Working Group D - Reporting Activity on State of the Environment Reporting		Guidance on "Reporting required for assessing the state of, and trends in, the water environment at the European level"
Version final	February 2009	Consolidated document -
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Summary	In the context of the implementation of the Water Framework Directive (WFD), the European Environment Agency (EEA) Eionet-Water annual data flow for waters was transferred into the WISE 'State of the Environment' (SoE) data flow. With this it remains one of the Eionet Priority Data Flows, but gains full integration into the reporting under WISE, complementary with data reported under the WFD. In addition improved reporting on water quantity (water availability and water abstraction), emissions and biological data are foreseen and described. This integration of the SoE reporting was discussed and agreed upon under the mandate of the Drafting Group for SOE – Reporting under the Working Group D – Reporting – in the WFD Common Implementation Strategy (WFD CIS). The drafting group was mandated in 2005 to provide Guidance on Reporting required for assessing the state of, and trends in, the water environment on European level. The drafting group met from the beginning regular back to back with the Eionet-water experts (different NRC water: freshwater, marine, water quantity and emissions). With this Eionet and WFD experts worked together to provide Guidance on Reporting required for assessing SoE on European level and align Eionet and WFD reporting. The results are provided here as a consolidated guidance document that is structured in four parts: which follow the tasks set out for the drafting group for the activity on SOE Reporting: • Part 1 presents: clarification on the reporting streams required for, and contributing to, SOE assessments • Part 2 presents: review of existing guidance documents • Part 3 presents: the core part of the guidance, including reporting sheets that describe the aim and the details of each reporting process • Part 4 deals with aspects of data processing, handling and reporting and requirements for technical integration. The work started under the mandate of Working Group D 2005-2007, when the main sections of the document parts 1, 2, 4 and the main section of part 3 were prepared. Reporting sheets describing reporting of nutrients and	

	hazardous substances were developed. Water Directors endorsed these parts in November 2007. Some open issues in particular on the reporting on transitional and coastal water, emissions, water quantity; and biological elements needed further discussion as described under the 2008-2009 mandate of the Working Group D. These issues were also the topic for three Eionet NRC freshwater and marine workshops in 2008. The consolidated guidance document were updated with reporting sheets describing these reporting processes and the Water Directors endorsed these parts in November 2008. A slightly updated version of the document has been produced in February 2009, taking into account some editorial comments received from Germany after the Water Directors November meeting.
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Guidance on the reporting required for assessing the state of, and trends in, the water environment at the European level

Introduction and summary

In the context of the implementation of the Water Framework Directive (WFD), the European Environment Agency (EEA) Eionet-Water annual data flow for waters was transferred into the WISE 'State of the Environment' (SoE) data flow. With this it remains one of the Eionet Priority Data Flows, but gains full integration into the reporting under WISE complementary with data reported under the WFD. The SoE data flow is voluntary. It is based on international agreements to provide data for the EEA according to its mandate, not on a compulsory basis but with some responsibilities on countries to do so, as stated in their agreement to the regulation establishing EEA and Eionet[1]. The reporting process toward the EEA includes 32 Member Countries *(EU 27 plus Iceland, Liechtenstein, Norway, Switzerland and Turkey)* together with 6 West Balkan countries as cooperating countries *(Albania, Bosnia and Herzegovina, Croatia, the Former Yugoslav Republic of Macedonia, Montenegro and Serbia).* The link between SOE and WFD data for those countries is only optional depending on to which degree they follow any WFD scheme in their national monitoring. WISE with both compliance and SoE-reporting is the integrative, water-related part of the Shared Environmental Information System (SEIS) and fully committed to the INSPIRE principles.

This integration of the SoE reporting was discussed and agreed upon under the mandate of the Drafting Group for SOE – Reporting under the Working Group D – Reporting – in the WFD Common Implementation Strategy (WFD CIS) and in several EEA-Eionet workshops. The drafting group was mandated in 2005 to provide *Guidance on Reporting required for assessing the state of, and trends in, the water environment on European level.*

The results are provided here as a consolidated document. The work started under the mandate of Working Group D 2005-2007, when the main parts of the document sections 1, 2, 4 and the main part of section 3 were prepared. Water Directors endorsed these parts in Nov. 2007.
Section 3 lists the reporting sheets for the SOE-parameter as the core part of the guidance. The approach of reporting sheets as a textual definition of format and scope of the required reporting has been used in the WFD CIS also in the context of the WFD compliance reporting. SOE and compliance reporting sheets build upon each other in the sense that information reported already under the WFD obligatory reporting (Art. 3, 5, 8) is not required again, but used as available in WISE. The reporting sheets are considered to be a useful tool to allow the process to be seen and discussed transparently, before the EEA further implements the data dictionary in Reportnet as the technological implementation in WISE.
Some open issues in particular on the reporting on emissions, water quantity; biological elements and transitional and coastal water needed further discussion as described under the 2008-2009 mandate of the Working Group D (activity 3 – integration of state of environment reporting).

[1] http://europa.eu/eur-lex/en/consleg/main/1990/en_1990R1210_index.html

The updated sheets for these reporting processes are provided in the following as part of the consolidated document. All four areas required one or way the other particular consideration with different groups of experts and added new aspects to the basic Eionet–water data flow, which was transitioned into WISE as main part of the guidance. The consultation with these expert groups have been organised in Eionet workshops and meetings throughout 2008 (as outlined in the current mandate). Each of those could provide an agreement on a respective reporting sheet and cornerstones for the further development of the area.

Reporting on water quantity
See reporting sheet page 65-76
The SOE reporting related to water scarcity and drought (WS&D) was discussed at the thematic workshop at EEA 10.-11.June 2008, together with experts from the Water Scarcity and Drought Network, Eurostat and hydrological services. It describes the parameter needed for the RBD related assessment of the Indicator Water Exploitation Index, but covers also other possible indicators as they are developed with the WS&D Network to fulfil the Commission requirement of a regular report on the WS&D situation in Europe. The further discussion on the use and interpretation of the reported information will be continued with water quantity experts from Member States in the WS&D Network and in the Eionet.

Reporting on emissions to water
See reporting sheet page 77-83
The SOE-reporting for emission loads to water as a single harmonised reporting, streamlining requirements under the WFD (including priority substances), UWWTD, NiDi, IPPC, E-PRTR and the ESTAT/OECD Joint questionnaire and the Marine conventions (land-based sources), was discussed at the thematic workshop at EEA 11.-12.September 2008. There and in the follow-up process it became clear that the reporting sheet itself is a good starting point for a streamlined data flow. But two elements need follow-up beyond the formulation of the reporting sheet.

a) more effort needs to be put into the integration between the different policy processes,
b) the development of the indicator assessment using the reported information needs close feedback and consultation with the Member State's experts from the above-mentioned policy processes and the Eionet.

Reporting on biological elements
See reporting sheets pages 84-95
For the further development of the reporting on biological elements the three best developed reporting sheets on benthic invertebrate fauna in rivers, phytoplankton and other aquatic flora in lakes have been discussed and a suitable SOE reporting format were agreed in the Ecostat meeting 1.-2.October 2008. Depending on the progress Ecostat can make in the definition of EQR values, other elements for rivers, lakes or transitional and costal waters could be taken into the SOE reporting in a later stage.

