

European Topic Centre on Inland Waters

# **INTERNATIONAL WATER DATABASES**

By

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#### Note

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## EXECUTIVE SUMMARY

This report catalogues and summarises the data contained within databases associated with international monitoring programmes which are relevant to the EEA's needs. Information is provided on each of the data sources together with the type of data included, countries and water bodies covered and the determinands measured. This report is only able to portray the information within the metadatabase using a few relatively simple examples. The main output from this project is a searchable electronic database of the identified international databases that allows rapid identification of geographical areas, determinands measured and temporal coverage of the data.

The monitoring programmes recorded in the metadatabase fall into three broad categories:

- those produced from monitoring schemes derived to support EC legislation;
- those related to international conventions based in Europe; and
- those derived from international conventions based outside Europe such as the UNEP/WHO/UNESCO/WMO project on global water quality monitoring (GEMS/WATER).

Four different sources of information have been used to compile the metadatabase:

- data relating to international conventions agreed between the EEA countries, obtained from the database developed in the project MW1 (Requirements for Water Monitoring);
- published reports and other literature relating to different monitoring programmes, including Paris and Oslo Commission reports, Helsinki Commission reports, the Dobris Assessment, UNEP publications, etc.; and
- information available on the Internet.

Data obtained from these sources were augmented by distribution of a questionnaire to key organisations.

It is intended that the report and the database will be a source of information to be used alongside other reports and inventories produced by the Inland Waters Topic Centre. These include a review of the international monitoring requirements for monitoring surface and groundwaters, and inventories of EEA Member States monitoring networks; surface water quality and quantity networks, and groundwater quality and quantity monitoring networks. The information contained in these reports will be used when implementing the freshwater monitoring network designed for the EEA area. Contacts for each of the databases recorded and summarised in this report will be available through the EEA's Catalogue of Data Sources (CDS). The CDS is available to all National Focal Points and forms part of the EIONET. The CDS is also scheduled to be

made more widely available (for example, to members of the public) through the World Wide Web during 1997.

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## 1. INTRODUCTION

This report catalogues and summarises the data contained within databases associated with international monitoring programmes which are relevant to the EEA's needs. The main output from this project is a searchable electronic metadatabase of these databases that allows rapid identification of geographical areas, parameters measured and temporal coverage of the data. It is intended that the report and the database will be a source of information to be used alongside other reports and inventories produced by the Inland Waters Topic Centre. These include a review of the international monitoring requirements for monitoring surface and groundwaters (Nixon *et al.*, (1996); inventories of EEA Member States monitoring networks, surface quality (Kristensen 1995) and surface quantity (Rees *et al.*, 1996) networks, and groundwater quality and quantity monitoring networks (Koreimann *et al.*, 1996). The information contained in these reports will be used when implementing the freshwater monitoring network designed for the EEA area (Nixon *et al.*, 1996), and will be recorded in the EEA's Catalogue of Data Sources.

The monitoring programmes recorded in the metadatabase fall into three broad categories:

- those produced from monitoring schemes derived to support EC legislation;
- those related to international conventions based in Europe; and
- those derived from international conventions based outside Europe such as the UNEP/WHO/UNESCO/WMO project on global water quality monitoring (GEMS/WATER).

Four different sources of information have been used to compile the metadatabase:

- data relating to international Conventions agreed between the EEA countries, obtained from the database developed in the project MW1;
- published reports and other literature relating to different monitoring programmes, including Paris and Oslo Commission (PARCOM) reports, Helsinki Commission reports, the Dobris Assessment, UNEP publications, etc.; and
- information available on the Internet.

Data obtained from these sources were augmented by distribution of a questionnaire to key organisations.

This report summarises the main aspects of the metadatabase, it provides information on each of the data sources together with the type of data included, countries and water bodies covered and the parameters measured. This report is only able to portray the information within the metadatabase using a few relatively simple examples. However, the electronic version is able to exploit the full flexibility of this media and allows limitless combinations of reporting the data, in line with the users requirements.

Sections 2-6 describe the different sections of the metadatabase covering geographical and temporal coverage, the water bodies included, the parameters reported and the format of data storage.

**It should be noted that the report and database are compiled from the best available information as described. The review process (with National Focal Points and National Reference Centres) revealed additional information and/or errors. Appropriate amendments and additions have been made in this final agreed version of the report.**

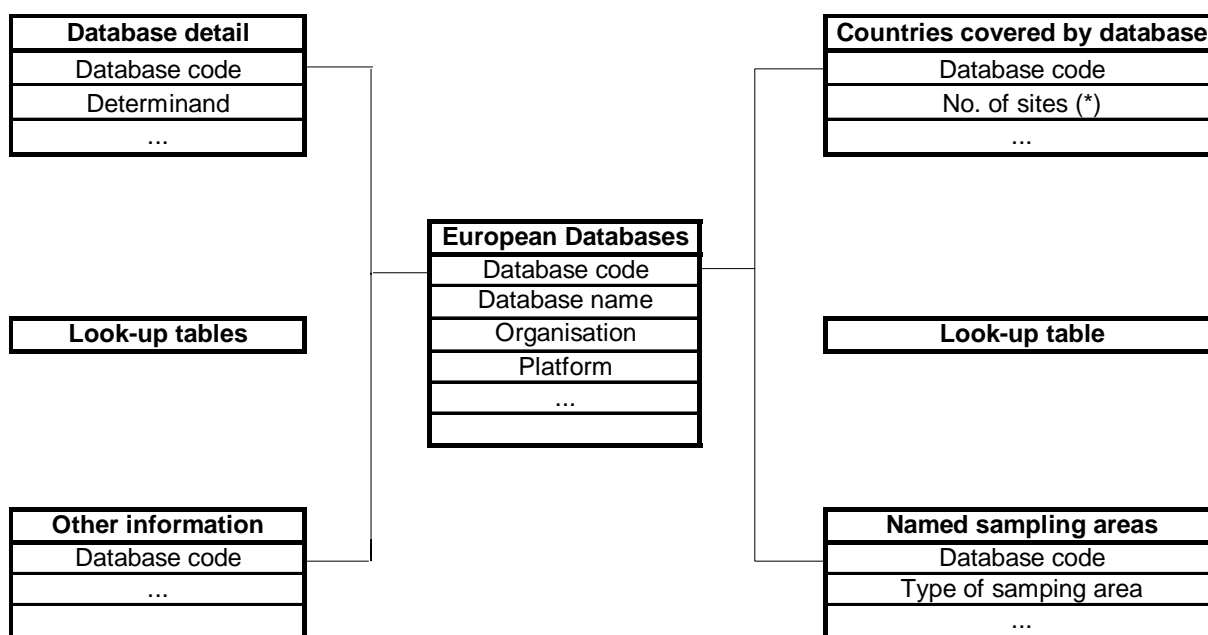


## 2. THE METADATABASE

### 2.1 Metadatabase structure

The metadatabase was constructed using Microsoft Access software. This was selected because it is potentially compatible with the databases on which the metadatabase is based and can be run on most standard business machines.

The metadatabase is structured to minimise duplication of data. Figure 2.1 shows the major component data tables in the database.



(\*) Number of sites for each type of water (rivers, lakes, estuarial water, marine water, groundwater)

*Figure 2.1 Schematic representation of the major elements of the metadatabase structure*

The information is held in five tables:

**European databases:** This table holds the main information for each database, including:

- the name of the database;
- the organisation/s responsible for data collection and data management;
- the platform in which data are collected (reports and/or computer system);
- availability of data; and

- other specific comments such as different phases of the programme or actual status, it also contains the information of the type of sampling site.

**Countries covered by database:** This table holds the history of monitoring for each database by country . This allows the following lists to be produced:

- countries (inside and outside of the EEA area) where monitoring has been carried out;
- the number of sites where sampling has been undertaken in each country according to five different types of water bodies (rivers, lakes, marine water, estuaries, groundwater);
- and the number of years of sampling per country.

**Named sampling areas:** This table contains:

- the name of the areas, regions or water bodies where sampling has been undertaken; and
- the country where each area is situated.

**Database detail:** This table contains the information of the determinands measured in each database. Each determinand is expressed as:

- its name;
- the statistic held in the database;
- the number of years sampling has been carried out and the year it began; and
- the unit in which the determinand is held, together with comments related to the information given for specific sites.

**Other information:** This table holds data related to freshwater quality and quantity, for example, climatic information (precipitation, atmospheric temperature, etc.), land uses, and soil types.

The terms held in the metadatabase tables exactly match those reported in each database to avoid inconsistencies. The data in the tables draw their data from many different and disparate data sources and as a result different definitions are used (e.g. for parameters measured, areas covered etc.). To solve this problem a number of look-up tables have been created in order to standardise, as far as possible, the information held. These are described in Sections 3 to 6.

## 2.2 Scope of metadatabase

Information covering around 20 databases has been identified and collected. These fall into a number of broad categories:

- those produced from monitoring schemes derived to support EC legislation;
- those related to international conventions based in Europe; and
- those based on international conventions based outside Europe.

The picture is further complicated by the fact that some organisations implement several monitoring programmes and produce a number of databases under the same umbrella. This is true of organisations like the Oslo and Paris Commission which produce databases related to specific topics such as pollution by mercury and from the titanium dioxide industry.

Table A.1 and A.2 in Appendix A lists names and addresses of organisations that were consulted for information on each monitoring programme and associate database. Details of those who may be contacted for further information on a specific programme are also included.

### *2.2.1 Databases derived from EU legislation and International Conventions.*

Following the adoption of the Exchange of Information Decision (77/795/EEC as amended by Decision 86/574/EEC), the state of 77 rivers in the EU has been monitored annually. The European Commission has prepared a summary report based on information submitted by each Member State every three years since 1987. The European Commission also maintains databases relating to the quality of designated waters under the Bathing Waters Directive (76/160/EEC), Freshwater Fish Directive (78/659/EEC) and the Shellfish Waters Directive (79/923/EEC).

Some of the monitoring programmes included in the metadatabase come from one international agreement or convention, but have been divided into different records in the metadatabase according to their different type of data (e.g. the record on PARCOM activities is different from that on the Joint Monitoring Programme (JMP) and the different international programmes from the UN/ECE Convention on the Long Range Transboundary Air Pollution each have different records).

Monitoring of European coastal and marine waters and the assessment of land-based sources are undertaken by organisations such as the Helsinki Commission (which monitors the Baltic Sea area), the Paris Commission (which monitors the Northeast Atlantic Ocean), the North Sea Task Force (which monitors the North Sea) and the Mediterranean Action Plan Co-ordination Unit (which monitors the Mediterranean Sea).

The International Council for the Exploration of the Sea (ICES) Environmental Data Bank was established to support ICES' own scientific needs as well as in support of the monitoring programmes of the Oslo and Paris Commissions (OSPAR) and the Arctic Monitoring and Assessment Programme (AMAP). ICES has also provided advice on data handling and data assessment to the Helsinki Commission as well. All 19 ICES member countries have contributed to the data bank that in October 1996 covered data from 1977 to 1995.

The effects of air pollutants on the quality of surface water and groundwater are assessed under the International Co-operative Programmes (ICP) guidelines. Five ICP

programmes started in the 1980's within the UN/ECE Convention on Long-Range Transboundary Air Pollution (LRTAP). The ICP on Assessment and Monitoring on Rivers and Lakes (LRTAP/ICP-Waters) relating to water quality in Europe is included in the metadatabase as "effect programmes", and holds data from 103 riverine sites and 63 lentic sites. In 1988 a UN/ECE International Pilot Programme on Integrated Monitoring began which ran for 4 years and was replaced by the ICP Programme on Integrated Monitoring (ICP-IM) of Air Pollution Effects on Ecosystems. This type of integrated monitoring, which aims to predict the state of the ecosystems and their long-term changes, was found to be successful following several years of assessment in surface and groundwaters. Data have been held at the Environment Data Centre in Helsinki since 1988. The metadatabase contains information on the five ICP-IM subprograms related to the quality of surface water and groundwater. The determinands required for the phase 1993-96 are also included in the metadatabase as an effect programme.

### 2.2.2 *Databases derived from monitoring programmes based in Europe*

The CORINE Information System was developed within the framework of the CORINE (Co-ordination of Information on the Environment) Programme 1985-1990, in order to provide information on the state of the environment in Europe. Since 1990, it has since been maintained by the EEA. In addition to the information from the CORINE Programme the database also contains data resulting from the implementation of the Bathing Waters Directive and the Exchange of Information Decisions. The data are held in an ORACLE database, which is associated with ARC/INFO GIS software which runs the CORINE Information System.

The quality of selected rivers and lakes in the EU area is also surveyed by the Statistical Office of the European Communities (EUROSTAT). Information gathered from a questionnaire sent to each EU country is held in a database built using various platforms including Microsoft Access which has been updated annually since 1970.

The EEA Task Force undertook a data compilation in order to identify and compare the environmental problems for the first State of Environment Report for Europe (the Dobbris Assessment). Information on the quality of rivers and lakes was collected from a questionnaire forwarded to national focal points of European countries not only in the EEA area, but also in the east of Europe. As a result, data on water quality indicators were obtained from a total of about 700 monitoring stations in twenty-eight countries.

The Organisation for Economic Co-operation and Development (OECD) publishes the OECD Environmental Data Compendium every two years containing the response to a questionnaire, sent jointly with that from EUROSTAT since 1988, from twenty-two countries. The metadatabase holds only those data related to European rivers and lakes.

The type of water sampled (freshwater, coastal water and groundwater) and the geographical coverage are the main features differentiate between the twenty-seven monitoring programmes collated in the metadatabase. Some of the organisations (e.g. the European Environment Agency Task Force or the European Commission) have collected data covering a wide range of European rivers and lakes, in the EEA and EU areas. Other organisations (such as the International Commission for the Protection of

the river Rhine, the International Commission for the Protection of the river Elbe) maintain programmes concerned with the protection of a specific river or basin, e.g. monitoring of the Rhine, the Elbe or the Danube, as shown in Table 2.1.

### 2.2.3 *Databases derived from monitoring programmes based outside Europe*

Two of the programmes collected in the metadatabase have a world-wide coverage. These are the Global Environment Monitoring System (GEMS) maintained by the World Health Organisation and the Global Runoff Data Centre (GRDC) database operated under the auspices of the World Meteorological Organisation. Data from European countries, in both cases, are grouped in a “European” region. The GEMS/WATER programme is a joint UNEP/WHO/UNESCO/WMO programme on global water quality monitoring. The information on the quality of fresh and ground water is held in a database maintained in the Canada Centre for Inland Waters. The GRDC, established at the Federal Institute of Hydrology in Koblenz, Germany, maintains and updates information on water quantity of rivers.

