support the work of authorities and help to operate and maintain the waste water treatment plant.

In Germany data from self-monitoring are aggregated to monthly and annual reports, these data are stored for at least 3 years. The data of monitoring by authority are transmitted to the central data base of regional authority. Additionally the data are used for the calculation of waste water charges.

In Austria the monitored data are documented in data banks, records and monitoring reports, e.g. every 3 years in the water protection report.

In the Czech Republic and the Slovak Republic monitoring data are also used to calculate fees and penalties, for research in water field and the "State Water Management Balance". The data are available for water management and control authorities. On the basis of revised standard STN 75 7241 „Water Quality. Control of Wastes and Special Waters“ in Slovak Republic data are stored for at least five years. In the Slovak Republic the data base "LABOD" is prepared by the Water Research Institute.

In Hungary since 1998 a nation-wide data base is being compiled.

In Croatia the data are used for calculation of a pollution coefficient or of the water pollution fee. The data are documented on forms, the data are also processed on computers.

All monitored data in Bosnia i Hercegovina have been stored at computer centre in the public water enterprise "VODOPRIVREDA". This computer centre has been destroyed during war activities.

In Bulgaria data are used for water quality management and annual reports.

In Romania the monitored data are processed, evaluated and stored in files (printed files, computer software files). This data bank enables the survey of used raw materials, products, waste, documentation about waste water treatment plants and the results of surveillance (there is still a need of a data bank with appropriate software to calculate the pollutant loads).

In Moldova the monitoring data are stored as tables in written format. These are used for reports, which are basis for further measures and decisions.

In Ukraine and Romania the monitoring data are introduced e.g. in annual reports which are used for planning of water resources and for prognosis of social and economical development in Ukraine.

**6. Is there a quality assurance system in function for monitoring of discharges?
Give a short description.**

Quality assurance systems are more or less in function in the laboratories of the countries.

Germany, Austria, the Czech Republic, the Slovak Republic, Hungary, Bulgaria and Slovenia accredit (authorize, certificate) commercial and/or authority laboratories according to internationally valid standards mainly ISO 9000 (Quality management and quality assurance standards-Guidelines for selection and use) and EN 45 001 (General criteria for the operation of testing laboratories). The Czech Republic and the Slovak Republic have installed the “Czech Institute for Accreditation“ and the “(Slovak) National Reference Laboratory (Water Research Institute in Bratislava)“ to take a leading role in the process of accrediting laboratories.

This accreditation process according to internationally valid standards has just started in Croatia, Romania, Moldova and Ukraine. At the present time the quality assurance system in those countries consists mainly of parallel sampling and analysing.