Reporting on parameter in transitional and coastal waters
See reporting sheets pages 103-106
The coherent SOE reporting for the status and trends in transitional, coastal and marine waters was discussed in cooperation with the relevant groups under the marine strategy framework directive (MSFD) in a thematic workshop at EEA on 14/15 May 2008. The expert group agreed on the reporting sheet for nutrients and chlorophyll in transitional and coastal waters. Further developments will be needed

for these parameters in marine waters and for priority substance and other hazardous substances in biota for transitional, coastal waters and marine waters. Marine aspects, in particular can only be taken forward when the monitoring and reporting process under the MSFD is shaped in a respective implementation strategy. From an SOE side, the input to the future process is outlined in the indicator convergence process, which is being carried out in cooperation with regional conventions and Member States. Future SOE-reporting formats will have to be taken form there.

Other possible reporting elements

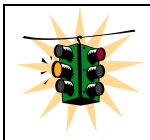
A possible SOE reporting on hydro-morphological elements and conditions or continuity is not foreseen for the moment. SOE information on measures and policy actions to assess policy effectiveness can only be evaluated and further specified, when first results of the RBMP can be reviewed.

Structure of the guidance document

The consolidated guidance document is structured in four parts which follow the tasks set our for the Drafting Group for the Activity on State of the Environment Reporting:

- *Part 1* presents Task 1: Clarification on the reporting streams required for, and contributing to, SOE assessments
- *Part 2* presents task 2 Review of existing guidance documents
- *Part 3* presents the core part of the guidance, the Guidance on scope of SOE-parameters
  The following table gives an overview of the reporting sheets included in this document
- *Part 4* deals with tasks 4 and 5 on data processing, handling and reporting and requirements for technical integration.

An updated consolidated WFD compliance reporting guidance including reporting sheets for the RBMP reporting (Article 13) was presented for and endorsed by the Water Directors at their Paris meeting 24-25 November 2008. Thisguidance will soon be made public available (the November version is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d). EEA will for future WISE-SOE reporting ensure consistency between the requirement of WFD compliance reporting guidance and the WISE-SOE reporting sheets.



Look Out!

Double reporting should be avoided. Information that was already reported under WFD into WISE will be taken from there and does not need to be provided again.

Table 1 Overview of the reporting sheets and their envisaged reporting dates

Reporting Sheet Code	*Reporting Sheet Title*	*Reporting dates*	*Serial Number*
1.Rivers (natural, canalised rivers and artificial canals) and lakes (natural, artificial (reservoirs) and mixed)			
NUT_ORG_RV_LK	State of rivers and lakes in terms of nitrogen, phosphorus, chlorophyll-a and organic pollution determinands in water	Regular reporting since 2008	1
HAZ_WAT_RV_LK	State of rivers and lakes in terms of Priority Substances and other hazardous substances in water	Regular reporting since 2008	2
BIO_INV_RV	State of river water bodies in terms of biological quality elements – benthic invertebrate fauna	*DD to be specified in 2009*	*5*
BIO_PHY_LK	State of lake water bodies in terms of biological quality elements – phytoplankton	*DD to be specified in 2009*	*6*
BIO_AQU_LK	State of lake water bodies in terms of biological quality elements – Macrophytes in lakes	*DD to be specified in 2009*	*7*
2. Surface water and groundwater			
QNT_SW_GW	State and quantity of water resources	*Test in 2008; DD to be specified in 2009.*	3
EMI_ *SW_GW*	Loads, discharges and emissions of pollutants to surface waters and groundwater	*Test in 2008; DD to be specified in 2009*	4
3. Groundwater			
NUT_GW	State of groundwaters in terms of nitrogen	Regular reporting since 2008.	*8*
HAZ_GW	*State of groundwaters in terms of hazardous substances*	Regular reporting since 2008	*9*
4. Transitional and coastal waters			
NUT_TW_CW	State of transitional and coastal waters in terms of nitrogen, phosphorus, oxygen and chlorophyll a in water	Test ongoing based on Eionet-water and then annually from 2009 onwards	*10*
5. Geographic, supportive and interpretative information for monitoring sites, data quality *(surface waters and groundwaters)*			
STA_CHA_PRE	*Site characteristics and proxy pressure information.* [Note: Proxy pressure information arising from inland sources will be derived by the EEA. Countries will be asked to validate this information.]	*Reported once unless information changes and/or a new site is reported*	*14*
GEO_INF	*Geographic information*	*Reported once unless information changes and/or a new site is reported*	*15*
DQ	*Data Quality for reported SOE data*	*Test in 2007 based on Eionet-Water and then October 2008 and every four years thereafter*	*16*

DD: Data Dictionary

Content

Part 1

Clarification on the reporting streams required for, and contributing to, SOE assessments

1. Introduction

The concept report on reporting for water was adopted by the Water Directors' meeting in Rome on 24/25 November 2003. It describes three distinct, but overlapping, requirements for information to be gathered from Member States to EU and International Organisations. These are:

1. Checking compliance and implementation of EU legislation at a national level.
2. Assessing and comparing state and trends for the environment and the associated pressures, impacts and socio-economic driving forces that either cause or result from changes.
3. Use information on implementation and trends to assess the effects and effectiveness (including cost-efficiency) of policy, both before and after measures have been introduced.

The Commission and Member States are developing guidance for compliance reporting under the Water Framework Directive (WFD) with the ongoing drafting group under the Reporting Working Group (WG D). This is seen as one of the first operational steps in implementing the concept paper on reporting for water that has the ultimate goal of developing a Water Information System for Europe (WISE). The guidance document for compliance reporting will eventually encompass not only the reporting requirements for the WFD but also other related Directives where information supplied under those Directives is of direct relevance to the implementation of the WFD.

Additional guidance will deal with state of the environment and trends reporting. State of Environment data and information is required by the European Environment Agency (EEA), the Commission, Eurostat and other international organisations undertaking Europe-wide or regional assessments. This document is the first part of the guidance and provides *"clarification on the reporting streams required for, and contributing to, SOE assessments"* (Task 1 of the mandate for the Activity on State of the Environment Reporting under Working Group D – Reporting).

2. Clarification on reporting streams required for and contributing to SOE-assessments

2.1 Differences between data and information

Member States are required to report data and information to the Commission on various aspects of the Water Framework Directive and other water-related Directives. Some of this will originate from their national monitoring networks and will have to be collected at a frequency, scope and detail that meet the reporting requirements.

Data in the context of this guidance is taken to be the numeric values arising from the measurement of the various components of the water environment in relation to its

state and pressures upon it. For example, nutrient and hazardous substances concentrations, numbers and types of aquatic flora and fauna and water flows are measured in water bodies at a frequency and at a number of sampling points that are suitable and adequate for their intended use(s) and the expected changes of the parameter.

The data may be subsequently aggregated temporally and spatially for different purposes such as the production of indices of quality or for comparisons with standards of quality. At some point in the aggregation process the basic data becomes information. Examples of how data is used to provide information in the context of the WFD would be in the assessment of risk that a water body might fail its Environmental Objectives (Article 5) and the production of maps expressing the ecological/chemical status of water bodies in a River Basin District (RBD) (Article 15). Another example would include the ranking of the importance of pressures within River Basin Districts without the provision of the basic data on discharges, emissions and/or abstractions on which the ranking is based or the provision of other ways of aggregation as weighted averages or percentiles. Meta-data would also fall into the category of information as it provides a description of the data that helps in interpretation, such as the type/objective of monitoring programmes and the type of station where measurements were undertaken.