**Table 2.1** *Summary of the databases or monitoring programmes collected in the metadatabase*

<i>Database name</i>	<i>Comments</i>
AMAP/Freshwater	At the Ministerial Conference in Rovaniemi, Finland, in June 1991, the Ministers from the eight Arctic countries agreed to develop an Arctic Monitoring and Assessment Programme (AMAP). The primary objectives of the programme are the measurement of the levels of anthropogenic pollutants and assessment of their effects in relevant component parts of the Arctic environment. The assessment will include monitoring for fresh and marine waters and will be presented in status reports. As an initial priority, the AMAP will focus on persistent organic contaminants, selected heavy metals and elements and radionuclides. Ultimately, AMAP should include ecological indicators to provide a basis for the assessment of the status of the Arctic ecosystems.
AMAP/Marine	At the Ministerial Conference in Rovaniemi, Finland, in June 1991, the Ministers from the eight Arctic countries agreed to develop an Arctic Monitoring and Assessment Programme (AMAP). The primary objectives of the programme are the measurement of the levels of anthropogenic pollutants and assessment of their effects in relevant component parts of the Arctic environment. The assessment will include monitoring for fresh and marine waters and will be presented in status reports. As an initial priority, the AMAP will focus on persistent organic contaminants, selected heavy metals and elements and radionuclides. Ultimately, AMAP should include ecological indicators to provide a basis for the assessment of the status of the Arctic ecosystems. The "Named water bodies" considered are the European coastal areas. The areas in Canada or in United States has not been considered in this metadatabase.

*Table 2.1 continued*

<i>Database name</i>	<i>Comments</i>
AMHY	<p>The development of the Data Base containing data from south European countries (AMHY area) is undertaken by the European AMHY (Alpine and Mediterranean Hydrology) group (Topic I), within the FRIEND (Flow Regimes from International Experimental and Network Data) research programme, as a contribution to Unesco's Fourth International Hydrological Programme.</p> <p>The number of years registered is the mean record length by country, that means a total average of 25 year sampling. Although the start of analysis is registered from 1910, it does not mean a total length of 25 years per time series. There are some series beginning before 1910 and ending after 1990, while there are others which record length is shorter. Data are available, in general terms, for the last 25 years up to 1990 in almost every AMHY countries.</p>
Baltic Monitoring Programme	<p>The Helsinki Commission's monitoring and assessment activities are mainly carried out under the Baltic Monitoring Programme (BMP), based on the Convention on the Protection of the Marine Environment of the Baltic Sea area (Helsinki Convention, 1974/1992). Monitoring has been carried out at about 600 stations in the Baltic Sea since 1979. Heavy metals and synthetic organics are assessed in biota, as well as other biological indicators, and analysis of nutrients, physicochemical and organic pollution are undertaken in water.</p>
Bucharest/85	<p>In 1985 The Bucharest Danube Declaration was signed by the riparian countries with the objective of accomplishing the water quality monitoring network of the Danube river, along its border section to Germany, Austria and Slovakia.</p>
CORINE/WATER	<p>The CORINE (COordination of INformation on the Environment) Programme was adopted in 1985 by the European Community's Council of Ministers, with the objective of gathering, co-ordinating and improving the consistency of information on the state of the environment in the European Community.</p> <p>The CORINE Information System on water features contains data about 12 surface water parameters from 1066 gauging stations in meridional EC countries, during the years between 1970-85. It also contains climatological data from 4773 stations in all EC wide coverage. 49141 segments have been digitised in order to get a distribution of major surface water bodies in EC countries. The System Information contains a digital elevation model .</p>
EC Bathing Waters Directive	<p>The Bathing Waters Directive 76/160/EEC sets standards for bathing water (fresh or sea water) quality during the bathing season in terms of physical, chemical and microbiological determinands. Monitoring requirements are defined in terms of minimum frequency, location and reference methods of analysis.</p> <p>The number of sampling sites has increased with time. About 15000 sites were tested for the 1991 campaign while a total of about 17000 were tested in 1994. The total number of sampling sites have been updated to 1994 campaign.</p> <p>Data from the different member states are collected in DOS format although a conversion to Access v2.0 is currently being carried out.</p>
EC Freshwater Fish Directive	<p>The Freshwater Fish Directive 78/659/EEC sets quality objectives for designated fresh waters in order to support fish life. Two types of water are to be designated, those suitable for salmonids and those suitable for cyprinids. Objectives are based on physical and chemical determinands. Minimum monitoring frequencies and some reference methods for analysis are given.</p>
EC Shellfish Waters Directive	<p>The Shellfish Waters Directive 79/923/EEC sets objectives for designated coastal and brackish waters in order to support shellfish. These are based on physical, chemical and microbiological determinands. Minimum monitoring frequencies are given. A separate Directive (91/492/EEC) is concerned with protecting consumers of shellfish.</p>
Elbe/89	<p>ICPE: International Commission for the Protection of the River Elbe. Data updated to 1993 according to the Commission Report.</p>

*Table 2.1 continued*

<i>Database name</i>	<i>Comments</i>
Exchange of Information Directive	Council Decisions 77/795/EEC and 86/574/EEC established a common procedure for the exchange of information on the quality of surface freshwater. It requires monitoring for specified water quality determinands at specific measuring stations (covering the main rivers in each Member State). Results of monitoring must be submitted to the Commission. Reference methods of analysis are given.
FRIEND	<p>The development of the European Water Archive (EWA) is undertaken within the FRIEND (Flow Regimes from International Experimental and Network Data) research programme, as a contribution to Unesco's Fourth International Hydrological Programme. The first phase of the project finished in 1989, and it was followed by the four-year study phase, concluding in 1993.</p> <p>The EWA comprises data from the FRIEND and Alpine and Mediterranean Hydrology (AMHY) programmes. This means that some countries contribute to the EWA with data from both programmes. Nevertheless, a complete data set just for the AMHY programme is collected in this database.</p> <p>The number of years registered is the mean record length by country, that means a total average of 27 year sampling.</p> <p>The FRIEND project began in 1985. No assessment of the monitoring has been carried out. Agencies of different countries have provided data to the FRIEND project free of charge as the condition it is used solely for FRIEND research. Data are available, in general terms, for the last 27 years up to 1993 for almost every FRIEND area country.</p>
GEMS/WATER	GEMS/Water was initiated in 1976 as a freshwater monitoring network. It is operated by UNEP and WHO with the support of UNESCO and WMO as part of the GEMS environmental pollution monitoring programmes. In August 1990 a new phase for GEMS/Water was approved, where long-term objectives were defined.
GRDC/WMO	The GRDC database operates under the auspices of the WMO under the guidance of an international Steering Committee. It contains information of the discharges measured in 600 sites all over Europe (WMO Region 6).
HELCOM/PLCs	<p>The objective of the Pollution Load Compilations (PLCs) is to measure the direct inputs to the Baltic Sea from the land-based uses, according to the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1974 (Helsinki Convention). The PLC tasks have been carried out in stages: PLC-1 was a first compilation of different sets of data. The results were published in BSEP No 20. PLC-2 was a pilot programme based on the results from PLC-1. It tried to undertake a basic coverage of major direct sources of pollution.</p> <p>PLC-3 is the current stage of the programme, which Guidelines were prepared in 1993 aiming a better assessment of direct discharges to the Baltic Sea.</p>
HYDABA/ICPR	<p>In 1950 the International Commission for the Protection of the Rhine against Pollution (ICPR) was founded in Basle. In 1963, the International Convention (Bern Convention) detailed the tasks of the ICPR including to monitor the state of the Rhine and to prepare international conventions on chemical pollution (Rhine Convention 1976), chlorides (Bonn Convention 1976 and 1991) and thermal pollution (ICPR's work in this field is now ended). In 1987, the Rhine countries as well as the ICPR elaborated a comprehensive action programme, the Rhine Action Programme (RAP) which defined targets to be achieved by the year 2000. The ICPR has a monitoring programme which is revised regularly, the latest was published in July 1994 for 1995.</p> <p>Data are held in the HYDABA database of the Federal Hydrological Institute in Koblenz.</p>

*Table 2.1 continued*

<i>Database name</i>	<i>Comments</i>
ICES Environmental Data Bank	<p>The International Council for the Exploration of the Sea (ICES) Environmental Data Bank was established to support ICES' own scientific needs as well as in support of the monitoring programmes of the Oslo and Paris Commissions (OSPAR-12 countries) and the Arctic Monitoring and Assessment Programme (AMAP). ICES has also provided advice on data handling and data assessment to the Helsinki Commission. All 19 ICES member countries have contributed to the data bank that in October 1996 covered data from 1977 to 1995. The following data types are included:</p> <ul style="list-style-type: none"> <li>• contaminants in finfish and shellfish (300,000 records);</li> <li>• contaminants in sea water (ca. 280,000 records);</li> <li>• contaminants in sediments (ca. 73,000 records);</li> <li>• data from measurements of the biological effects of contaminants (EROD and OEB (ca. 3,000 records);</li> <li>• fish disease prevalence (ca. 15,000 records);</li> <li>• quality assurance information</li> </ul> <p>The database is held at ICES in Copenhagen Denmark.</p>
IIASA/Elbe-Oder	<p>The International Institute for Applied System Analysis developed a database for the Upper Elbe/Oder River Basin based on an atmospheric deposition model, water pollution and a soil sampling programme for heavy metal pollution.</p>
IIASA/Rhine	<p>The International Institute for Applied System Analysis developed a database for the Rhine River Basin based on aqueous and atmospheric emissions and deposition for 1955-1990.</p>
JAMP/OSPAR94	<p>The monitoring activities of the new OSPAR Convention 1994 will be carried out by the Environmental Assessment and Monitoring Committee (ASMO) under the Joint Assessment and Monitoring Programme (JAMP). OSPAR 1994 aims to prepare a Status Quality Report 2000 with the data from the JAMP and the MMP (NSTF) collected by the year 2000.</p> <p>The data held in this metadatabase come from the agreements achieved in the Joint Meeting of the Oslo and Paris Commissions in Brussels, June 1995.</p>
Joint Monitoring Programme	<p>The Paris Convention represents the second step taken by the maritime states bordering the North East Atlantic in combating pollution of the marine environment of that region. It followed on from the Oslo Convention which deals with the control of pollution of the seas by the dumping of harmful substances. It introduced two lists of substances for control, the Black and Grey lists. Contracting countries are obliged to eliminate pollution by substances on the Black List and limit pollution by substances on the Grey List. This approach was later adopted in EC legislation. The Convention is administered by a Commission (PARCOM) which required, amongst other things, marine environmental monitoring to be undertaken. A Joint Monitoring Programme (JMP) has been established with the Oslo Commission.</p>
LRTAP/ICP-IM	<p>The Integrated Monitoring Programme (ICP IM) is part of the Effects Monitoring Strategy under the UN/ECE Long-Range Transboundary Air Pollution Convention.</p> <p>The Integrated Monitoring (IM) projects are implemented under the auspices of the Working Group of Environmental Monitoring Data, which is supported by the Environment Committee of the Nordic Council of Ministers.</p> <p>Five sub-programmes related to quality of freshwater and groundwater are being carried out:</p> <ul style="list-style-type: none"> <li>* GW: groundwater chemistry;</li> <li>* RW: runoff water chemistry;</li> <li>* LC: lake water chemistry;</li> <li>* RB: hydrobiology of streams;</li> <li>* LB: hydrobiology of lakes.</li> </ul>



*Table 2.1 continued*

<i>Database name</i>	<i>Comments</i>
LRTAP/ICP-Water	The sulphur protocol to the Convention on Long-Range Transboundary Air Pollution of the UNECE was adopted in 1985 in Helsinki under the auspices of the ECE Protection of the Environment framework. This network has been established to evaluate long range transport and deposition of acidifying compounds.
MEDPOL	Mediterranean Action Plan (MAP) (Phase I 1975 - 1980) led to the long term Mediterranean Pollution Monitoring and Research Programme (MEDPOL). Phase II (1981- ) included monitoring at four levels: sources of pollution; near shore areas; offshore areas; and atmospheric transport of pollutants. Monitoring in MEDPOL is carried out for nine different matrices (air, biota -except plankton-, effluent, plankton, precipitation, seashore, sediment, suspended matter, sea water). In this database only the determinands assessed in biota, plankton, sediment, suspended matter and sea water are recorded.
Monitoring Master Plan	The North Sea Task Force was established following a Ministerial Declaration made at the second International Conference on the Protection of the North Sea held in London in November 1987. Its aim was to enhance scientific knowledge and understanding of the North Sea environment, to provide more consistent and dependable data and to permit links between contaminant inputs, concentrations and effects to be established with greater confidence. A North Sea Task Force Monitoring Master Plan (MMP) has been developed which builds on the monitoring carried out under the Joint Monitoring Programmes (JMP) of the Oslo and Paris Commissions.
PARCOM/ Mercury	Paris Commission tries to reduce the Hg emissions from waste chlor-alkali plants. This record shows the state of emissions over the countries agreeing the Paris Convention updated to 31 December 1992.. There is no chlor-alkali industry in the catchment area for Denmark, Iceland and Ireland.
PARCOM/ Radioactive	In 1986, the Paris Commission agreed to collect information from Contracting Parties about discharges of radioactive substances from nuclear installations in the Convention Area from 1985 onwards. Information is provided from: * nuclear power stations; * nuclear fuel reprocessing plants; * nuclear fuel fabrication plants and * research and development facilities.
PARCOM/ Refineries	The Paris Commission adopted Guidelines for discharges from new refineries in 1980. The number of refineries has decreased between 1980 and 1990.
PARCOM/ Titanium Dioxide	The discharges from the titanium dioxide industry are regularly assessed over the countries agreeing the Paris Convention. There is no production of TiO <sub>2</sub> in Denmark, Ireland, Iceland, Portugal and Sweden. Germany and Belgium have insignificant emissions, and strong acids were dumped up to 31 December 1989. Dumping continues in Spain.
Regensburg/87	In 1987 the Regensburg Agreement was signed between Austria, Germany and the EU with the objective of accomplishing the water quality monitoring network of transboundary rivers.
SIREN-IW/OECD	In the Recommendations adopted on 31st January 1991 by the OECD Council, and approved by Environment Ministers, Member governments agreed to ensure the development of objective, reliable and comparable environmental statistics and information at international level. SIREN (System of Information on Resources and the Environment) is the compilation and publication of environmental data. These data are yearly published in the OECD Environmental Data Compendium. The state of the environment is assessed for: inland waters, air, land, forest, wild life, waste, risks for human health and noise.
The Dobris Assessment	Information in this Report is based on questionnaires forwarded to national focal points; various national and regional state of the environment reports; and a review of the scientific literature concerning the environmental state of European rivers, lakes and reservoirs.

### 3. GEOGRAPHICAL AND TEMPORAL COVERAGE

#### 3.1 Geographical coverage

The geographical coverage for each database or monitoring programme varies depending on the scope of each programme. Table 3.1 shows the EEA area countries involved in each monitoring programme. Germany has the highest level of participation in monitoring programmes (a total of 27). Whilst some countries are signatories to Conventions and their associated monitoring programmes they have not reported data. For example, Spain and Luxembourg have not reported data for the Joint Monitoring Programme under the Oslo and Paris Conventions and no information is available from the Netherlands relating to monitoring carries out under the Convention on Long Range Transboundary Air Pollution.

**Table 3.1** Countries involved in each database or monitoring programme

Database name	A	B	D	DK	E	F	FI	GR	I	IRL	IS	L	N	NL	PT	S	UK
AMAP/Freshwater	-	-	-	X	-	-	X	-	-	-	X	-	X	-	-	X	-
AMHY	-	-	-	-	X	X	-	X	X	-	-	-	-	-	X	-	-
Baltic Monitoring Programme	-	-	X	X	-	-	X	-	-	-	-	-	-	-	-	X	-
Bucharest/85	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CORINE/WATER	-	X	X	X	X	X	-	X	X	X	-	X	-	X	X	-	X
EC Bathing Waters Directive	-	X	X	X	X	X	X	X	X	X	-	X	-	X	X	-	X
EC Freshwater Fish Directive	-	X	X	X	X	X	-	X	X	X	-	X	-	X	X	-	X
EC Shellfish Waters Directive	-	X	X	X	X	X	-	X	X	X	-	X	-	X	X	-	X
Elbe/89	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EUROSTAT Lakes	-	-	X	X	X	-	X	X	-	X	-	X	X	X	X	X	X
EUROSTAT Rivers	-	X	X	X	X	X	-	X	X	X	-	X	-	X	X	-	X
Exchange of Information Directive	-	X	X	X	X	X	X	X	X	X	-	X	-	X	X	-	X
FRIEND	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	X
GEMS/WATER	-	X	X	X	X	X	X	-	X	-	-	X	X	X	X	X	X
GRDC/WMO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
HELCOM/PLCs	-	-	X	X	-	-	X	-	-	-	-	-	-	-	-	X	-
HYDABA/ICPR	-	-	X	-	-	X	-	-	-	-	-	-	-	X	-	-	-
ICES-Environmental databank*		X	X	X	X	X	X			X	X		X	X	X	X	X
JAMP/OSPAR94	-	X	X	X	X	X	X	-	-	X	X	X	X	X	X	X	X
Joint Monitoring Programme	-	X	X	X	X	X	-	-	-	X	X	X	X	X	X	X	X
LRTAP/ICP-IM	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
LRTAP/ICP-Water	X	X	X	X	X	-	X	-	X	X	-	-	X	X	-	X	X
MEDPOL	-	-	-	-	X	X	-	X	X	-	-	-	-	-	-	-	-
Monitoring Master Plan	-	X	X	X	-	X	-	-	-	-	-	-	X	X	-	X	X

**Table 3.1 continued**

Database name	A	B	D	DK	E	F	FI	GR	I	IRL	IS	L	N	NL	PT	S	UK
PARCOM/Mercury	-	X	X	X	X	X	-	-	-	X	X	-	X	X	X	X	X
PARCOM/Radioactive	-	X	X	X	X	X	-	-	-	X	X	-	X	X	X	X	X
PARCOM/Refineries	-	X	X	X	X	X	-	-	-	X	X	-	X	X	X	X	X
PARCOM/Titanium Dioxide	-	X	X	X	X	X	-	-	-	X	X	-	X	X	X	X	X
Regensburg/87	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIREN-IW/OECD	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
The Dobris Assessment	X	X	X	X	X	X	X	-	X	X	X	X	X	X	-	X	X

Note

\* Also includes, Canada, Estonia, Latvia, Lithuania, Poland, Russia, Switzerland, USA

### 3.2 Temporal coverage per country

The metadatabase contains information on the history of monitoring for 22 programmes. However, there is no information relating to that carried out for:

- the Dobris Assessment;
- the CORINE information system;
- the Shellfish Water Directive;
- the Arctic Monitoring and Assessment Programme (fresh and salt water); and
- the pollution land compilations monitoring under the Helsinki Convention.

The temporal information included covers the total number of years that sampling has been carried out for each EEA country (Table 3.2) and the year that monitoring started for each programme. Table 3.3 shows the number of years that monitoring has been carried out in non-EEA countries.

**Table 3.2** *Number of years of sampling per EEA country involved in each monitoring programme*

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
AMAP/Freshwater																	
AMHY					59	128	4	3	64						62		
Baltic Monitoring Programme			15	15			15									15	
Bucharest/85	7		7														
CORINE/WATER																	
EC Bathing Waters Directive		8	8	8	8	8	1 (20*)	8	8	8		8		8	8		8
EC Freshwater Fish Directive										1				1			3
EC Shellfish Waters Directive																	
Elbe/89			5														
EUROSTAT Lakes			13	1	11		21	7		14		11	19	10	6	21	11
EUROSTAT Rivers		14	19	15	21	12	3 (20^)	9	9	12		16		20	9		17
Exchange of Information Directive		14	15	15	6	15		10	15	15		15		15	6		15
FRIEND	31	11	31	53	31	25	50	3	28	24	41	8	37	23		40	25
GEMS/WATER		12	12	2	4	12	10		1			2	6	12	11	9	11
GRDC/WMO	25	8	51	37	23	25	69	3	25	7	39	8	39	44	12	23	22
HYDABA/ICPR			15			15								15			
Joint Monitoring Programme		13	13	13		13				13			13	13	13	13	13
LRTAP/ICP-IM			6				6						7	4	4	12	6
LRTAP/ICP-Water	7	4	9	7	0		17			8			9			10	7
PARCOM/Mercury		11	11		11	11							11	11	11	11	11
PARCOM/Radioactive		6	6	6	6	6							6	6	6	6	6
PARCOM/Refineries		10	10		10	10				10	10		10	10	10	10	10
PARCOM/Titanium Dioxide		13	13	13	14	14				14	14		14	14	14	14	14
Regensburg/87	4		4														
SIREN-IW/OECD	13	13	13	13	13	13	13	13	13	13		13	13	13	13	13	13
The Dobris Assessment																	

Notes:

- \* 1 year as EU Member State, 20 years using same procedures as given in the Directive
- ^ 3 years of 'official' data, 20 years of data in total

**Table 3.3** *Number of years of sampling per country outside the EEA area involved in each monitoring programme*

Database name	AG	AL	BU	BY	CH	CY	CZ	EE	EP	GE	HR	HU	IL	LE	LI
AMHY			9		82										
Baltic Monitoring Programme															
Bucharest/85			7								7	7			
Elbe/89							5								
FRIEND			9		35		64								
GEMS/WATER												12			
GRDC/WMO		9	22		28	21	50			11		36			
HELCOM/PLCs															
HYDABA/ICPR					15										
LRTAP/ICP-IM			NK	NK	4		4	NK		NK		5			
LRTAP/ICP-Water			NK	NK			12					1			
MEDPOL	NK	19				19			NK				19	NK	NK
PARCOM/Radioactive					1										
SIREN-IW/OECD					13		13					13			

Notes:

NK Not known

Database name	LT	LV	MA L	MD	MO	PL	RO	RU	SI	SK	SY	TN	TR	UA	Y
AMHY							151		45						13
Baltic Monitoring Programme	3	3				16		14							
Bucharest/85				7			7			7				7	7
Elbe/89										5					
FRIEND							35	51	25	61					13
GEMS/WATER								11							
GRDC/WMO	42	13		15		37	67	21			4			20	37
HELCOM/PLCs	NK	NK				NK		NK							
HYDABA/ICPR															
LRTAP/ICP-IM	1	1		NK		6	NK	5						NK	
LRTAP/ICP-Water	NK	NK				4		4							
MEDPOL			19		NK						NK	NK	19		19
PARCOM/Radioactive															
SIREN-IW/OECD						13				13					

Notes:

NK Not known

## 4. SUMMARY OF INFORMATION ON DIFFERENT WATER TYPES

### 4.1 Sampling sites for each country

The number of sampling sites in each country involved in the monitoring programmes has been recorded according to the types of water covered, namely:

- rivers;
- lakes;
- estuaries;
- marine and coastal waters; and
- groundwater.

Tables B.1 to B.5 in Appendix B show the number of sites where monitoring has been carried out per country and programme in each of the five types of water.

Different monitoring programmes use different sampling units. For example, the Exchange of Information Decisions and the UNESCO Flow Regimes from International Experimental and Network Data (FRIEND) programme define the sampling site as a sampling station or gauging station, whilst the Oslo and Paris Convention's Joint Monitoring Programme defines areas, each with a number of sampling sites. The specific "site" definitions for each monitoring programme are shown in Table 4.1.

**Table 4.1 Definition of a sampling site per monitoring programme**

<i>Database name</i>	<i>Type of sampling site</i>
AMAP/Freshwater	Lake sediment station for sediment data Fish station for biological data Major rivers stations for water quality data
AMHY	River gauging stations (total number of 261).
Baltic Monitoring Programme	A sampling site has been defined as separate site if the distance of the points is >1.5 nautical mile (1 nautical mile = 1852 metres).. Several countries visit the same sampling sites. These sites are: * harmful substances in biota sampling stations (50); * other sampling stations (718); mainly hydrography, some also primary production, chlorophyll a, phytoplankton, zooplankton and zoobenthos.
Bucharest/85	Sampling area for water quality data. All sampling sites are investigated by both bordering countries. Within the Bucharest Declaration 11 sampling sites in all are investigated. All the samplings are taken from the left and right banks and from the middle of the river, except in four areas: three of them from the middle only (kms. 2203,8; 1806,4; 1433,0), and one in the left and right banks (km. 1873,0)
CORINE/WATER	Gauging stations for flow data. Thermo-pluviometric stations for climatic data. Measuring stations for quality of surface water data.
EC Bathing Waters Directive	Designated freshwater and coastal sampling stations (the registered number of river sites also include lake sites for empty lake site boxes).
EC Freshwater Fish Directive	Sampling or measuring station.

<i>Database name</i>	<i>Type of sampling site</i>
EC Shellfish Waters Directive	Sampling or measuring station
EUROSTAT Lakes	Lake sampling station
EUROSTAT Rivers	River sampling station
Exchange of Information Directive	Sampling or measuring stations
FRIEND	River gauging stations (total number of 4584)
GRDC/WMO	Gauging stations.
HELCOM/PLCs	Sub-regions in the Baltic Sea. Each sub-region reports parameters of riverine inputs from different stations. Stations are divided into hydrological stations (flow measurement) and hydrochemical stations (measures of flow and quality determinands).
HYDABA/ICPR	Sampling stations.
Joint Monitoring Programme	J.M.P. sampling areas: each area contains a different number of stations
LRTAP/ICP-IM	Each monitoring area contains a different number of stations depending on the required monitoring level (intensive for complex monitoring or biomonitoring). Each area may contain (according to the Manual for Integrated Monitoring, phase 1993-1996): station for runoff water, station for hydrobiology of stream, station for hydrobiology of lake, lake water station and a groundwater station.
MEDPOL	Coastal (bathing + coastal general) sampling stations: a total of 5844. Estuarine sampling stations: a total of 186. A total of 52 stations have been defined as "hot spots" due to their high concentrations of different determinands.
Monitoring Master Plan	A total of 85 primary sampling stations has been defined in the ten sub-regions into which the North Sea has been divided by the NSTF. At each of these stations all mandatory determinands will be measured, as they represent the minima requirement for each NSTF monitoring station. Supplementary stations in the vicinity of the Task Force stations is encouraged.
PARCOM/Mercury	Plants based on mercury cells with mercury losses into the catchment area of the Paris Convention.
PARCOM/Radioactive	* nuclear power stations (NPS) * nuclear fuel reprocessing plants (NFRP) * nuclear fuel fabrication and enrichments plants (NFFEP) * research and development (R&D) facilities; plus 2 sampling sites proceeding from municipal sewer system in Netherlands.
PARCOM/Refineries	Refineries discharging to the Paris Convention Area waters.
PARCOM/Titanium Dioxide	Titanium Dioxide industries.
Regensburg/87	Sampling area for water quality data.
SIREN-IW/OECD	Sampling stations. For selected rivers (rivers draining large watersheds in the selected countries) the measurement stations are at the mouth or downstream frontiers of the rivers. For selected lakes, variations in the methods of sampling must be taken into account.
The Dobris Assessment	River stations

## 4.2 Rivers

Twenty one of the monitoring programmes included in the database are related to riverine sites. Fifteen record water quality, although eleven also examine flow. Three

databases hold water quality data on European rivers and the remaining three programmes are associated with inputs to rivers.

### **Water quality of European rivers**

Four programmes determine the water quality of the rivers in an European level: EU Exchange, GEMS/WATER, SIREN/OECD, Rivers/EUROSTAT. Five countries outside the EEA area are also involved in monitoring the water quality of European rivers.

Data for the LRTAP/ICP-Waters programme have been reported by twelve EEA countries at a total of 103 riverine sites.

### **Specific uses of water**

Data have been included in the metadatabase relating to specific uses of rivers, namely:

- designated bathing waters;
- designated freshwater fisheries; and
- industrial emissions.

### **Regional aspects**

Some monitoring programmes are concerned with quality of a specific river or catchment area. Those based on decisions or agreements between three or more European countries have been included, for example:

- data held in HYDABA/ICPR database for the river Rhine;
- Bucharest/85 for the river Danube;
- Regensburg/87 for the Danube catchment area;
- Elbe/89 for the river Elbe; and
- The AMAP/Freshwater programme is concerned with the protection of rivers in the Arctic countries.

### **Water quantity of European rivers**

Three programmes assess water quantity of European rivers:

- AMHY;
- FRIEND; and
- GRDC/WMO.



### **4.3 Lakes**

A total of seven programmes determine water quality parameters in lakes. Belgium, France and Iceland have not reported any data to any of the programmes on quality of lakes.

#### **Water quality of European lakes**

The water quality of lakes (natural and artificial) in Europe is monitored by three programmes. Latvia and the Russian Federation also submit data to the LRTAP/ICP-IM programme.

#### **Specific Water Uses and Regional Monitoring**

The AMAP/Freshwater programme is concerned with the protection of lakes in the Arctic countries, 94 sites in Finland, Norway and Russian Federation are recorded in the metadatabase, although the information is not complete. Information relating to discharges monitored under PARCOM programmes are also included.

Table B.2.1 in Appendix B shows the number of sites where monitoring is carried out in lakes inside the EEA area, and Table B.2.2 shows the European countries outside the EEA area. Information is not complete for the AMAP/Freshwater programme. Information for designated bathing waters has been included with the riverine sites in Table B.1.1.

### **4.4 Estuaries**

Estuarine water has been considered as a separate type of water body since six programmes make this differentiation in their monitoring activities although none of them directly assess the water quality of European estuaries. Two programmes assess estuarine water quality for specific water uses, as designated shellfish waters and for the Joint Monitoring Programme whilst industrial emissions are monitored under PARCOM programmes. Non-EEA countries are included in the MED-POL programme. Table B.3 in Appendix B shows the number of sites where monitoring is carried out in estuaries. Information for designated shellfish waters is not complete.

### **4.5 Coastal waters**

Nine programmes include quality parameters from coastal and marine sites.