In terms of this guidance it is clearly understood that compliance reporting generally involves the reporting of information (though the geographic coordinates of water bodies reported for compliance purposes is considered to be data), whereas for the assessment of the state of, and trends in, the environment both data and information may be needed depending on the type and scope of assessments and the determinands on which they are based.

2.2 General considerations in the reporting of SOE data and information

The frequency of reporting of SOE data will generally have to be based on the frequency of monitoring of determinands and hence the availability of data from the national monitoring networks. Some WFD quality elements would be monitored annually or more often (e.g. nutrients) others would not (e.g. aquatic flora). In some cases SOE data will only be reported when it becomes available. Also it would not always be data that will be reported, sometimes it will be information e.g. on the hydromorphological quality elements of water bodies.

The different levels of aggregation of reported data influence its usefulness for the different assessments undertaken. How the data will be used in assessments will influence the way the data are treated before they are reported. There may also be a difference in the aggregation level of data reported to the EEA and that used in EEA assessments: the latter are usually at a higher level of aggregation.

For the analysis of trends, data at the annual or monthly level and at individual station level would be needed where such trend assessment is useful at the European level and where data is available from the national monitoring networks. For example, assessments of trends in nutrient concentrations in coastal waters are best based on winter averages when primary productivity is at a minimum, and seasonal/flow related events have significant impacts in assessing riverine loads.

The assessment of ecological status for the WFD will involve the processing of disaggregated monitoring data of the relevant parameters and quality elements by Member States using their national assessment systems. The results will be presented as colours on a map. This will be the process at the Member State level for reporting compliance information (in the above mentioned sense – section 2.1) to the Commission. So, the reporting for compliance purposes and the reporting that enables SOE assessments will have to be based on the same basic data from Member States. SOE is a different but parallel data stream than that required for compliance reporting, and should be defined separately.

2.3 Commission's needs for data and information

The 2003 reporting concept paper indicated that the main reason the Commission requires information to be supplied is to enable it to check compliance with EU legislation. In order to be able to do this, it requires information that enables it to:

- *Ensure data are plausible;*
- *Ensure data are consistent;*
- *Conduct cross-references and cross-checks on data (especially in International River Basins); and*
- *Ensure the Directive has been implemented in a harmonised way.*

The Commission also requires information on State of the Environment and trends and on implementation of measures to allow it to determine whether existing policies are adequately protecting the environment and to identify where further measures may be needed.

For data to meet the Commission's needs, it must be collected and reported in a clear and consistent way by all Member States. The information can be aggregated and supplied at a higher aggregation than may be required at, for example Member State level. However, the Commission may need access to more detailed information in cases where compliance is not clear.

A summary of reporting requirements under the Water Framework Directive is given in Table 1 (this has been reproduced from the concept paper).

Table 1. Reporting obligations of the WFD

Subject	Article	Responsibility	To	Report due date	Frequency/ Review
List of competent authorities	3.8/Annex I	MS	COM	22/06/04	3 months after change
Characterisation of RBD human activity/ economic analysis	5, 15.2,	MS	COM	22/03/05	22/12/13, every 6 years thereafter
Monitoring programmes	8, 15.2	MS	COM	22/03/07(1)	
RBMP	15.1	MS	COM	22/03/10(1)	22/12/15, every 6 years thereafter
Register of Protected Areas	6	MS	COM	22/03/10(2)	22/12/15, every 6 years thereafter
Progress on implementation of programme of measures	11, 15.3	MS	COM	Within 3 years of publication of RBMP	
Implementation	18.1, 18.2	COM	EP C	22/12/12	Every 6 years
Progress by MSs in implementation	18.3	COM	EP C	22/12/06(3) 22/12/08(4)	
Interim reports on implementation of programme of measures	18.4	COM	EP C	22/12/15	Every 6 years

Notes:
C - Council
COM – Commission
EP – European Parliament
MS – Member States
1. *Latest date. Report to be submitted within 3 months of completion*
2. *To be included in report of RBMP*
3. *Report on characterisation and economic analysis*
4. Report on monitoring programmes

2.4 EEA's needs for data and information

The EEA's mission is to deliver timely, targeted, relevant and reliable information on Europe's environment.

The activities of the European Environment Agency are all centred on the flow of data and information from national monitoring to European reporting. This is called *the Monitoring-Data-Information-Assessment-Reporting (MDIAR)* chain. Whilst some of the data and information required by the EEA comes from Eionet-Water dataflows, the EEA also receives information from, and works closely, with other organisations such as JRC and Eurostat, and the wider research community.

From these central activities the processes, products and services of the Agency are derived: periodical indicator-based reporting, integrated assessment, reporting on topics and development of databases etc. are built on the databases and information from member countries and beyond.

Furthermore all EEA products and services are developed within the *DPSIR assessment and reporting framework* for environmental information: *D*riving forces (sectors etc.), *P*ressures on the environment, *S*tate, *I*mpact and *R*esponses (policy action etc.).

The EEA's need for representative information on pressures, state and impact takes into account:

- Spatial resolution (required aggregated regional, national, sea areas, catchments, sub-catchments, water bodies, e.g. transitional water bodies, groundwater bodies, different sized (including small) rivers and lakes);
- Temporal resolution (e.g. yearly indicator reporting of indicators based on data and information that is no more than 2 years old);
- Sectoral resolution (apportionment) (e.g. point and diffuse sources of pollutants, and water abstractions and demand).

Information collected through Eionet-Water is used in a number of assessment products including a core set of policy relevant water indicators, other water related indicators and broader integrated assessments, for example assessments that link water quality to pressures from agriculture and point sources. The data for these assessments needs to be at the lowest level of aggregation that ensures comparability, for example annual/monthly concentrations of nutrients at representative monitoring stations.

Within the general DPSIR framework, the EEA is also developing a water accounts methodology and indicators which again require data and information representative of river stretches/water bodies and catchments rather than countries as a whole.

Eionet-Water is one of the tools used to collect the data and information required for the EEA's assessments on water (see guidance under Task 2 for details). The annually reported data and information provide an overview of water quality and quantity in relation to variations in anthropogenic pressures within a country and thereby across the EEA area. Eionet-Water has been successfully and progressively implemented throughout the EEA's member and collaborating countries over the last 10 years. In 2005, between 23 and 31 countries (depending on water category) were reporting data on the chemical quality of their groundwater, rivers, lakes, transitional, coastal and marine waters. Sixteen countries were also providing data on water quantity. However, Eionet-Water does not give a representative view of individual sub-catchments, catchments or of River Basin Districts, as it was originally designed to be representative at a country level.

Eionet-Water was also designed to be progressively developed and changed over time to meet the changing needs of the EEA for SOE data and information, and particularly to be able to assess the state of, and trends in, the water environment in the light of changing European policies such as the Water Framework Directive and the Common Agricultural Policy. These changes are being/will be reflected in changes in aspects such as the determinands and the spatial and temporal aggregation of the data requested for SOE reporting. The latter is especially important with respect to the question of representativity. For example the basis of the assessments under the Water Framework Directive are the water body, sub-catchment, catchment and River Basin District and not necessarily the country as a

whole as it is reflected in Eionet-Water so far. In addition, models that may be used for assessing, e.g. at European hotspots, the impact of agriculture on water require more disaggregated data and information.

2.5 Relevance of reported compliance data and information to SOE assessments

The aim of this section is to identify the extent to which the data and information collected at national level and reported to the Commission for compliance purposes might contribute to SOE assessments and what would be the appropriate spatial and temporal aggregation for SOE-reporting. The starting point for this task is Table 5.1 in the 2003 reporting concept paper which summarises the types of data reported for the various Directives. Additional columns have been added to the original table identifying the aspects of the reported data and information that has potential use for, and contribution to, SOE assessments with an assessment of any limitation of potential use for, and contributions to, SOE assessments (the revised table is shown in Annex 1).

It should also be noted that a number of the older water-related Directives are to be repealed under the Water Framework Directive. Table 2 (taken from the reporting concept paper) summarises the timetable for the repeal of Directives and indicates those that will remain in force. This information should be borne in mind when considering the relevance and future availability to SOE assessments of monitoring data collected at the Member State level, and the information subsequently reported, under current Directives.

Table 2 Reporting requirements for water-related Directives

Legislation to be repealed by the WFD	**Date of repeal**
Exchange of Information Decision (77/795/EEC)	2007
Surface Water Directive (75/440/EEC amended by 79/869/EEC)	2007
Freshwater Fish Directive (78/659/EEC)	2013
Shellfish Waters Directive (79/923/EEC)	2013
Groundwater Directive (80/68/EEC)	2013
Dangerous Substances Directive (76/464/EEC)	2013
Legislation remaining in force	
Urban Waste Water Treatment Directive (91/271/EEC)	
Bathing Water Directive (76/160/EEC)	
Nitrates Directive (91/676/EEC)	
Drinking Water Directive (98/83/EC)	

Information reported as part of the requirements of Directives is not always suitable for the assessment of the state and trends of the water environment. For example at the moment under the WFD much of the mandatory information is aggregated at the River Basin District level only[2], whereas for transparent, robust and representative

[2] It has been acknowledged in the WFD compliance reporting guidance document that some information may not be available in 2004 for reporting in the level of detail ideally required. A phased approach has therefore been adopted with summary information at the RBD level required in the first report. Member States can report less aggregated data and information if they wish, on an optional basis. It is intended that detailed information at a water body level will be available by 2010 and should be supplied by electronic means at this time.

SOE assessments data and information would be required from catchments, sub-catchments and water bodies.

The data and information reported on the state of water bodies for some of the established Directives may not be comparable because the degree of comparability will depend on the water bodies included and monitored. The latter is often dependent on the interpretation of the designation rules (e.g. for bathing waters, freshwater and shell fisheries, nitrate vulnerable zones and sensitive areas) and national differences of how these are implemented (e.g. some countries have not designated inland bathing waters, or designated whole territories or specific areas as vulnerable or sensitive).

Numeric data are not required to be reported for the older Directives. Rather the data are aggregated and used in the assessment of compliance with standards. It is the latter that is reported in terms of passing or failing. For the reasons given in the previous paragraph, information just on compliance with standards laid down in the various Directives would not give reliable assessments of state and trends.

In addition the monitoring data on which the compliance assessments of the older directives are based are not necessarily representative of the general or range of quality of water bodies in a country. This is because the monitoring requirements are generally site specific: either at locations designated for a specific use (e.g. fisheries and bathing waters); locations affected by a specific discharge (e.g. of dangerous substances and from urban waste water treatment works); or, for the Exchange of Information Decision, at a few nationally selected sites in main rivers. Designation will vary from country to country because of real differences in types and quality of waters, differences in the types and extent of pressures affecting them and because of differences in how designation rules are interpreted and implemented.

In summary, some aspects of the information currently reported for the assessment of compliance with established Directives (Table 2) is useful for SOE assessments. This includes: relatively highly aggregated information on compliance with standards (only in relation to specific designated water uses and specific pollutant discharges), and on ecological status; estimates of pollution loads under the UWWT Directive, and E-EPTR will also provide data on emissions from many large installations; and, summary of nitrate concentrations in waters affected by agricultural activities (according to proposed concentration classification criteria, and to whether there are decreasing, increasing or no trends in concentrations - alternatively raw data can be reported). However for many existing reporting requirements, data are not required to be reported, information is not timely (every 6 years WFD, 4 years Nitrate Directive, 2 years UWWT Directive) and may only be representative of certain types of water body (vulnerable zones, bathing waters) and according to national designations.

Article 8 of the WFD establishes the requirements for the monitoring of surface water status, groundwater status and protected areas. Monitoring programmes are required to establish a coherent and comprehensive overview of water status within each river basin district. The programmes have to be operational at the latest by 22 December 2006. The results of the monitoring programmes will be used for the classification of the ecological status/potential and the chemical status of surface water bodies, and to assess the quantitative and chemical status of groundwater bodies. Member States are required to provide a map for each river basin district illustrating the classification of the ecological status/potential and chemical status for each body of surface water, and a map of the resulting assessment of groundwater quantitative

and chemical status. These maps will be reported to the Commission for compliance assessment.

The Commission and Member States are developing guidance for reporting meta-data and information that will be used to check Member State's compliance with the monitoring programmes required by the WFD. Examples of the requested information include: type of monitoring (surveillance, operational or investigative); geographic coordinates of monitoring stations; identifiers (codes, names) of water bodies monitored; water body type; parameters indicative of the quality elements to be monitored; and monitoring frequencies. This type of information would also be used in the SOE data flow but supplemented with the numeric data being measured at the monitoring stations. Other information reported for compliance assessments under the WFD is also of potential use for SOE assessments: this is further summarised in Annex 1.

In summary, the sources and bases of the compliance reporting (information) on water status under the WFD will be the monitoring networks which will also provide the basic data for SOE reporting and assessments. Monitoring will still be required for those directives that are not to be repealed under the WFD (Table 2). However, Member States will wish to design integrated monitoring networks, where possible, that provide the data and information that meet the needs of all related policies. It is anticipated that there will be eventually only one monitoring system at the national level that would incorporate the needs of both the WFD and other directives and policies. To take into account the purpose of the measurements (e.g. the directive the monitoring station or network is linked to) it is necessary to describe the nature of the network or station that provides the data – this could be included as meta data.

2.6 Challenges in developing SOE reporting from in monitoring under WFD

As described in section 2.1 national monitoring networks will be the source of data on the state of the environment reported to the EEA and other international organisations. Countries are designing their national monitoring programmes to meet the requirements of the Water Framework Directive (WFD) for surveillance, operational and investigative monitoring. The relative contribution of reported SOE data from the different types of monitoring will depend on how countries design their networks. For example, some countries may intend to report or make available data from surveillance monitoring and may include stations/water bodies covering the range of statuses (high to bad) found in the country no matter if they are included in surveillance and/or operational monitoring. Data may also arise from monitoring undertaken for other Directive e.g. Nitrates Directive. Two key points from the EEA's perspective is that the data should meet its requirements and the Agency must know what the data and information represents.