#### **General Water quality of coastal and marine areas**

The quality of water in coastal and marine areas is monitored by five general programmes:

- Baltic Monitoring Programme (BMP);
- The Pollution Load Compilations (PLCs/HELCOM) of the Baltic Sea from land-based sources;

- Master Monitoring Plan (MMP);
- MED-POL for the Mediterranean Sea; and
- Joint Monitoring Programme (JMP) for the Northeast Atlantic. The parties to the 1994 Convention on the Protection of the North East Atlantic agreed to implement the Joint Assessment and Monitoring Programme (JAMP) with the aim of preparing a Quality Status Report of the maritime area by the year 2000.

### **Specific Water Uses**

Monitoring to assess compliance of bathing water with the EU Bathing Water Directive was undertaken at 11790 coastal sites of the EU Member States in 1994. EU Member States also assessed compliance waters in coastal sites with the Shellfish Waters Directive. Information on the monitoring of industrial discharges to coastal and marine waters in the Paris Convention Area has also been included.

Table B.4 in Appendix B shows the number of sites where monitoring is carried out by the EEA countries in coastal and marine waters. Information for shellfish waters is not complete.

### **4.6 Groundwater**

Two programmes carry out monitoring in groundwater sites: GEMS/WATER and the groundwater chemistry sub-programme of ICP-IM. Table B.5 in Appendix B shows the number of sites where monitoring is carried out in groundwater.

## 5. SUMMARY OF INFORMATION ON DETERMINANDS

### 5.1 Determinands assessed by monitoring programme

In order to allow information in the metadatabase to be references in terms of determinand, the parameters included have been grouped by means of a look-up table. The types of determinands included and some examples of the standardised determinands grouped into each type are as follows:

Aesthetic determinands: Colour, floating materials, surfactants.

Biological determinands: Benthic fauna, planktonic flora, species list, ecotox test, primary production, tar ball collections, fish disease.

Chemicals: Acidity, calcium, chlorides, cyanides, fluorides etc.

Metals: Aluminium, arsenic, boron, zinc etc.

Microbiological determinands: Coliform, salmonella, total bacteria etc.

Nutrients: Ammonia, nitrogen etc.

Organic pollution: BOD, COD, organic carbon, dissolved oxygen etc.

Physical and physicochemical determinands: Flow, level, pH, temperature, dissolved solids etc.

Radioactive elements: Alpha emissions, caesium, strontium etc.

Synthetic organics: PCB, DDT, BHC, HCH etc.

Table C.1 in Appendix C shows a complete list of the determinands, classified by matrix, for each monitoring programme.

The matrices considered in the metadatabase are biota, water and sediment.

- **Biota** Determinands assessed in biota are grouped under the following headings:
  - biological determinands;
  - metals;
  - microbiological determinands;
  - synthetic organics; and
  - radioactive elements.

Table D.3 in Appendix D shows, where available, the determinands measured in biota for each monitoring programme, the number of sites where they have been assessed, and the year the programme began.

- **Water** The determinands measured in suspended matter have been classified in this matrix, although the each determinand has been annotated with the phrase

“measured in suspended matter”. Similarly, where determinands have been measured in groundwater they are annotated with the term “measured in groundwater”. Determinands assessed in water have been grouped under the following headings: aesthetic, biological, chemical, microbiological and physical determinands, radioactive elements and synthetic organics.

Table D.1 in Appendix D shows the determinands measured in water for each monitoring programme, the number of sites where they have been assessed, and the year the programme began. Table D.2 in Appendix D shows the same information for sea waters, whilst Table D.4 in Appendix D displays the list of determinands monitored in groundwater. All the determinands held in the tables in Appendix D are standardised. Further information on each determinand can be found in Table C.1 in Appendix C.

- **Sediments** The determinands monitored in sediments are listed in Table C.1 in Appendix C.

## 5.2 Statistics used

The determinands are mainly reported by each monitoring programme as their annual average values although in some cases, the annual average is also complemented with the annual maximum and the annual minimum. Other statistics used include the annual averages of the maxima and minima, the mean monthly averages and total annual values. Flow is recorded in terms of maxima, minima and averages.

## 5.3 Units

The unit in which a measurement is expressed is dependent on the determinand concerned.

Chemicals (e.g. Ca, Cl, F, Hg) and metals are usually measured as mg (or  $\mu\text{g}$ ) of each particular element per litre. Other units include  $\mu\text{mol}/\text{dm}^3$ , kg/s and tonnes. When metals are assessed in suspended matter or biota, they are measured as g/kg.

Coliforms, faecal coliforms and faecal streptococci have been recorded in terms of the number per 100 ml ( $\text{N}/100\text{ml}$ ). Phytoplankton is counted either in  $\text{N}/\text{l}$  (or  $\text{N}/\text{ml}$ ) or the number of species. Chlorophyll is measured in  $\text{mg}/\text{m}^3$  or  $\mu\text{g}/\text{dm}^3$ . Other biological indicators have different units, the carbon dark fixation and the inorganic assimilated carbon are both measured in  $\text{mg C m}^3/\text{day}$ , the specimen density in rivers and lakes is measured in  $\text{indiv}/\text{m}^2$  and respiration is measured in  $\text{mg O}_2 \text{ m}^3/\text{day}$ .

Nutrients have been recorded in mg (or  $\mu\text{g}$ ) per litre. Nitrogen compounds are expressed in all cases as mg N/l whilst phosphorous compounds are measured either as mg P/l or  $\text{mg PO}_4/\text{l}$ . Silica is measured in mg Si/l or kg Si/s. One programme also uses  $\mu\text{mol}/\text{dm}^3$ .

BOD and COD have both been measured in terms of  $\text{mg O}_2/\text{l}$ . Dissolved oxygen has been measured as  $\text{mg O}_2/\text{l}$  and  $\% \text{O}_2$ . Organic carbon has been measured as mg C/l and kg/s.

Flow has mainly been measured as  $\text{m}^3/\text{s}$ , although the stream runoff is reported in  $\text{l}/(\text{s}\cdot\text{km}^2)$  and groundwater level has been measured in cm from the surface.

Alkalinity has been reported as mg/l and as mmol H ions/l. Conductivity is always measured as  $\mu\text{S}/\text{cm}$  and temperature is always reported in  $^{\circ}\text{C}$ . Suspended and dissolved solids have both been measured in mg/l. The colour in water has been measured in  $\text{cm}^{-1}$ , and also expressed by the colour number (Pt mg/l)

Radioactivity in water is measured in Bq/l (or mBq/l). The synthetic organics assessed in water are expressed in  $\mu\text{g}/\text{l}$  or reported as tonnes discharged in effluent. Those assessed in suspended matter and biota are measured in  $\mu\text{g}/\text{kg}$  (or mg/kg).

## 6. PLATFORMS

In general there is a lack of information about the format in which data is contained within the different databases. The software used to store data includes:

- ORACLE relational database management system (RDMS). Some databases using this system are compatible with the ARC/INFO GIS system. or have an interface with RAISON, (Regional Analysis by Intelligent systems on a microcomputer), a system which is able to provide regional statistics based on maps;
- Ingres;
- DOS;
- Microsoft Access; and
- INFORMIX under UNIX

In addition, some data are reported only as hard copy. No information was available relating to the systems used for holding the data.

## 7. NATIONAL MONITORING DATABASES

As has been described in the introduction to this report it is intended that this report is used in conjunction with other ETC/IW reports to provide the source of relevant information for the Agency and Topic Centres and for implementation of the freshwater monitoring network. The relevant information from these other reports are not reproduced here but the some of the relevant Tables referring to national databases are listed.

1. Surface water quality monitoring (Kristensen 1995) - *Appendix A List of monitoring networks, periodical surveys and special surveys.*
2. Surface water quantity monitoring (Rees *et al.*, 1996) - *Table 4.1 Data storage and management, and Table 4.12 Availability of data.*
3. Groundwater quality monitoring (Koreimann *et al.*, 1996) - *Table 4.9 Data storage and management, and Table 4.10 Availability of data.*
4. Groundwater quantity monitoring (Koreimann *et al.*, 1996) - *Table 5.9 Data storage and management, and Table 5.10 Availability of data.*

For further information the reader should consult the relevant quoted reports and/or the EEA's Catalogue of Data Sources.

## 8. REFERENCES

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# **APPENDIX A**

## **LIST OF DATABASES OR MONITORING PROGRAMMES REVIEWED LIST OF CONTACT ORGANISATIONS**

TABLE A.1 - Organisations and persons consulted and contact organisation and contact person for each monitoring programme.

TABLE A.2 - Addresses of the contact organisations.

**Table A.1 Organisations and persons consulted and contact organisation and contact person for each monitoring programme.**

Monit. Programme	Contact Organisation	Contact Person	Q	Reply
AMAP			X	-
AMHY	CEMAGREF (France)	Ms. Alexandra Manea	X	Q
BMP.	Finnish Environment Institute (FEI)	Ms. L Tuominen-Roto	X	Q
Bucharest/85	Institut für Wassergüte des Bundesamtes für Wasserwirtschaft (Austria)	Dipl. Ing. Peter Kreitner	X	Q
CORINE/WATER	EEA (Denmark)	Mr. Niels Thyssen	X	-
EC Bathing Water	EC /DGXI (Belgium)	Mr. I. Papadopoulos	X	D
EC Freshwater Fish	EC /DGXI (Belgium)	Mr. Jonathan Moore	X	-
EC Shellfish Waters	EC /DGXI (Belgium)	Mr. Jonathan Moore	X	-
EEA -TF (Dobris)	NERI (Denmark)	Mr. Peter Kristensen	X	-
Elbe/89	Wassergütestelle Elbe (Germany)	Herr Dr. Stachel	X	D
EU Exchange	EC /DGXI (Belgium)	Mrs. Adeline Kroll	X	A
FRIEND	IH Wallingford (UK)	Mr. Gwyn Rees	X	Q
GEMS/WATER	NWRI/CCIW (Canada)	Mr. Bob Duffield	I	I
GRDC/WMO	GRDC/Federal Institute of Hydrology (Germany)	Dr. Wolfgang Grabs	X	M
HYDABA/ICPR	Federal Institute of Hydrology (Germany)	Mr. Dr. Keller	X	D
ICP-IM	Finnish Environment Institute (FEI)	Ms. Sirpa Kleemola	I	G
ICES Environmental data bank	ICES (DK)	Mr Jan René Larsen	X	I
JMP	OSPARCOM (UK)	Mr. B van de Wetering	X	D
Lakes/EUROSTAT	EUROSTAT (Luxembourg)	Mr. Theo van Cruchten	A	A
LRTAP/ICP-Waters	NIVA (Norway)	Ms. Merete Johannessen	X	Q
MMP	OSPARCOM (UK)	Mr. B van de Wetering	X	D
MED-POL	UNEP (Greece)	Mr. A. Aksel	X	M
PARCOM/Hg	OSPARCOM (UK)	Mr. B van de Wetering	X	D
PARCOM/Radioactive	OSPARCOM (UK)	Mr. B van de Wetering	X	D
PARCOM/Refineries	OSPARCOM(UK)	Mr. B van de Wetering	X	D
PARCOM/TiO2	OSPARCOM (UK)	Mr. B van de Wetering	X	D
PLCs/HELCOM	HELCOM (Finland)	Ms Eeva-Liisa Poutanen	L	G
Regensburg/87	Bundesministerium für Land und Forstwirtschaft.(Austria)	Dr Monika Eder-Paier	X	Q
Rivers/EUROSTAT	EUROSTAT (Luxembourg)	Mr. Theo van Cruchten	X	A
SIREN-IW/OECD	OECD Environment Committee (France)		A	A
JAMP/OSPAR94	OSPARCOM (UK)	Mr. B van de Wetering	X	G

Key to the "Q" (Questionnaire forwarded to) and "Reply" column:

X: Questionnaire forwarded to the "Organ\_consulted".

-. No response to the questionnaire forwarded to collate (and complete as necessary) the data. Information collected in the database is not complete.

Q: Filled questionnaire received.

D: Data compilations in reports

G: Guidelines in reports

L: Letter

I: Internet

M: Data on magnetic supports

A: Data available in the ETC/IW office.

**Table A.2** *Addresses of the contact organisations*

Contact	Address	Telephone number	Fax/ e-mail
Mrs. Adeline Kroll	EUROPEAN COMMISSION Directorate General XI Environment Nuclear Safety and Civil Protection 200 Rue de la Loi, B-1049 Brussels BELGIUM	+32 2 2969175	+32 2 2969562
Mr. Peter Kristensen	National Environmental Research Inst. Vejlssøvej 25 PO BOX 314 DK - 8600 Silkeborg DENMARK	+45 89 20 1400	+45 89 20 1414 fvap@wpgate.dmu.min.dk
Mr. Niels Thyssen	EUROPEAN ENVIRONMENT AGENCY Kongens Nytorv 6 DK 1050 Copenhagen K DENMARK	+45 33 14 50 75	+45 33 14 65 99 niels.thyssen@eea.dk
Mr. Bob Duffield	NWRI, Canada Centre for Inland Waters P.O BOX 5050 Burlington, Ontario L7R 4A6, CANADA.		(*) Bob.Duffield@cciw.ca
Mr. Gwyn Rees	INSTITUTE OF HYDROLOGY Wallingford Oxfordshire OX10 8BB	+44 1491 838800	+44 1491 8382256
Ms. Merete Johannessen	NIVA PO Box 173 Kjelsås N-0411 Oslo NORWAY	+47 22 18 5140	+47 22 18 5200 Merete.Johannessen@niva.no
Mr. I. Papadopoulos	EUROPEAN COMMISSION Directorate General XI Environment Nuclear Safety and Civil Protection 200 Rue de la Loi, B-1049 Brussels BELGIUM	+32 2 2969175	+32 2 2969562
Mr. L. Jeftic	Co - ordinating Unit for the Mediterranean Action Plan United Nations Environment Programme PO Box 18019 11610 Athens GREECE	+30 1 72531905	+30 1 72531967 unepmedu@athena.compulink.forthnet.gr
Mr. BGM van de Wetering	The Secretary General Oslo and Paris Commission New Court 48 Carey Street London WC2A 2JE	+4401712429927	
Mr. Jonathan Moore	EUROPEAN COMMISSION Directorate General XI Environment Nuclear Safety and Civil Protection 200 Rue de la Loi, B-1049 Brussels BELGIUM	+32 2 2368677	
Mr. Ulf Ehlin	The Executive Secretary Helsinki Commission Mannerheimintie 12 A SF - 00100 Helsinki FINLAND	+35806220220	
Ms. Alexandra Manea	Division Hydrologie-Hydraulique CEMAGREF Groupement de Lyon 3 bis, Quai Chauveau - CP 220 69336 LYON Cedex 09 FRANCE	+33 72 208768	+33 78477875 manea@lyon.cemagref.fr
Dr. Wolfgang Grabs	Global Runoff Data Centre Federal Institute of Hydrology Kaiserin Augusta-Aulagen, 15 - 17 56068 Koblenz GERMANY	+49 261 1306-0	+492611306302

Contact	Address	Telephone number	Fax/ e-mail
Dr. Wilhelm Vogel	Federal Environment Agency Spittelauer Lände 5 1090 Vienna AUSTRIA	+431313045308	+431313045400
Frau Dr. A. Schulte- Wülwer-Leidig	Int. Kommission zum Schutze des Rheins Hohenzollernstraße 18 Postfach 309 D-56003 Koblenz GERMANY	+49 261 1249-5	+49 261 3657-2
Herr Dr. Stachel	Wassergütestelle Elbe Neßdeich, 120-121 21129 Hamburg GERMANY	+49 40 38073245	+49 40 38073248
Ms. Sirpa Kleemola	Finnish Environment Institute Impacts Research Division PO Box 140 FIN-00251 Helsinki FINLAND	+358 9 403 000	+358 9 4030 0190  Sirpa.Kleemola@vyh.fi
Mr Jan René Larsen	ICES, Palægade 2-4, DK-1261 Copenhagen K, Denmark	+ 45 331 54225	+ 45 33 93 42 15 jrl@server.ices.inst.dk <a href="http://www.ices.dk">http://www.ices.dk</a>

(\*) Information on GEMS/WATER can be found in Internet under item 2 "CCIW Environmental Data" at  
This gopher address: <gopher.cciw.ca>

## **APPENDIX B**

### **SUMMARY OF NUMBER OF SITES SAMPLED IN MONITORING PROGRAMMES**

TABLE B.1.1 Number of sampled riverine sites per EEA country involved in each monitoring programme.

TABLE B.1.2 Countries outside the EEA area involved in the metadata base monitoring programmes at riverine sites.

TABLE B.2 1 Number of sampled lakes per eea country involved in each monitoring programme.

TABLE B.2 2 European countries outside the eea area in the metadata base monitoring programmes at lake sites.

TABLE B.3 Number of sampled estuaries per eea country involved in each monitoring programme.

TABLE B.4 Number of sampled coastal and marine sites per eea country involved in each monitoring programme.

TABLE B.5 Number of sampled groundwater sites per country involved in each monitoring programme.

**Table B.1.1 Number of sampled riverine sites per EEA country involved in each monitoring programme.**

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
AMAP/Freshwater							1						3			1	
AMHY					36	41		2	88						3		
Bucharest/85	2		1														
EC Bathing Waters Directive		86	1915	116	346	1666	376 <sup>^</sup>	4	679	9		20		523	24		
EC Freshwater Fish Directive		155	477	3739	140	567		25	1160*	48		15		354			2221
Elbe/89			11														
EUROSTAT Rivers		8	13	4	16	17		6	16	4		5		14	18		20
Exchange of Information Directive		9	12	4	15	16	8	6	16	4		1		13	13		17
FRIEND	83	76	518	35	36	1357	69	2	72	62	8	2	178	25		65	1030
GEMS/WATER		9	12	4	5	16	3		7			1	4	5	1	3	10
GRDC/WMO	9	3	38	17	20	57	18	4	11	7	10	2	17	5	16	18	52
HYDABA/ICPR			3			2								3			
LRTAP/ICP-IM			1				5						2		1	12	2
LRTAP/ICP-Water	7	5	70	2						13						6	
PARCOM/Radioactive		3	28		4	10							2	3			3
PARCOM/Refineries		4	12		1	4								5			
PARCOM/Titanium Dioxide			3											1			
Regensburg/87	8		6														
SIREN-IW/OECD	2	3	3	2	4	4	3	3	2	2		2	1	6	3	4	4

Notes:

No data related to the number of sites per country are available from EEA-TF (Dobris) and CORINE/WATER. Information is not complete for AMAP and EC Freshwater Fish programmes. For EC Bathing Water, the number of sampled lakes are included in the number of riverine sites.

(a PARCOM/Refineries-(MP26): One refinery discharging to public water supply.

(b PARCOM/Radioactive (MP25): Four plants discharging to public water supply

(c PARCOM/Radioactive (MP25): One plant discharging to public water supply

\* 1160 designated areas, each area may have more than one monitoring site

<sup>^</sup> 42 riverine sites, 334 lake sites

**Table B.1.2 Countries outside the EEA area involved in the metadatabase monitoring programmes at riverine sites**

<i>Database name</i>	<i>BU</i>	<i>CH</i>	<i>CY</i>	<i>CZ</i>	<i>GE</i>	<i>HR</i>	<i>HU</i>	<i>LT</i>	<i>LV</i>	<i>MD</i>	<i>PL</i>	<i>RO</i>	<i>RU</i>	<i>SI</i>	<i>SK</i>	<i>SY</i>	<i>UA</i>	<i>Y</i>
AMHY	3	31										33		12				5
Bucharest/85	2					1	3					6			3		2	2
Elbe/89				5														
FRIEND	3	90		16								33	21	12	23			5
GEMS/WATER							2						30					
GRDC/WMO	15	9	14	24	8		19	5	3	2	19	7	73			4	22	13
HYDABA/ICPR		2																
LRTAP/ICP-IM		1		1					2		1		4					
PARCOM/Radioactive		4																
SIREN-IW/OECD		3		3			4				2				2			

Notes:

Monitoring programme code: They are the same as those of the Table B.1.1.  
(a GEMS/WATER: Stations in Russian Federation is for all the former USSR.

**Table B.2.1 Number of sampled lakes per EEA country involved in each monitoring programme**

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
AMAP/Freshwater							4						70				
EC Freshwater Fish Directive									2								
EUROSTAT Lakes			1	1	4		3	4		4		4	3	2	3	4	3
GEMS/WATER							2						3	1	1	1	2
LRTAP/ICP-IM							5							1			
LRTAP/ICP-Water	6	4	10		2		6		2	5			5			6	6
PARCOM/Radioactive																1	1
PARCOM/Refineries			1														
SIREN-IW/OECD	2		1	1	2		3		4	2			3	1	2	2	2

Notes:

AMAP/Freshwater (MP01): Information not complete.

EC Bathing Water (MP07): The number of lakes have been included in the number of riverine sites in table B.1.1.

**Table B.2.2 European countries outside the EEA area in the metadatabase monitoring programmes at lake sites**

<i>Database name</i>	<i>CH</i>	<i>CZ</i>	<i>HU</i>	<i>LV</i>	<i>PL</i>	<i>RU</i>
AMAP/Freshwater						20
GEMS/WATER			1			11 <sup>a</sup>
LRTAP/ICP-IM				1	1	3
LRTAP/ICP-Water		2	2		3	4
SIREN-IW/OECD	2		2			

a GEMS/WATER: Former USSR



**Table B.3** *Number of sampled estuaries per EEA country involved in each monitoring programme*

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
EC Shellfish Waters Directive																	2
Joint Monitoring Programme		1	1			2				2				3	2		7
PARCOM/Radioactive						1								1	1		4
PARCOM/Refineries					2	5							1	1	1		13
PARCOM/Titanium Dioxide			1		1	3							1				3

**Table B.4** *Number of sampled coastal and marine sites per EEA country involved in each monitoring programme*

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
Baltic Monitoring Programme			363	191			254									102	
EC Bathing Waters Directive		39	444	1190	1490	1870	100	1526	4543	108				52	315		457
EC Shellfish Waters Directive		1	5	45	47	82		47	36 *	2				7	17		29
Joint Monitoring Programme		1	1	7	7	4				5			1	3	4	3	5
MEDPOL					224	70		246	221								
Monitoring Master Plan		8	10	4		5							21	10		7	20
PARCOM/Mercury		4	11		5	3							1	2	2	2	11
PARCOM/Radioactive				1		4								1		5	17
PARCOM/Refineries		1								1			4		2	5	

Note:

- Number of areas designated, each area may have more than one monitoring site

**Table B.5** *Number of sampled groundwater sites per country involved in each monitoring programme*

<i>Database name</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>DK</i>	<i>E</i>	<i>F</i>	<i>FI</i>	<i>GR</i>	<i>I</i>	<i>IRL</i>	<i>IS</i>	<i>L</i>	<i>N</i>	<i>NL</i>	<i>PT</i>	<i>S</i>	<i>UK</i>
GEMS/WATER					1								1			3	2
LRTAP/ICP-IM			1										1	1	1	12	1

# **APPENDIX C**

## **LIST OF DETERMINANDS ASSESSED BY EACH MONITORING PROGRAMME**

TABLE C.1 List of determinands assessed by each monitoring programme

**Table C.1 List of determinands assessed by each monitoring programme**

Monitoring Programme Name	Matrix (biota, sediment, water) and monitored determinands
AMAP/Freshwater	<p><b>Biota:</b> Arsenic, Cadmium, Chlordane, Chromium, Copper, DDT, Dieldrin, Hexachlorobenzene, Hexachlorocyclohexane, Lead, Mercury, Nickel, PAH, PCB, Zinc.</p> <p><b>Sediment:</b> Aluminium, Arsenic, Cadmium, Calcium, Chlordane, Chlorides, Chromium, Copper, DDT, Dieldrin, Hexachlorocyclohexane, Iron, Lead, Magnesium, Mercury, Nickel, Organic carbon, Radionuclides<sup>(1a)</sup>, PAH, PCB, Potassium, Selenium, Sodium, Zinc.</p> <p><b>Water:</b> Aluminium, Arsenic, Cadmium, Caesium, Calcium, Chlorides, Chromium, Conductivity, Copper, Flow, Fluorides, Iron, Lead, Magnesium, Mercury, Nitrogen<sup>(1b)</sup>, Organic carbon, pH, Phosphorous, Planktonic flora, Potassium, Radionuclides<sup>(1b)</sup>, Selenium, Sodium, Sulphates, Suspended solids, Zinc</p>
AMAP/Marine	<p><b>Biota and water</b><sup>(2a)</sup>: Arsenic, Cadmium, Chlordanes<sup>(2b)</sup>, Chromium, Caesium<sup>(2b)</sup>, Copper, DDTs<sup>(2c)</sup>, Dieldrin, HCB, HCH, Lead, Lipid, Mercury, Nickel, Oil hydrocarbons, PAHs<sup>(2d)</sup>, PCBs<sup>(2e)</sup>, PCCs<sup>(2f)</sup>, PCDDs, PCDFs, Planar PCBs<sup>(2g)</sup>, Plutonium<sup>(2g)</sup>, Selenium, Strontium<sup>(2g)</sup>, Zinc.</p> <p><b>Sediments:</b> Arsenic, Cadmium, Chlordanes<sup>(2b)</sup>, Chromium, Caesium, Copper, DDTs<sup>(2c)</sup>, Dieldrin, Grand size (&lt;63 µm), HCB, HCH, Lead, Lithium, Mercury, Nickel, Oil hydrocarbons, PAHs<sup>(2d)</sup>, PCBs<sup>(2e)</sup>, PCCs<sup>(2f)</sup>, PCDDs, PCDFs, Planar PCBs<sup>(2g)</sup>, Plutonium<sup>(2g)</sup>, Selenium, Strontium<sup>(2g)</sup>, TOC, Zinc.</p>
AMHY	<b>Water:</b> Flow
BMP	<p><b>Biota:</b> Benthic fauna<sup>(4a)</sup>, Cadmium, Copper, DDE, DDT, Hexachlorocyclohexane, Lead, Mercury, PCB, Planktonic fauna, Planktonic flora<sup>(4b)</sup>, Zinc</p> <p><b>Water:</b> Alkalinity, Ammonia, Chlorophyll-a, Dissolved Oxygen, Hydrogen sulphide, Nitrogen<sup>(4c)</sup>, pH, Phosphorous<sup>(4d)</sup>, Salinity, Silicon, Temperature.</p>
Bucharest/85	<b>Water:</b> Alkalinity, Alpha activity, Ammonia, AOX, Arsenic, Benthic fauna <sup>(5a)</sup> , Beta activity, Bicarbonate, BOD, Caesium <sup>(5a)</sup> , Calcium, Chlorides, Chromium, COD <sup>(5a)</sup> , Coliforms, Conductivity, Copper, DDT, Dissolved Oxygen, Faecal coliforms, Flow, Hardness, Hexachlorocyclohexane, Hydrocarbons, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Nitrogen <sup>(5b)</sup> , pH, Phenols, Phosphorous <sup>(5c)</sup> , Planktonic flora, Potassium, Sodium, Species list, Strontium, Sulphates, Surfactants, Suspended solids, Temperature, Total bacteria, Triazine, Tritium, Zinc.
CORINE/WATER	<b>Water</b> <sup>(6a)</sup> : Alkalinity, Ammonia, BOD, Cadmium, Chlorides, Chromium, COD, Coliforms, Conductivity, Copper, Dissolved Oxygen, Flow, Iron, Lead, Manganese, Nickel, Nitrogen <sup>(6b)</sup> , pH, Phosphorous <sup>(6c)</sup> , Zinc.
EC Bathing Water Directive	<b>Water:</b> Total Coliforms, Faecal Coliforms, DO, Tarry residues, Colour, Enteroviruses, Faecal coliforms, Faecal streptococci Floating materials, Mineral oils, Phenols, Salmonella, Surfactants, Transparency.
EC Freshwater Fish Directive	<b>Water:</b> Ammonia <sup>(8a)</sup> , BOD, Chlorides, Copper, Dissolved Oxygen, Hydrocarbons, Nitrates, pH, Phenols, Phosphorous, Suspended solids, Temperature, Zinc.
EC Shellfish Waters Directive	<b>Water:</b> Arsenic, Cadmium, Chromium, Colour, Copper, Dissolved Oxygen, Faecal coliforms, Hydrocarbons, Lead, Mercury, Nickel, organohalogenated substances, substances affecting taste, saxitoxin, pH, Salinity, Silver, Suspended solids, Temperature, Zinc.
EEA -TF (Dobris)	<b>Water:</b> Alkalinity, Ammonia, BOD, Chlorides, COD, Copper, Dissolved Oxygen, Nitrogen <sup>(10a)</sup> , pH, Phosphorous <sup>(10b)</sup> , Zinc.
Elbe/89	<b>Water:</b> Alkalinity, Ammonia, AOX, Arsenic, Benthic fauna <sup>(11a)</sup> , Benzene, BOD, Cadmium, Calcium, Chlorides, Chlorobenzene, Chromium, COD, Coliforms, Colour, Conductivity, Copper, Dichloroethane, Dichlorobenzene <sup>(11a)</sup> , Dimethoat, Dissolved Oxygen, Faecal coliforms, Flow, Hexachlorobenzene, Iron, Lead, g-HCH, Magnesium, Manganese, Mercury, Nickel, Nitrogen <sup>(11b)</sup> , Organic carbon <sup>(11c)</sup> , Parathion, PCB <sup>(11d)</sup> , Pentachlorophenol, pH Phosphorous <sup>(11e)</sup> , Planktonic flora <sup>(11f)</sup> ,