The EEA requires that the reported SOE data should include data from water bodies of a wide a range of statuses as possible (or present), enabling the EEA to obtain a representative view of the state of water bodies within and across catchments, River Basin Districts and countries, and to produce representative assessments across catchments and river basins based on comparable data and information. Information is also needed on the water body being monitored and on any other water bodies for which it is representative. It is important to note that the aim of EEA SOE reporting is not to determine whether a water body is at risk (in terms of failing WFD environmental objectives) or not, neither is it to determine its status – this is a matter

for compliance reporting. To ensure proper EU-level SOE assessments the DPSIR framework must be followed. Furthermore, appropriate geographic references and linkages are required between monitoring stations, water bodies, catchments and river basin districts so that SOE data can be linked to the relevant pressures and driving forces. For the geographic aspects and to cover all “geo-basic data” there will be linkages with the WISE-GIS development and group.

The minimum periodicity of surveillance monitoring in the WFD is once every 6 years. This may not be adequate for the EEA in terms of sound SOE-assessments, especially e.g. for determinands such as nutrients, organic pollution indicators and hazardous substances. However, several countries have indicated, that in restructuring their monitoring networks they will use other existing programmes and will, where necessary, monitor at a higher frequency than the minimum 6 yearly obligation from the WFD. In addition, some monitoring stations will be deleted and others added when it is seen as necessary. The data and information out of these basic data should be made available to EEA
To fulfil the EEA mandate and provide timely, relevant and targeted SOE-assessments and to establish stable communication structures the data flow in principle should be maintained on a regular annual basis although some determinands will be available less frequently. However the EEA recognises that SOE data can only be reported when data have been monitored and are available. The frequency of monitoring will depend on the determinand. The details on the data flow with respect to status as well as for information and data on pressures will be developed in the guidance.

Part 2

Review of existing guidance documents

1. Introduction

The source of SOE information is the monitoring undertaken by countries to meet the requirements of national and international policy drivers. The identification of the SOE and pressure determinands has to be based on the existing guidance documents especially from the WG 2.7 on Monitoring and the EEA guidance documents for the former Eurowaternet. In addition, the SOE-WISE reporting guidance should take into account the monitoring guidance (where developed) for other Directives and international obligations. For example, informal guidance has been developed for the Nitrates Directive, and the guidance is being developed for chemical monitoring under the WFD. From this review it will be identified what data are available and how and where certain aspects need further development.

This section makes the distinction between guidance produced for monitoring and for reporting.

2. Monitoring guidance

Monitoring guidance documents or guidelines have been developed for most of the Directives, International Conventions and agreements requiring the collection of SOE data and information. These have been used in this document and include:

- European Commission. Common Implementation Strategy Guidance document No. 7: Monitoring under the Water Framework Directive, 2003[3].
- European Commission. Overall approach to the classification of ecological status and ecological potential. 27 November 2003.
- European Commission. Draft final report of the Expert Group on Analysis and Monitoring of Priority Substances. 10 June 2004.
- European Commission. Groundwater Monitoring: Technical report on groundwater monitoring as discussed at the workshop of 25th June 2004. Version 0.5, 13 December 2004.
- European Commission. Common Implementation Strategy. Draft monitoring specification, version 2. Groundwater monitoring drafting group.
- European Commission. Guidelines for the monitoring required under the Nitrates Directive (91/676/EEC), December 2004[4].

[3] Informal consensus position on best practice agreed by all CIS partners

[4] Informally agreed by Member States in the Nitrates Directive Committee, however the text has never been submitted to a formal vote

- European Commission (2005). Eutrophication assessment in the context of European water policies. Chapter 7: Monitoring – guidance and integration of requirements stemming from various obligations. (In progress).

- HELCOM. Manual for Marine Monitoring in the COMBINE Programme of HELCOM (http://sea.helcom.fi/Monas/CombineManual2/CombineHome.htm)

- HELCOM (2005). Guidelines for the compilation of waterborne pollution load to the Baltic Sea (PLC-water). HELCOM PLC 5 1/2005, Document 3/2.

- HELCOM (2005). Monitoring revision procedure – MON-PRO: Eutrophication. HELCOM MON-PRO 2/2005, Document 3/1.

- OSPAR (2003). 2003 Strategy for a Joint Assessment and Monitoring Programme (JAMP) (as revised by OSPAR 2004). Reference number 2004/17.

- OSPAR (2005). Draft Proposal for an agreement on the eutrophication monitoring programme. 10-14 January 2005, EUC 05/3/2-E.

- OSPAR (2005). Revised monitoring strategies for OSPAR Chemicals for Priority Action. 27 June – 1 July 2005, OSPAR 05/7/15-E.

- OSPAR (2005). Draft update of the agreement on monitoring strategies for OSPAR Chemicals for Priority Action and progress made in developing monitoring strategies. 27 June – 1 July 2005, OSPAR 05/7/16-E.

- OSPAR (2005). Draft revision and principles of the comprehensive study on riverine inputs and direct discharges (RID). ASMO 05/13/1.

- UNEP-MAP (2003). Review of implementation of MEDPOL Phase III monitoring activities. UNEP(DEC)/MED WG.243/3.

- UNEP-MAP (2003) Eutrophication monitoring strategy of MEDPOL. UNEP(DEC)/MED WG.231/14, 30 April 2003.

- Urban Waste Water Treatment Directive (91/271/EEC). There is no EU guidance on how the monitoring of water status/quality should be undertaken. There may be national examples available. The Directive gives guidance on the monitoring required at the outlet, and if necessary inlet, of the treatment works for compliance purposes (Annex 1D of Directive 91/271/EEC).

The guidance documents are briefly outlined in the remainder of this section: a summary and comparison of key aspects of monitoring required under the different directives and international agreements are given in Annex 1.

Monitoring under the Water Framework Directive: Guidance document No. 7

The guidance document proposes an overall methodological approach to monitoring for the implementation of the WFD and provides a framework within which Member States can either use/modify their existing methods, or where no appropriate monitoring and assessment systems exists, develop new systems that will incorporate all the requirements of the WFD. Of particular relevance to the reporting of SOE data and information is the provision of a number of tables summarising the key features of each quality element for surface waters and how each of the quality elements are monitored in Member States – the information in these tables was the starting point for Annex 1 of this document. In addition, guidance is provided on the appropriate selection of mandatory and recommended quality elements and parameters that are most representative of catchment pressures for each surface water body type. Guidance on the selection of groundwater parameters is also provided.

Overall Approach to the Classification of Ecological Status and Ecological Potential

Member States must monitor parameters indicative of the conditions of the different quality elements (biological, physico-chemical and hydromorphological). The meaning of the terms 'parameter' and 'quality element' in the Directive was open to different interpretations. Working Group 2A provided guidance on these aspects. Table 1[5] illustrates with examples the understanding of the definitions of parameters, quality elements and groups of quality elements. Further examples of parameters indicative of the condition of the biological quality elements are provided in Table 2[6].

Table 1. Examples illustrating the meaning of parameters, quality elements and groups of quality elements, based on the list in Annex V, 1.1 (of the WFD); the tables in Annex V, 1.2; and the monitoring requirements in Annex V, 1.3.