Monitoring Programme Name	Matrix (biota, sediment, water) and monitored determinands
	Potassium, Sodium, Sulphates, Suspended solids, Temperature, Tetrachloroethene, Toluene, Tetrachloromethane, Trichlorobenzene <sup>(11g)</sup> , Trichloroethene, Trichloromethane, Xylen, Zinc.
<b>EU Exchange of Information Decisions</b>	<b>Water:</b> Ammonia, BOD, Cadmium, Chlorides, COD, Coliforms, Conductivity, Dissolved Oxygen, Total Coliforms, Faecal coliforms, Faecal streptococci, Flow, Mercury, Nitrites, pH, Phosphorous <sup>(12a)</sup> , Salmonella, Temperature, Surfactants, biological quality.
<b>FRIEND</b>	<b>Water:</b> Flow
<b>GEMS/WATER</b>	<b>Water:</b> Aldrin, Alkalinity, Aluminium <sup>(14a)</sup> , Ammonia Anionic tensides MBAS, Arsenic <sup>(14a)</sup> , Barium <sup>(14a)</sup> , Benzene hexachloride, BOD, Boron <sup>(14a)</sup> , Cadmium <sup>(14a)</sup> , Calcium <sup>(14a)</sup> , Chlorides, Chromium <sup>(14a)</sup> COD, Coliforms, Conductivity, Copper <sup>(14a)</sup> , Cyanide, DDD <sup>(14b)</sup> , DDE <sup>(14b)</sup> , DDT <sup>(14c)</sup> , Dieldrin, Dissolved Oxygen, Dissolved solids, Endrin, Faecal coliforms, Faecal streptococci, Flow, Fluorides <sup>(14d)</sup> , Hydrogen sulphide, Iron <sup>(14a)</sup> , Lead <sup>(14a)</sup> , Lithium <sup>(14a)</sup> , Magnesium <sup>(14a)</sup> , Manganese <sup>(14a)</sup> , Mercury <sup>(14a)</sup> , MIREX, Nickel <sup>(14a)</sup> , Nitrogen <sup>(14e)</sup> , Organic carbon, Organochlorides, Organophosphorus <sup>(14f)</sup> , PAH, PCB, pH, Phenols, Phosphorous <sup>(14g)</sup> , Planktonic flora, Potassium <sup>(14a)</sup> , Selenium <sup>(14a)</sup> , Silicon, Sodium, Sulphates, Suspended solids, Temperature, Temperature (atmospheric), Transparency, Zinc <sup>(14a)</sup> .
<b>GRDC/WMO</b>	<b>Water:</b> Runoff.
<b>HYDABA/ICPR</b>	<b>Water</b> <sup>(16a)</sup> : Alpha activity, Ammonia, AOX, Arsenic, Azinphos-ethyl, Azinphos-methyl, Bentazone, Benzene, Benzofluoranthene, Benzoperylene, Benzopyrene, Beta activity, Cadmium, Caesium, Calcium, Chlor-dimethylaniline, Chlor-nitrobenzene, Chloridazone, Chlorides, Chloroaniline, Chlorotoluene, Chlorotoluron, Chromium, Conductivity, Copper, COT, DDD, DDE, DDT, Desethylatrazine, Dichloroaniline, Dichloroethane, Dichlorvos, Dimethylaniline, Dissolved Oxygen, Diuron, EDTA, Endosulfan, Fenthion, Flow, Fluoranthene, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclohexane, Indeno pyrene, Iron, Isoproturon, Lead, Magnesium, Manganese, Mercury, Metazachlor, Nickel, Nitrobenzene, Nitrogen <sup>(16b)</sup> , Nitrotoluene, NTA, Organic carbon <sup>(16c)</sup> , Parathion, PCB, Pentachlorophenol, pH, Phosphorous <sup>(16d)</sup> , Potassium, Silicon, Sodium, Strontium, Sulphates, Suspended solids, Temperature, Tetrachloroethene, Triazine trichlorobenzene, Trichloroethane, Trichloroethene, Trichloromethane, Trifluralin, Tritium, Zinc.
<b>ICES Environmental Data Bank</b>	<b>Water:</b> physical measurements, inorganic, major constituents, inorganic metals, inorganic nutrients, major organic constituents, organochlorine (chlorobiphenyls), organochlorines (DDT), other organochlorines, hexachlorocyclohexanes, organometallic compounds. <b>Biota:</b> physical measurements, inorganic metals, radionuclides, organochlorine (chlorobiphenyls), organochlorines (cyclodienes or drins), organochlorines (DDT), other organochlorines, hexachlorocyclohexanes, organometallic compounds, polycyclic aromatic hydrocarbons, biological effects measurements (EROD ethoxyresorufin-O-deethylase measurements), disease prevalence in fish <b>Sediment:</b> physical measurements, inorganic, major constituents, inorganic metals, inorganic nutrients, radionuclides, polycyclic aromatic hydrocarbons, organochlorine (chlorobiphenyls), organochlorines (cyclodienes or drins), organochlorines (DDT), organochlorines (dioxins), other organochlorines, hexachlorocyclohexanes, organometallic compounds, biological effects measurements (OEB oyster embryo bioassay).
<b>LRTAP/ICP-IM</b>	<b>Biota:</b> Biomass <sup>(18a)</sup> , Carbon dark fixation <sup>(18b)</sup> , Inorganic assimilated carbon <sup>(18b)</sup> , Respiration <sup>(18a)</sup> , Shannon-Wiener diversity index <sup>(18a)</sup> , Specimen density <sup>(18a)</sup> . <b>Water:</b> Alkalinity <sup>(18c)</sup> , Aluminium labile <sup>(18c)</sup> , Aluminium total <sup>(18c)</sup> , Calcium <sup>(18d)</sup> , Chloride <sup>(18d)</sup> , Chlorophyll a, Colour number, DOC, Dissolved oxygen, Flow in groundwater, Groundwater level, Iron <sup>(18e)</sup> , Magnesium <sup>(18d)</sup> , Manganese <sup>(18e)</sup> , Mercury, Nitrogen ammonium <sup>(18d)</sup> , Nitrogen nitrate <sup>(18d)</sup> , pH <sup>(18c)</sup> , Phosphorous phosphate, Phosphorous total, Potassium <sup>(18d)</sup> , Runoff, Silica <sup>(18d)</sup> , Sodium <sup>(18d)</sup> , Specific conductivity <sup>(18c)</sup> , Sulphur sulphate <sup>(18d)</sup> , Temperature.
<b>JMP</b>	<b>Biota:</b> Cadmium, Mercury, PCB. <b>Water:</b> Cadmium, Copper, Hexachlorocyclohexane, Lead, Mercury, Nitrogen <sup>(19a)</sup> ,

Monitoring Programme Name	Matrix (biota, sediment, water) and monitored determinands
	Phosphorous <sup>(19b)</sup> , Salinity, Suspended, solids, Zinc.
Lakes/EUROSTAT	<b>Water:</b> Acidity, Ammonia, Arsenic, BOD, Cadmium, Chromium, COD, Copper, Dissolved Oxygen, Dissolved solids, Lead, Mercury, Nickel, Nitrogen <sup>(20a)</sup> , Phosphorous <sup>(20b)</sup> , Suspended solids, Temperature, Transparency, Zinc.
LRTAP/ICP-Water	<b>Water:</b> Alkalinity, Calcium, Chlorides, Dissolved Oxygen, Inorganic assimilated carbon, Magnesium, Mercury, Organic carbon, pH, Planktonic flora, Potassium, Silicon, Sodium, Temperature.
Monitoring Master Plan	<b>Biota:</b> Cadmium, DDT, Dieldrin, Hexachlorocyclohexane, Lead, Mercury <sup>(22a)</sup> , PCB, PCP, HCB, HCB, Drins, Chloroform, Carbon Tetrachloride Zinc. <b>Sediment:</b> Arsenic, Cadmium, Copper, Chromium, DDT, Drins, Hexachlorobenzene, Lead, Mercury <sup>(22a)</sup> , Nickel, PCB, Zinc. <b>Water:</b> Aldrin, Arsenic, Ammonia, Cadmium, Chlorophyll A, Chromium, Copper, Dieldrin, DDT, Dissolved Oxygen, Endrin, Hexachlorocyclohexane, HCB, Lead, Mercury, Nickel, Nitrogen <sup>(22b)</sup> , PCP, Phosphorous <sup>(22c)</sup> , Salinity, Silica, Suspended solids, Temperature, Turbidity, Zinc
MEDPOL	<b>Biota:</b> Aldrin, Antimony, Aromatics, Arsenic, Beryllium, Cadmium, Chlordane, Chromium, Cobalt, Copper, DDD <sup>(23a)</sup> , DDT <sup>(23a)</sup> , DDE <sup>(23a)</sup> , Dieldrin, Endrin, Endosulfan, Endosulfan Sulphate, Enteroviruses, E. Coli, Faecal Coliforms, Faecal Streptococci, Halogenated Hydrocarbons, m Heptachlor, Heptachlor Epoxide, Hexachlorobenzene, Iron, Lead, Lindane, Manganese, Mercury <sup>(23b)</sup> , Molybdenum, Nickel, Polyaromatic Hydrocarbons, Polychlorinated Biphenyls <sup>(23c)</sup> , Pseudomonas Aeruginosa, Rubidium, Salmonella, Selenium, Silver, Staphylococcus Aureus, Total Coliforms, Tin, Vanadium, Zinc. <b>Sediment:</b> Aldrin, Aliphatics, Antimony, Arsenic, Cadmium, Calcium <sup>(23d)</sup> , Chromium, Chlordane, Copper, DDD <sup>(23a)</sup> , DDT <sup>(23a)</sup> , DDE <sup>(23a)</sup> , Dieldrin, E. Coli, Endrin, Endosulfan, Endosulfan Sulphate, Enteroviruses, Faecal Coliforms, Faecal Streptococci, Halogenated Hydrocarbons, Heptachlor, Heptachlor Epoxide, Hexachlorobenzene, HCH, Iron, Lead, Lindane, Manganese, Mercury <sup>(23b)</sup> , Molybdenum, Phenols, Phosphorus <sup>(23e)</sup> , Salmonella, Selenium, <i>Staphylococcus aureus</i> , Silver, Tin, Total Coliforms, Total Organic Carbon, Vanadium, Zinc. <b>Water:</b> Aldrin, Ammonia, Antimony, Arsenic, Beryllium, BOD, Cadmium, Caesium, COD, Chromium, Chlordane, Aromatics, Cobalt, E coli, Conductivity, Copper, DDD <sup>(23a)</sup> , DDT <sup>(23a)</sup> , DDE <sup>(23a)</sup> , Detergents, Dieldrin, Dissolved Oxygen, Endosulfan, Endosulfan Sulphate Endrin, Enteroviruses, Faecal Coliforms, Faecal Streptococci, Halogenated Hydrocarbons, Heptachlor <sup>(23f)</sup> , Hexachlorobenzene, Hexachlorocyclohexane, Iron, Lead, Lindane, Manganese, Mercury <sup>(23b)</sup> , Molybdenum, Nickel, Nitrogen <sup>(23g)</sup> , PAH's, PCBs <sup>(23c)</sup> , Petroleum Hydrocarbons, Phenols, Phosphorus <sup>(23e)</sup> Phytoplankton, <i>Pseudomonas aeruginosa</i> , Rubidium, Salmonella, Selenium, Silver, Silicates, <i>Staphylococcus aureus</i> , Tar balls, Tin, Total Coliforms, Total Organic Carbon, Total Suspended Solids, Vanadium, Zinc.
PARCOM/Hg	<b>Water:</b> Mercury
PARCOM/Radioactive	<b>Water:</b> Alpha activity, alpha + beta activity, beta, beta + gamma activity, Tritium, Other radionuclides.
PARCOM/Refineries	<b>Water:</b> BOD, COD, Hydrocarbons, Oil from refineries, Organic carbon, Phenols, Sulphides.
PARCOM/TiO2	<b>Water:</b> Aluminium, Arsenic, Cadmium, Calcium, Chromium, Cobalt, Copper, Hydrochloric acid, Iron <sup>(27a)</sup> , Lead, Magnesium, Manganese, Mercury, Nickel, Sodium, Sulphates, Titanium, Vanadium, Zinc, Zirconium.
PLCs/HELCOM	<b>Water:</b> Ammonia, AOX, Cadmium, Chromium, COD <sup>(28a)</sup> , Copper, Flow, Lead, Mercury, Nickel, Nitrogen <sup>(28a)</sup> , Organic carbon, Phosphorous <sup>(28b)</sup> , Suspended solids, Zinc.
Regensburg/87	<b>Water:</b> Alkalinity, Alpha activity, Ammonia, AOX, Arsenic, Benthic fauna, Beta activity, BOD, Cadmium, Calcium, Chlorides, Chromium, COD, Coliforms, Conductivity, Copper, Dissolved Oxygen, Faecal coliforms, Faecal streptococci, Flow,

Monitoring Programme Name	Matrix (biota, sediment, water) and monitored determinands
	Hardness, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Nitrate, Organic carbon <sup>(29a)</sup> , pH, Phosphorous <sup>(29b)</sup> , Salmonella, Sulphates, Suspended solids, Temperature, Tetrachloroethane, Tetrachloromethane, Trichloroethane, Trichloromethane, Tritium, Zinc.
<b>EUROSTAT/Rivers</b>	<b>Water:</b> Acidity, Ammonia, Arsenic, BOD, Cadmium, Chromium, COD, Copper, Dissolved Oxygen, Dissolved solids, Flow, Lead, Mercury, Nickel, Nitrogen <sup>(30a)</sup> , Phosphorous, Salmonella, Streptococci, Suspended solids, Temperature, Tensio active substances, Zinc.
<b>SIREN-IW/OECD</b>	<b>Water:</b> Ammonia, BOD, Cadmium, Copper, Dissolved Oxygen, Lead, Nitrogen <sup>(31a)</sup> , Phosphorous <sup>(31b)</sup> .
<b>JAMP/OSPAR94</b>	Primary list of determinands: Cadmium, Mercury, Nutrients, Oil, PAHs, Lead, PCBs, phytoplankton, Radionuclides, TBT.  Further information will be taken into account in the development and implementation of the JAMP.

Notes:

<sup>(1a)</sup> Radionuclides in lake sediments: Pb-210 (essential), Cs-134, Cs-137 (both recommended)

<sup>(1b)</sup> Nitrogen: Nitrate, Tot-N

Radionuclides in water: Cs-134, Cs-137, gross gamma radiation (all of them recommended).

<sup>(2a)</sup> All determinands in water are recommended, except Cs-134, Cs-137 and Sr-90 which are considered essential.

<sup>(2b)</sup> Chlordanes: cis-chlordane, trans-nonachlor, cis-nonachlor, trans-chlordane.

<sup>(2c)</sup> DDTs: pp'-DDT, pp'-DDE, pp'-DDD

Caesium: Cs-143; Cs-137

<sup>(2d)</sup> PAH: Naphthalene, and C1-, C2-, and C3- alkyl derivatives; Anthracene; Phenanthrene and C1- and C2- alkyl derivatives; Dibenzothiophene and C1- and C2- alkyl derivatives; Fluoranthene; Pyrene; Benzo[a]anthracene; Chrysene; Benzofluoranthenes; Benzo[e]pyrene; Benzo[a]pyrene; Perylene; Benzo[g,h,i]perylene; Indeno[1,2,3-cd]pyren and Dibenzo[a,h]anthracene.

<sup>(2e)</sup> Cbs nos. 28,31,52,101,105,118,138,153,156,180.

<sup>(2f)</sup> PCCs: Toxaphene.

<sup>(2g)</sup> Planar Cbs: IUPAC nos 77,126,169

Plutonium: Pb-239; Pb-240

Strontium: Sr-90

<sup>(4a)</sup> Zoobenthos and zooplankton

<sup>(4b)</sup> Chlorophyll-a, phytoplankton, phaeopigment.

<sup>(4c)</sup> NO<sub>3</sub>-N; NO<sub>2</sub>-N; Tot-N

<sup>(4d)</sup> Dissolved inorganic phosphorous, Tot-P.

<sup>(5a)</sup> Benthic fauna: Saprobic index, saprobic level.

COD:COD, COD-Mn

Caesium: Cs-134, Cs-137

<sup>(5b)</sup> Nitrite, Nitrate.

<sup>(5c)</sup> Orthophosphate; Tot-P

<sup>(6a)</sup> Data from the EU Exchange of Information, except Coliforms (based on the EC bathing Water Directive) and Flow.

<sup>(6b)</sup> NO<sub>3</sub>-N, Tot-N.

<sup>(6c)</sup> PO<sub>4</sub>-P, Tot-P

<sup>(8a)</sup> Non-ionised ammonia, Tot-ammonium.

<sup>(10a)</sup> Tot-N, NO<sub>3</sub>-N

<sup>(10b)</sup> Tot-P, Dissolved orthophosphate.

<sup>(11a)</sup> Benthic fauna: Saprobic index.

Dichlorobenzene:1,2-; 1,3-; 1,4- Dichlorobenzene

<sup>(11b)</sup> NO<sub>3</sub>-N, NO<sub>2</sub>-N

<sup>(11c)</sup> DOC, TOC

<sup>(11d)</sup> PCBs nos. 101, 138, 153, 180, 52, 28, Tot-PCBs.

<sup>(11e)</sup> Tot-P, Orthophosphate.

<sup>(11f)</sup> Chlorophyll, phytoplankton

<sup>(11g)</sup> 1,2,3-; 1,2,4-; 1,3,5- Trichlorobenzene

<sup>(12a)</sup> Tot-P

<sup>(14a)</sup> Measured as total and dissolved.

<sup>(14b)</sup> DDDs: op-DDD; pp-DDD; pp-DDD olefin.

DDEs: op-DDE; pp-DDE.

<sup>(14c)</sup> DDTs: op-DDT; pp-DDT; total-DDT.

<sup>(14d)</sup> Fluoride: for groundwater stations only.

- (14e) NO<sub>3</sub>+NO<sub>2</sub>; Tot-N.
- (14f) Dissolved and particulate.
- (14g) Dissolved and particulate: PO<sub>3</sub>-P, PO<sub>4</sub>-P; Tot-P.
- (16a) Determinands measured in suspended matter: COT, Tot-P, Fe, Hg, Ni, Zn, Cu, Cr, Pb, Cd, Mn, As; 2,4' DDT; 4,4' DDT; 2,4' DDD; 4,4' DDD; 2,4' DDE; 4,4' DDE; 1,2,3-trichlorobenzene; 1,2,4-trichlorobenzene; 1,3,5-trichlorobenzene; Hexachlorobenzene; PCB 28; PCB 52; PCB 101; PCB 118; PCB 138; PCB 153; PCB 180; Fluoranthene; Benzo(b)fluoranthene; Benzo(k)fluoranthene; Benzo(a)pyrene; Benzo(ghi)perylene; Indeno(1,2,3-cd)pyrene.
- (16b) NO<sub>3</sub>-N, Tot-N.
- (16c) TOC, DOC.
- (16d) Orthophosphate, Tot-P.
- (18a) Determinands to be measured in the hydrobiology of lakes and hydrobiology of streams subprogrammes.
- (18b) Determinands to be measured in the hydrobiology of lakes subprogramme.
- (18c) Also measured in groundwater.
- (18d) Also measured as dissolved in groundwater.
- (18e) Measured as dissolved in groundwater only.
- (19a) NO<sub>3</sub>-N, Tot-N
- (19b) PO<sub>4</sub>-P, Tot-P
- (20a) NO<sub>3</sub>-N, Tot-N
- (20b) Tot-P
- (22a) Methyl-Hg.
- (22b) NO<sub>3</sub>-N, NO<sub>2</sub>-N, Tot-N.
- (22c) Orthophosphate, Total dissolved phosphorus.
- (23a) op-DDD; pp-DDD; op-DDT; pp-DDT; op-DDE; pp-DDE.
- (23b) Total and Organic Mercury, Sediment and biota, Total in water
- (23c) As Arochlor 1254, 1260.
- (23d) Calcium; Calcium carbonate.
- (23e) Organic Phosphorous; Tot-P; Phosphates (only in water)
- (23f) Heptachlor; Heptachlor Epoxide.
- (23g) Nitrates; Nitrites; Nitrates+Nitrites; Tot-N.
- (27a) Tot-Fe, Iron (II) Chloride, Iron (II) sulphate
- (28a) COD: COD-Mn; COD-Cr.  
Nitrogen: NO<sub>3</sub>-N, NO<sub>2</sub>-N, Tot-N.
- (28b) Tot-P, PO<sub>4</sub>-P
- (29a) TOC, DOC
- (29b) Orthophosphate, Tot-P.
- (30a) Tot-N, Orthophosphate.
- (31a) Nitrates, Tot-N
- (31b) Tot-P

## **APPENDIX D**

### **DETERMINANDS MEASURED, NUMBER OF SITES AND STARTING YEAR PER MONITORING PROGRAMME FOR DIFFERENT WATER TYPES AND MATRICES**

- TABLE D.1 Quality of surface freshwaters: determinands measured per monitoring programme in matrix water, number of sites and start of analysis.
- TABLE D.2 Quality of marine and coastal waters: determinands measured per monitoring programme in water, number of sites and start of analysis.
- TABLE D.3 Quality of marine and coastal waters: determinands measured per monitoring programme in matrix biota, number of sites and start of analysis.
- TABLE D.4 List of determinands required in groundwater by lrtap/icp-im and gems/water.



**Table D.1 Quality of surface freshwaters: Determinands measured per monitoring programme in water, number of sites and start of analysis**

The figures in brackets indicate the number of sites where the determinand has been measured. The figure following the number of sites indicate the year of starting of the analysis. Detailed information on determinands can be found in Table C.1.

Determinand	MP01	MP05	MP06	MP07 <sup>b</sup>	MP08 <sup>c</sup>	MP10 <sup>d</sup>	MP11	MP12 <sup>g</sup>	MP14 <sup>h</sup>	MP16	MP20	MP21	MP29 <sup>i</sup>	MP30	MP31 <sup>l</sup>
<b>Aesthetic determinands:</b>															
Colour				X (17172)			X (14)92								
Float. mat.				X (17172)											
Surfactants		X (11)88		X (17172)											
<b>Biological determinands:</b>															
Benthic fauna		X (11)88					X (14)93						X (14)		
Plank. flora	X	X (11)88					X (16)93		X						
Species list		X (11)88													
<b>Chemical determinands:</b>															
Acidity											X (35)70			X (127)70	
Calcium	X	X (11)91					X (16)92		X	X (3 to 0)			X (14)		
Chlorides	X	X (11)88	X (137)70		X	X (442)	X (16)89	X (125)	X	X (3 to 0)			X (14)		
Cyanide									X						
Fluorides	X								X						
Hyd.sulphide									X						
Mercury										X (3 to 0)					
Sulphates	X	X (11)88					X (16)89		X	X (3 to 0)		X	X (14)		
<b>Metals:</b>															
Aluminium	X								X			X			
Arsenic	X	X (11)91					X (16)93		X	X (3 to 0)	X (6)85		X (2)	X (39)75	
Barium									X						
Boron									X						
Cadmium	X		X (137)70				X (16)92	X (125)	X	X (3 to 0)	X (10)80		X (2)	X (115)75	X (45)
Chromium	X	X (11)91	X (137)70				X (16)93		X	X (3 to 0)	X (8)80		X (2)	X (56)75	X (42)
Copper	X	X (11)91	X (137)70		X	X (192)	X (16)89		X	X (3 to 0)	X (11)83		X (2)	X (59)70	X (42)
Iron	X	X (11)88	X (137)70				X (16)92		X	X (3 to 0)			X (2)		
Lead	X	X (11)91	X (137)70				X (16)93		X	X (3 to 0)	X (10)85		X (2)	X (59)75	X (45)
Lithium									X						
Magnesium	X	X (11)91					X (16)92		X	X (3 to 0)			X (14)		
Manganese		X (11)91	X (137)70				X (16)92		X	X (3 to 0)		X	X (2)		

Table D.1 continued

Determinand	MP01	MP05	MP06	MP07 <sup>b</sup>	MP08 <sup>c</sup>	MP10 <sup>d</sup>	MP11	MP12 <sup>e</sup>	MP14 <sup>h</sup>	MP16	MP20	MP21	MP29 <sup>i</sup>	MP30	MP31 <sup>l</sup>
Mercury	X	X (11)91					X (16)90	X (125)	X	X (3 to 0)	X (9)80		X (2)	X	
Nickel		X (11)91	X (137)70				X (16)93		X	X (3 to 0)	X (4)80		X (2)	X (39)75	
Potassium	X	X (11)91					X (16)92		X	X (3 to 0)					
Selenium	X								X						
Sodium	X	X (11)91					X (16)92		X	X (3 to 0)		X			
Zinc	X	X (11)91	X (137)70		X	X (176)	X (16)92		X	X (3 to 0)	X (10)85		X (2)	X (49)75	
<b>Microbiological determinands:</b>															
Coliforms		X (11)91	X (171)72	X (171)72			X (14)93	X (125)	X				X (14)		
F. coliforms		X (11)91		X (171)72			X (13)93	X (125)	X				X (14)		
F. streptococci.				X (171)72				X (125)	X				X (14)		
Salmonella				X (171)72				X (125)					X (14)	X (3)89	
Streptococci														X (3)89	
Total bacteria		X (11)91													
<b>Nutrients:</b>															
Ammonia		X (11)88	X (137)70		X	X (580)	X (16)89	X (125)	X	X (3 to 0)	X (30)70		X (14)	X (140)70	X (56)
Nitrogen	X	X (11)88	X (137)70		X	X (1)	X (16)89	X (125)	X	X (3 to 0)	X (9)70	X	X (14)	X (5)	X (8)
Organo P									X						
Phosphorous	X	X (11)88	X (137)70		X	X (2)	X (16) <sup>e</sup>	X (125)	X	X (3 to 0)	X (32)70	X	X (14)	X (117) <sup>f</sup>	X (9)
Silicon									X	X (3 to 0)					
<b>Organic Pollution:</b>															
BOD		X (11)88	X (137)70		X	X (645)	X (16)93	X (125)	X		X (8)80		X (14)	X (13)70	X (55)
COD		X (11)88	X (137)70			X (470)	X (16)89	X (125)	X		X (10)70		X (14)	X (6)80	
Diss. oxygen		X (11)88	X (137)70		X	X (620)	X (16)89	X (125)	X	X (3 to 0)	X (19)70		X (14)	X (7)70	X (55)
Org. carbon	X						X (15)92		X	X (3 to 0)		X	X (14)		
<b>Physical determinands (flow and level) and physicochemical determinands:</b>															
Flow	X	X (11)88	X (137)70				X (16)89	X (125)	X	X (3 to 0)			X (14)	X (109)7	
Level												X			
Alkalinity		X (11)88	X (137)70			X (274)	X (14)92		X				X (14)		
Bicarbonate		X (11)91													
Conductivity	X	X (11)88	X (137)70				X (16)89	X (125)	X	X (3 to 0)			X (14)		
Diss. solids									X		X (8)75			X (14)80	
Hardness		X (11)88											X (14)		
pH	X	X (11)88	X (137)70	X (171)72	X	X (717)	X (16)89	X (125)	X	X (3 to 0)		X	X (14)		
Susp. solids	X	X (11)88			X		X (16)89		X	X (3 to 0)	X (10)70		X (14)	X (60)70	

**Table D.1 continued**

Determinand	MP01	MP05	MP06	MP07 <sup>b</sup>	MP08 <sup>c</sup>	MP10 <sup>d</sup>	MP11	MP12 <sup>e</sup>	MP14 <sup>h</sup>	MP16	MP20	MP21	MP29 <sup>i</sup>	MP30	MP31 <sup>l</sup>
Temperature		X (11)88			X		X (16)89	X (125)	X	X (3 to 9)	X (19)70		X (14)	X (136)70	
Transparency				X (17)72					X		X (4)75				
<b>Radioactive elements:</b>															
Alpha		X (11)93								X (3 to 9)			X (4)		
Beta		X (11)88								X (3 to 9)			X (4)		
Caesium	X	X (11)91								X (3 to 9)					
Radionuclide	X														
Strontium		X (11)93								X (3 to 9)					
Tritium		X (11)93								X (3 to 9)			X (2)		
<b>Synthetic organics:</b>															
Aldrin									X						
AOX		X (11)95					X (16)92			X (3 to 9)			X (3)		
Azinphos-ethyl										X (3 to 9)					
Azinphos-methyl										X (3 to 9)					
Bentazone										X (3 to 9)					
Benzene							X (16)93			X (3 to 9)					
BHC									X						
Bfluoranthene <sup>1</sup>										X (3 to 9)					
Benzoperylene										X (3 to 9)					
Benzopyrene										X (3 to 9)					
C dimethylami <sup>2</sup>										X (3 to 9)					
Cnitrobenzene <sup>3</sup>										X (3 to 9)					
Chloridazone										X (3 to 9)					
Chloroaniline										X (3 to 9)					
Chlorobenzene							X (10)93								
Chlorotoluene										X (3 to 9)					
Chlortoluron										X (3 to 9)					
COT										X (3 to 9)					
DDD									X	X (3 to 9)					
DDE									X	X (3 to 9)					
DDT		X (11)91							X	X (3 to 9)					
Desethylatrazine										X (3 to 9)					
Dichlorethane							X (14)93			X (3 to 9)					
Dichloroaniline										X (3 to 9)					