Groups of Quality Elements	Examples of Quality Elements	Examples of parameters
General physicochemical elements	Oxygenation conditions	COD, BOD, Dissolved oxygen (see point 12 of Annex VIII)
Non-priority, specific pollutants	Copper discharged in significant quantities	Concentrations of copper in water, sediment **or** biota
Hydromorphological elements	Hydrological regime	Quantity of flow, dynamics of flow
Biological elements	Composition and abundance of benthic invertebrate fauna	Composition, abundance (for further examples see Table 3)

[5] Table 1A, page 8, in the classification of ecological status guidance
[6] Table 2, page 9, in the classification of ecological status guidance

Table 2. Examples of the sorts of parameters that may be useful in estimating the condition of a biological quality element

(a) Example Biological Quality Element	(b) Example (type-specific) conditions specified for the element at good status	(c) Examples of indicative parameters (metrics) based on measurements of composition and abundance	
Benthic Invertebrate Fauna (rivers)	There must be no more than slight changes in composition and abundance There must be no more than slight changes in the ratio of disturbance sensitive taxa to insensitive taxa There must be no more than slight signs of alteration to the level of diversity	Presence or absence of particular species or groups of species Overall richness or richness of particular taxonomic Groups Relative number of taxa in particular taxonomic groups Abundance of particular species or groups of species Relative abundance of particular species or groups of species Overall diversity, or diversity within particular taxonomic groups	Taxa could be selected and/or grouped by known sensitivity/tolerance, feeding type, habitat preferences, etc

Analysis and Monitoring of Priority Substances

The aim of Expert Group on the Analysis and Monitoring of Priority Substances (AMPS) was to give technical expert advice on aspects of analysis and monitoring related to chemical pollution of surface waters, building upon the CIS Monitoring Guidance. One of the aspects developed was on the monitoring of seasonally variable substances: a list of potential candidate substances for additional seasonal monitoring was produced (Annex VIII). It was emphasised that this list was not exhaustive. It is expected that monitoring requirements will be stipulated in the Commissions proposal for environmental quality standards and emission controls to assess the compliance with the no deterioration objective of the WFD in terms of priority substances in biota and sediment.

Working Group C on groundwater

The CIS Working Group C on groundwater organised a workshop to share national and regional experiences on groundwater monitoring taking into the CIS guidance on monitoring. The main findings regarding the monitoring network, the monitoring frequency and the quality assurance of the algorithms proposed by the former WG 2.8 (Tools on assessment, classification of groundwater) were:

- Distribution of monitoring sites as well as the selected number and types of sites was highlighted as important with regard to the applicability of the proposed statistical methods and the comparability of the assessment.

- Minimum requirements (distribution and number of sites) depend on the algorithms (for status and trend assessment) applied.

- Importance of continuity with regard to selected sampling sites - changes should not affect the outcome of the assessment.

- Sampling frequency should be in accordance with the natural conditions of the GW-body

- In the time series some observations may be missing, but the missing of two or more subsequent values should be avoided for trend assessment - risk of bias due to extrapolation

- Take care of the sampling time or period to avoid bias by seasonal effects which reduces the power of the trend analyses and to avoid induced trend phenomena

- In case of yearly measurements it should be guaranteed that the measurements are taken in one and the same quarter or within a certain time period of the year

- Need of sufficient information on LOD (limit of detection) and LOQ (limit of quantification)

Nitrates Directive (91/676/EEC)[7]

Monitoring of surface freshwaters, estuarine, coastal and marine waters is required for the Nitrates Directives where marine waters are referred to as those in "exclusive economic zones". There is a requirement for Member States to review the eutrophic state[8] of their surface waters every four years. The review does not explicitly require monitoring though undoubtedly information from monitoring would be invaluable in the assessment. Assuming that some monitoring would be undertaken then it is likely that this would include those water bodies not previously identified as being polluted. The guidance also suggests different station densities for rivers and standing waters, with an increased density inside and at the borders of polluted waters, and waters deemed to be at risk from eutrophication, and less in areas with low nutrient pressures. Guidance is also given on the selection of quality elements/parameters to be measured and frequency of monitoring: for example a minimum of monthly samples for nutrients is recommended;

Urban waste Water Treatment Directive (91/271/EEC)

There is no EU guidance on how the monitoring of water status/quality should be undertaken. The Directive gives guidance on the monitoring required at the outlet, and if necessary inlet, of the treatment works for compliance purposes (Annex 1D of Directive 91/271/EEC). However, there is a requirement for Member States to review the identification of sensitive areas[9] and less sensitive areas every four years.

[7] Informally agreed by Member States in the Nitrates Directive Committee, however the text has never been submitted to a formal vote

[8] For the Nitrates Directive monitoring requirements depend on whether Member States designate their whole territory as a vulnerable zone or identify specific vulnerable zones. The former are required to monitor the nitrate content of waters (surface waters and groundwater) at selected monitoring points which make it possible to establish the extent of nitrate pollution in the waters from agricultural sources. In the latter case Member States are required to monitor the nitrate concentration in freshwaters and to review the eutrophic state of their fresh surface waters, estuarial and coastal waters.

[9] All waters are considered to be "sensitive" if countries have not identified specific sensitive areas and have applied Article 5.8 of Directive 91/271/EEC). Hence all surface water bodies would have to be included in the review.

Assuming that this would involve some monitoring (there is no explicit requirement), then it is likely that this would include those water bodies not previously identified as being sensitive (i.e. normal or less sensitive). There is no guidance on the number of monitoring stations or determinands that might be appropriate for monitoring the quality of receiving waters or the loading to the waters.

HELCOM

The monitoring of physical, chemical and biological variables of the open Baltic Sea started in 1979. Until 1992 monitoring of coastal waters was considered as a national obligation and only assessment of such data had to be reported to the Commission. However, under the revised Helsinki Convention of 1992, it is an obligation to conduct also monitoring of the coastal waters and to report the data to the Commission. Thus the Cooperative Monitoring in the Baltic Marine Environment - COMBINE – Programme was instituted in 1992. A manual for the COMBINE Programme has been produced in which the contributions made by all Contracting Parties are defined and all the methods to be used described. The manual is updated once a year.

OSPAR

OSPAR's Joint Assessment and Monitoring Programme requires that individual monitoring strategies are set for each of the substances (or group of substances) on the OSPAR List of Chemicals for Priority Action based on Background Documents for each chemical. This leads to a suite of 19 monitoring strategies that make recommendation in terms of monitoring in water, sediment or biota, and whether the monitoring of production/use/sales and discharges should be undertaken. The OSPAR Eutrophication Monitoring Programme provides the basis for enabling Contracting Parties to assess and classify the eutrophication status of their maritime waters under the Comprehensive Procedure of the Common Procedure for the Identification of the Eutrophication Status of the OSPAR Maritime Area. Guidance is given in terms of monitoring locations, determinands and frequencies.

UNEP-MAP

The mandatory monitoring matrices for MED POL programme are biota and sediment for hazardous substances (total Hg, Cd, halogenated hydrocarbons, poly aromatic hydrocarbons etc). In addition, it has been recommended that sea water quality parameters (like nutrients) and basic oceanographic parameters are also included to supplement the programmes and the regional assessments. The programme also covers the collection of data on land based inputs from point and diffuse sources. Therefore, countries are recommended to establish monitoring for river and effluent discharges as well as for atmospheric loads.