**Table D.1 continued**

Determinand	MP01	MP05	MP06	MP07 <sup>b</sup>	MP08 <sup>c</sup>	MP10 <sup>d</sup>	MP11	MP12 <sup>e</sup>	MP14 <sup>h</sup>	MP16	MP20	MP21	MP29 <sup>i</sup>	MP30	MP31 <sup>l</sup>
Dichlorobenzene							X (8)93								
Dichlorvos										X (3 to 9)					
Dieldrin									X						
Dimethoat							X (14)93								
Dimethylaniline										X (3 to 9)					
Diuron										X (3 to 9)					
EDTA										X (3 to 9)					
Endosulfan										X (3 to 9)					
Endrin									X						
Fenthion										X (3 to 9)					
Fluoranthene										X (3 to 9)					
HCB							X (15)92			X (3 to 9)					
HCBtadiene										X (3 to 9)					
HCH		X (11)91					X (15)92			X (3 to 9)					
Hydrocarbons		X (11)88			X										
Indeno pyrene										X (3 to 9)					
Isoproturon										X (3 to 9)					
Metazachlor										X (3 to 9)					
Nitrobenzene										X (3 to 9)					
Nitrotoluene										X (3 to 9)					
NTA										X (3 to 9)					
Organochlorides									X						
PAH									X						
Parathion							X (14)93			X (3 to 9)					
PCB							X <sup>(3)1</sup>		X	X (3 to 9)					
Pentachlorophenol							X (14)92			X (3 to 9)					
Phenols		X (11)88		X (17)72	X				X						
Tensio active subs								X (125)						X (4)85	
Tetrachloroethane													X (3)		
Tetrachloroethene							X (16)93			X (3 to 9)					
Tetrachlormethane							X (16)92						X (3)		
Toluen							X (16)93								
Triazine		X (11)91								X (3 to 9)					

**Table D.1 continued**

Determinand	MP01	MP05	MP06	MP07 <sup>b</sup>	MP08 <sup>c</sup>	MP10 <sup>d</sup>	MP11	MP12 <sup>e</sup>	MP14 <sup>h</sup>	MP16	MP20	MP21	MP29 <sup>i</sup>	MP30	MP31 <sup>l</sup>
Trichlorobenzene							X (14)93			X (3 to 9)					
Trichloroetane										X (3 to 9)					
Trichloroethane													X (3)		
Trichloroethene							X (16)92			X (3 to 9)					
Trichloromethane							X (16)92			X (3 to 9)			X (3)		
Trifluraline										X (3 to 9)					
Xylen							X (16)93								

<sup>1</sup> Benzofluoranthene    <sup>2</sup> Chlordimethylaniline    <sup>3</sup> Chlornitrobenzene    BHC: Benzene hexachloride

Codes and monitoring programmes

Code	Monitoring Programme Name	Code	Monitoring Programme Name	Code	Monitoring Programme Name
MP01	AMAP/Freshwater	MP10	EEA -TF (Dobříš)	MP20	Lakes/EUROSTAT
MP05	Bucharest/85	MP11	Elbe/89	MP21	LRTAP/ICP-Water
MP06	CORINE/WATER	MP12	EU Exchange	MP29	Regensburg/87
MP07	EC Bathing Water	MP14	GEMS/WATER	MP30	Rivers/EUROSTAT
MP08	EC Freshwater Fish	MP16	HYDABA/ICPR	MP31	SIREN-IW/OECD

Notes for the number of sites:

<sup>(1)</sup> NO3 at 654 sites; Tot-N at 329 sites.

<sup>(2)</sup> Dissolved P at 412 sites; Tot-P at 546 sites

<sup>(3)</sup> PCBs nos 101, 138, 28, 52 at 11 sites; PCB180 at 16 sites; Tot-PCB at 5 sites.

<sup>(4)</sup> NO3 at 23 sites; N at 13 sites

<sup>(5)</sup> NO3 at 131 sites; N at 9 sites

<sup>(6)</sup> COD at 119 sites; COD-Mn at 3 sites

<sup>(7)</sup> Dissolved Oxygen at 141 sites; Ox. saturation at 51.

<sup>(8)</sup> Tot-N at 32 sites; NO3 at 58 sites.

<sup>(9)</sup> Tot-P at 32 sites

P at 61 sites

Notes for the start of analysis:

<sup>a</sup> Since 1988

<sup>b</sup> Since 88

<sup>c</sup> Since 84

<sup>d</sup> Since 88

<sup>e</sup> Tot-P since 92; Orthophosphate since 89

<sup>f</sup> Tot-PCB since 92; PCBs since 93

<sup>g</sup> Since 77

<sup>h</sup> Since 79 (Phase II)

<sup>i</sup> Since 91

<sup>j</sup> COD-Mn since 86

<sup>k</sup> Oxygen saturation since 85

<sup>l</sup> Since 70

**Table D.2 Quality of marine and coastal waters: Determinands measured per monitoring programme in water, number of sites and start of analysis**

The figures in brackets indicate the number of sites where the determinand has been measured. Detailed information on determinands can be found in Table C.1.

Determinand	MP02	MP04	MP09	MP19 <sup>(4)</sup>	MP23 <sup>(5)</sup>	MP22	MP24	MP25	MP26	MP27	MP28
Colour			X								
<b>Biological determinands:</b>											
Planktonic flora		X <sup>(1)</sup>				X					
Ecotox test						X					
Primary production		X (112)									
Tar Ball Collections					X						
<b>Chemicals:</b>											
Calcium										X (7)	
Fluorides					X						
Hydrochloric acid										X (8)	
Hydrogen sulphide		X (81)									
Sulphates										X (13)	
Sulphides									X (85)		
<b>Metals:</b>											
Aluminium										X (11)	
Antimony					X						
Arsenic	X		X		X					X (4)	
Beryllium					X						
Cadmium	X		X	X	X	X				X (13)	X
Chromium	X		X		X	X				X (12)	X
Cobalt					X					X (1)	
Copper	X		X	X	X	X				X (13)	X
Iron					X					X <sup>(7)</sup>	
Lead	X		X	X	X	X				X (12)	X
Magnesium										X (8)	
Manganese					X					X (12)	
Mercury	X		X	X	X	X	X (41)			X (13)	X
Molybdenum					X						
Nickel	X		X		X	X				X (8)	X
Organic Mercury					X						
Rubidium					X						
Selenium					X						
Silver			X		X						
Sodium										X (6)	
Tin					X						
Titanium										X (13)	
Vanadium					X					X (12)	
Zinc	X		X	X	X	X				X (13)	X
Zirconium										X (3)	
<b>Microbiological determinands:</b>											
Coliforms					X						
Enteroviruses					X						
Faecal coliforms			X		X						
Faecal streptococci					X						
Pseudom. aeruginosa*					X						
Salmonella					X						
Staphylococcus aureus					X						

**Table D.2 continued**

Determinand	MP02	MP04	MP09	MP19 <sup>(4)</sup>	MP23 <sup>(5)</sup>	MP22	MP24	MP25	MP26	MP27	MP28
<u>Nutrients:</u>											
Ammonia		X (389)			X	X					X
Nitrogen		X <sup>(2)</sup>		X	X	X					X
Organic Nitrogen					X						
Organophosphorus					X						
Phosphorous		X <sup>(3)</sup>		X	X	X					X
Silicon		X (396)			X	X					
<u>Organic pollution:</u>											
BOD					X				X (85)		X
COD					X				X (85)		X
Dissolved oxygen		X (600)	X		X	X					
Organic carbon					X				X (85)		X
<u>Physicochemical determinands:</u>											
Alkalinity		X (163)									
Conductivity					X						
pH		X (275)	X								
Salinity		X (645)	X	X		X					
Suspended solids			X	X	X	X					X
Temperature		X (668)	X			X					
Turbidity						X					
<u>Radioactive elements:</u>											
Alpha								X (14)			
Alpha and beta								X (1)			
Beta								X (7)			
Beta and gamma								X (3)			
Caesium	X				X						
Other radionuclides								X (78)			
Plutonium	X										
Strontium	X										
Tritium								X (79)			
<u>Synthetic organics:</u>											
Aldrin					X	X					
Aliphatics					X						
AOX											X
Aromatics					X						
Chlordane	X										
DDD					X						
DDE					X						
DDT	X		X		X						
Detergents					X						
Dieldrin	X		X		X						
Endrin					X	X					
Heptachlor					X						
Heptachloroepoxyde					X						
Hexachlorobenzene	X				X						
HCH	X		X	X	X	X					
Hydrocarbons			X		X				X <sup>(6)</sup>		
Organo-tin						X					
Organochlorides					X						
PAH	X				X						
Parathion			X								
PCB	X										
PCC	X										

**Table D.2 continued**

Determinand	MP02	MP04	MP09	MP19 <sup>(4)</sup>	MP23 <sup>(5)</sup>	MP22	MP24	MP25	MP26	MP27	MP28
PCDD	X										
PCDF	X										
Phenols					X				X (85)		
Polychlorin. Biphenyl**					X						
Triazine						X					

\* Pseudomonas Aeruginosa.

\*\* Polychlorinated. Biphenyl

Codes and monitoring programmes

Code	Monitoring Programme Name	Code	Monitoring Programme Name
MP02	AMAP/Marine	MP24	PARCOM/Hg
MP04	BMP	MP25	PARCOM/Radioactive
MP09	EC Shellfish Waters	MP26	PARCOM/Refineries
MP19	JMP	MP27	PARCOM/TiO <sub>2</sub>
MP22	MMP	MP28	PLCs/HELCOM
MP23	MED-POL		

Notes for number of sites:

<sup>(1)</sup> Chlorophyll-alpha at 201 sites; phaeopigment at 139 sites.

<sup>(2)</sup> Nitrate at 471 sites; Nitrite at 480 sites; Tot-N at 264 sites.

<sup>(3)</sup> Dissolved inorganic phosphorous at 491 sites; Tot-P at 388 sites.

<sup>(4)</sup> Determinands measured in some of the 59 PARCOM areas depending on the years.

<sup>(5)</sup> Heavy metals in suspended matter at 131 sites; Halogenated hydrocarbons in suspended matter at 2 sites; Micro-organisms in sea water at 902 sites.

<sup>(6)</sup> Oil from refineries at 85 sites; Hydrocarbons at 85 sites.

<sup>(7)</sup> Iron(II)chloride at 13 sites; Iron(II)sulphate at 13 sites; Tot-Fe at 8 sites.

Notes for start of analysis:

BMP (MP04) since 79

EC Shellfish Waters (MP09) since 86

JMP (MP19): Cd, Salinity, Suspended Solids and Hg since 80; CU, PB, V and HCH since 87; Nitrogen and Phosphorous since 90.

MED-POL (MP23) since 75

PARCOM/Hg (MP24) since 82

PARCOM/Radioactive (MP25) since 86

PARCOM/Refineries (MP26) since 81

PARCOM/TiO<sub>2</sub> (MP27) since 79



**Table D.3 Quality of marine and coastal waters: Determinands measured per monitoring programme in biota.**

The figures in brackets indicate the number of sites where the determinand has been measured. Detailed information on determinands can be found in Table C.1.

Determinand	AMAP/Marine	BMP	JMP <sup>(4)</sup>	MED-POL <sup>(5)</sup>	MMP
Biological determinands:					
Benthic fauna		X <sup>(1)</sup>			
EROD					X
Fish disease					X
Planktonic fauna		X (116)			
Planktonic flora		X <sup>(2)</sup>			
Metals:					
Antimony				X	
Arsenic	X			X	X
Beryllium				X	
Cadmium	X	X (47)	X	X	X
Chromium	X			X	
Cobalt				X	
Copper	X	X (47)		X	X
Iron				X	
Lead	X	X (47)		X	X
Manganese				X	
Mercury	X	X (46)	X	X	X
Molybdenum				X	
Nickel	X			X	
Organic Mercury				X	
Rubidium				X	
Selenium	X			X	
Silver				X	
Sodium				X	
Tin				X	
Vanadium				X	
Zinc	X	X (47)		X	X
Microbiological determinands:					
Coliforms				X	
Enteroviruses				X	
Escherichia coli				X	
Faecal coliforms				X	
Faecal streptococci				X	
Pseudomonas aeruginosa				X	
Salmonella				X	
Staphylococcus aureus				X	
Radioactivity:					
Caesium	X				
Plutonium	X				
Strontium	X				
Synthetic organics:					
Aldrin				X	
Aromatics				X	
Chlordane	X				X
DDD				X	
DDE		X (38)		X	
DDT	X	X (46)		X	X

**Table D.3 continued**

Determinand	AMAP/Marine	BMP	JMP <sup>(4)</sup>	MED-POL <sup>(5)</sup>	MMP
Dieldrin	X			X	X
Dioxins					X
Endrin				X	
Halogenated hydrocarbons				X	
Heptachlor				X	
Heptachloroepoxyde				X	
Hexachlorobenzene	X			X	
Hexachlorocyclohexane	X	X (20)		X	X
Hydrocarbons	X				
Lipid	X				
Organo-tin					X
Organochlorides				X	
PAH	X			X	X
PBB					X
PBDE					X
PCB	X	X (48)	X		X
PCC	X				X
PCDD	X				
PCDF	X				
Polychlorinated Biphenyl				X	

Notes for number of sites:

- (1) Zoobenthos biomass at 128 sites; Zoobenthos species list at 135 sites; Zooplankton biomass at 80 sites
- (2) Phytoplankton-biomass at 188 sites; Phytoplankton-species list at 188 sites
- (3) Heavy metals in plankton at 58 sites; Halogenated hydrocarbons in plankton at 83 sites.
- (4) Determinands measured in some of the 59 PARCOM areas depending on the years.

Notes for the start of analysis:

- BMP since 79 (DDE, DDT and PCBs since 78)  
 JMP since 80  
 MED-POL since 74

**Table D.4 List of determinands required in groundwater by LRTAP/ICP-IM and GEMS/WATER**

Monitoring Programme Name	Determinands in groundwater
<b>GEMS/WATER:</b> According to the revised list of variables for Phase II of the Programme agreed in Leningrad in 1990 (*)	Basic variables to be monitored (**): Water flow/level, Temperature, pH, Electrical conductivity, Dissolved Oxygen; Calcium, Magnesium, Sodium, Potassium, Chloride, Fluoride, Sulphate, Alkalinity; Nitrate+nitrite, Ammonia, Total-P particulate.
<b>LRTAP/ICP-IM:</b> According to the list of variables included in the GW (groundwater chemistry) subprogramme for Phase 1993-96(**)	Sulphur sulphate dissolved, Nitrogen nitrate dissolved, Nitrogen ammonium dissolved, Calcium dissolved, Sodium dissolved, Potassium dissolved, Magnesium dissolved, Chloride dissolved, Tot-P dissolved; Dissolved organic carbon, Aluminium total, Aluminium labile, Manganese dissolved, Iron dissolved, Silica dissolved, pH, specific conductivity, Alkalinity, Groundwater flow, Groundwater level.

Notes:

- (\*) GEMS/WATER Operational Guide.
- (\*\*) Manual for Integrated Monitoring. Programme Phase 1993-1996 (International Co-operative Programme on Integrated Monitoring on Air Pollution Effects).
- (\*\*\*) These are the basic variables to be monitored in all GEMS/WATER stations, including groundwater stations.