Summary of main points

Member States are in the process of designing their monitoring networks for the Water Framework Directive: these have to be operational by 22 December 2006. Member States will wish, where possible, to have integrated monitoring programmes that provide the data and information which will meet the needs of the WFD and all other relevant policies, Directives and international agreements. For example, where

possible, the same monitoring stations, quality elements and sampling frequencies would be used for Water Framework Directive assessments and also for any assessment required for other policies e.g. those arising from the OSPAR Convention.

The degree to which that is possible will depend on the similarities and differences between the various legislation and policies in terms of the objectives of monitoring, geographic remit of the legislation, water bodies that should be monitored, selection of monitoring points, selection of quality elements/determinands to be measured and monitoring frequencies. Each of these aspects need to be taken into consideration to ensure that monitoring provides information and data that is fit for all relevant and related purposes, and to ensure that unnecessary monitoring is not undertaken. It is/will be the national monitoring programmes that provide the data and information required for the assessment of SOE at the European level.

a) Rivers and lakes

For fresh surface water bodies there is potentially a good deal of synergy between the policy drivers in terms of the identification and inclusion of the same water bodies impacted by nutrients, and the quality elements indicative of eutrophication that are recommended to be monitored. There is also a joint need to review periodically the status of those water bodies identified as not being impacted by nutrients or at risk of becoming impacted by nutrients: these (or groups of these) will be included in surveillance monitoring for the Water Framework Directive and be part of the periodic review of waters for the Nitrates Directive and Urban Waste Water Treatment Directive.

Water bodies impacted by, or at risk from, nutrients will be included in operational monitoring for the Water Framework Directive (though not all will necessarily be monitored as the representative monitoring of groups of water bodies is allowed), and they will also be required to be monitored for the Urban Waste Water Treatment Directive (waters subject to discharges from urban waste water treatment works and direct discharges from some industries) and for the Nitrates Directive (diffuse sources, assessment of effectiveness of action programmes). Some if not all of the impacted or at risk water bodies (from nutrient enrichment) should also be included in Water Framework Directive surveillance monitoring and the periodic review for the Urban Waste Water Treatment and Nitrates Directives.

There are synergies between the monitoring required in all water categories for the different policy drivers in terms of quality elements required for assessing eutrophication particularly in terms of biological quality and physicochemical quality elements but less so for the hydromorphological quality elements required for the Water Framework Directive. However, HELCOM requires the monitoring of zooplankton in coastal and marine waters, an element not required by the Water Framework Directive or other policy drivers. Even though there are many similarities between the policy drivers at the biological quality element level there are some differences in terms of the recommended measured parameters indicative of the quality elements. However these difference may not be significant as long as some common disaggregated parameters such as composition and abundance of the biological element are measured (at an appropriate taxonomic level) then other related parameters could be easily derived.

There are potential differences in the frequency that monitoring might be undertaken in fresh surface waters. The reviews under the Urban Waste Water Treatment and Nitrates Directives are required at intervals of no more than four years. For the review under the Nitrates Directive, monitoring for nitrate is required over a year when a minimum of monthly samples is required. It is not yet clear how Member States will implement surveillance and operational monitoring programmes for the Water Framework Directive. A minimum of one year in six years (or one year in 18 years in exceptional circumstances) is given in the Directive for surveillance monitoring, with a minimum of one sample per 3 months in the years that monitoring is undertaken for surveillance and operational monitoring. However, an overriding requirement of monitoring for the Water Framework Directive is the achievement of acceptable levels of precision and confidence in the monitoring results and subsequent assessments. In practice this will mean much more frequent monitoring than the bare minimum quoted by the Directive. In addition, monthly sampling for nutrients is currently common practice in many Member States. In conclusion it is likely that in practice an integrated monitoring programme based on the requirements of the Water Framework Directive would be at a frequency that met the needs of the other policies.

b) Transitional, coastal and marine waters

The monitoring undertaken for the assessment of eutrophication and hazardous substances for Marine Conventions includes offshore marine waters not required for the Water Framework Directive. Marine waters in terms of the Nitrates Directive include those within a Member State's exclusive economic zone. Additional monitoring of coastal and marine waters to that required for the Water Framework Directive will, therefore, be required for use in assessing eutrophication, hazardous substances (including oil) and the impact of offshore activities for the Marine Conventions.

There are also potential differences in the hazardous substances to be included in monitoring programmes for the different policies. The WFD requires the surveillance monitoring of those Priority Substances discharged into river basins or sub-basins, and other pollutants if they are discharged in significant quantities into the river basins or sub-basins. OSPAR has defined a List of Chemicals for Priority Action. Individual monitoring strategies (that may include measurement of concentrations in marine waters) are required to be established for each of the substances (or group of substances). There are differences between the substances included on the WFD Priority List and on OSPAR's List of Chemicals for Priority Action. These differences would have to be accounted for in any integrated monitoring programme in waters of joint jurisdiction. However, any of the substances included on the OSPAR list that are not on the WFD Priority List would be included in the WFD category of "other/main pollutants", and would have to be included in monitoring programmes if they were causing or potentially causing a water body to fail its Environmental Objectives.

As for freshwaters there are potential differences in the frequency that monitoring might be undertaken for the different policies. In terms of Marine Conventions, HELCOM defines frequent and highly frequent monitoring stations that have recommended sampling frequencies higher than other geographically relevant and related policies (e.g. Water Framework Directive and Nitrates Directive). A common theme that could be incorporated into a harmonised monitoring programme for transitional, coastal and marine waters is the recognition that sampling should be targeted to specific times of year for some of the elements (e.g. nutrients and

chlorophyll). There is also a common theme of ensuring that monitoring results are fit for purpose and this implies that different frequencies would be required for different elements, different water categories and different water bodies. As examples: Member States have to achieve acceptable levels of precision and confidence in the monitoring results and subsequent assessments (Water Framework Directive); Contracting Parties have to determine optimum sampling frequencies, for example, to confirm maximum winter nutrient concentrations have been determined (OSPAR) or to detect changes in concentrations over 10 years (MEDPOL).

3. Reporting guidance

Guidance documents or guidelines on reporting have been developed for some of the directives and international agreements requiring the reporting of SOE data and information. These have been used in this document and include:

- Commission Guidance on WFD compliance reporting: http://forum.europa.eu.int/Members/irc/env/wfd/library?l=/working_groups/new_wg_reporting/guidance_document&vm=detailed&sb=Title

- EIONET-Water guidance: (1) European Freshwater Monitoring Network Design Topic report No 10/1996 http://reports.eea.eu.int/92-9167-023-5/en (2) Eurowaternet - The European Environment Agency's Monitoring and Information Network for Inland Water Resources - Technical Guidelines for Implementation http://reports.eea.eu.int/TECH07/en: (3) Eurowaternet Quantity - Technical guidelines for implementation Technical report No 99 http://reports.eea.eu.int/technical_report_2003_99/en: (4) Eurowaternet: Technical guidelines for implementation in transitional, coastal and marine waters Technical report No 97 http://reports.eea.eu.int/technical_report_2003_97/en . The guidelines are updated annually with the annual Eionet data request.

- Commission. Guidance Document for EPER implementation according to Article 3 of the Commission Decision of 17 July 2000 (2000/479/EC) on the implementation of a European Pollutant Emission Register (EPER) according to Article 15 of Council Directive 96/61/EC concerning Integrated Pollution Prevention and Control (IPPC) European Commission Directorate-General for Environment November 2000.

- Commission. Nitrates Directive (91/676/EEC): Status and trends of aquatic environment and agricultural practice. Development guide for Member States' reports. European Commission, Directorate-General for Environment, April 2000.

- Commission. User Manual for Directive 91/271/EEA UWWT-Questionnaire. 30 October 2003.

- HELCOM. Manual for Marine Monitoring in the COMBINE Programme of HELCOM (http://sea.helcom.fi/Monas/CombineManual2/PartA/AFrame.htm)

- HELCOM (2005). Guidelines for the compilation of waterborne pollution load to the Baltic Sea (PLC-water). HELCOM PLC 5 1/2005, Document 3/2.

- OSPAR (2004). ICES Integrated environmental reporting format, version 3.2. MON 04/3/2-E.

- OSPAR (2004). OSPAR guidelines for harmonised quantification and reporting procedures for nutrients (HARP-NUT). Reference number 2004-2-E.

- OSPAR (2005). Draft revision and principles of the comprehensive study on riverine inputs and direct discharges (RID). ASMO 05/13/1.

- UNEP/MAP (2003). Report on implementation of the pilot phase of the MAP reporting exercise: lessons learnt and recommendations drawn from reporting exercise. UNEP(DEC)/MED WG.237/3.

- Norwegian Pollution Control Authority (2001). Harmonised quantification and reporting procedures for hazardous substances (HARP-HAZ) prototype.

Water Framework Directive: compliance reporting

Guidance Documents have been developed to identify the information requirements under Article 3 (Coordination of administrative arrangements within river basin districts) and Article 5 (Characteristics of the river basin district, review of the environmental impact of human activity and economic analysis of water use) of the Water Framework Directive. Separate “Reporting sheets” have been developed for each subject agreed by the Water Directors, outlining the information that Commission requires for compliance checking. At a later stage the Commission will use this information for providing information at a EU-level to the general public. An equivalent Guidance Document has been developed to identify the information requirements for the upload of Article 8 (Monitoring of surface water status, groundwater status and protected areas) and Article 15 (Reporting) information. Again separate “Reporting sheets” has been developed for each subject, outlining the information that Commission requires for compliance checking. The Water Directors will agree the final sheets in November 2005.

An updated consolidated WFD compliance reporting guidance including reporting sheets for the RBMP reporting (Article 13) was presented for and endorsed by the Water Directors at their Paris meeting 24-25 November 2008. The guidance will soon be made public available (The November version is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d).

Eionet-Water

In terms of water, the EEA has established Eionet-Water as the process by which it obtains on a voluntary basis much of the information it requires on the pressures on, state of, and impacts on the quality and quantity of water across the whole of Europe. Eionet-Water is based on existing national and international networks and covers rivers, canals, lakes, reservoirs, transitional, coastal and marine waters. It also includes data on emissions and loads to all water categories, and a methodology for producing comparable information on Europe’s water resources (water quantity). In terms of quality and emissions/loads, information is obtained on nutrients, organic matter indicators and hazardous substances. Work is underway to develop Eionet-

Water data flows on biological and hydromorphological indicators. Validated data arising from Eionet-Water is now available to the public via the EEA's web page[10]. The EEA supplements, when necessary, Eionet-Water with information and data from other international and national sources such as Marine Conventions, national State of Environment Reports, FAO, Eurostat, JRC, and DG Environment.

The original Eurowaternet, now turned into EIONET-water, was designed to give a representative assessment of water types and variations in anthropogenic pressures within a country and also across the EEA area. The first step in achieving a representative network was for countries to establish a basic network with numbers of monitoring stations being based on land surface area, the bigger the country the more stations requested. This approach would enable countries with limited monitoring stations and resources to immediately participate in EEA data flows - this will remain particularly important as non-EU/EEA countries from Eastern Europe begin to contribute to EEA data flows.

The longer-term aim was to have a fully representative network and indeed some countries, e.g. France and UK, were able to statistically test the representiveness of their station selection in terms of obtaining a national overview. Eionet-Water does not necessarily give a representative view of individual catchments or of River Basin Districts.

Eionet-Water is based on national monitoring networks. As these change (for example to meet the requirements of the WFD) then it might be inevitable that Eionet-Water station selection might also have to change because, for example, monitoring may no longer be undertaken at some stations. Indeed some countries (e.g. France and Greece) have regularly changed their station selections.

A summary and comparison of the different aspects and components of Eionet-Water is given in Table 3.

[10] http://dataservice.eea.eu.int/dataservice/

Table 3 A summary and comparison of the different aspects and components of Eionet-Water

Aspect	*Quantity*	*Emissions*	*Groundwater*	*Rivers*	*Lakes*	*Transitional and coastal waters*	*Marine waters*
Guidelines produced[11]	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Priority data flow	*Informal annual data flow*	*No – volunteers, existing sources*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Current status	*2016 precipitation stations, 1118 river gauging stations from 16 countries*						
Current status: Nutrients and organic pollution indicators			*1934 groundwater bodies from 31 countries*	*3475 stations from 29 countries*	*1464 stations/lakes from 25 countries*	*~2280 stations from 23 countries*	
Current status: Hazardous substances			*~300 groundwater bodies from ~10 countries for atrazine and simazine*	*1322 stations from 15 countries. Total of 159 substances*		*1128 stations from 18 countries. Total of 46 substances in biota.*	
Determinands requested	*Precipitation River discharge Evapo-transpiration*	*Nitrogen Phosphorus Organic matter Priority List substances*	*Nitrate Ammonium Nitrite Dissolved oxygen Selected pesticides*	*Nutrients (N&P) Organic pollution indicators Chlorophyll a Discharge Priority substances, List I/II substances in water*	*Nutrients (N&P) Chlorophyll a Secchi depth Conductivity Alkalinity Priority substances, List I/II substances in water*	*Nutrients (N&P), chlorophyll a, silicate, Organic pollution indicators, salinity. Priority substances, List I/II substances Some substances on OSPAR List of Substances of Possible Concern and HELCOM's priority substances in waters, biota and sediment as appropriate*	*Nutrients (N&P), chlorophyll a, silicate, salinity. Priority substances, List I/II substances Some substances on OSPAR List of Substances of Possible Concern and HELCOM's priority substances in waters, biota and sediment as appropriate*

9. Guidelines are updated annually with the annual data request

Aspect	Quantity	Emissions	Groundwater	Rivers	Lakes	Transitional and coastal waters	Marine waters
Monitoring station types	*Reference and flux gauging stations Precipitation*	*Not relevant. Aggregation based on scale of lake or river basin*	*Well or spring Type of use: industrial, drinking, surveillance, other*	*Reference Representative Impact Flux Largest rivers*	*Reference Representative Impact Largest lakes*	*Reference Physchem station HazSubs station*	
Basis of selection of stations/bodies	*Representative subsample of national networks*	*All available*	*Groundwater body at least 300 km^2 in area, or of regional, socio-economic or environmental importance in terms of quantity and quality, or exposed to severe or major impacts.*	*Minimum guide of 1 station per 1000 km^2 of land, or statistically representative selection (at national level) or all available national stations, Geographically spread across country, representing type of, and pressures on, water bodies*	*Minimum guide of 1 station/lake per 1750 km^2 of land, or statistically representative selection (at national level) or all available national stations, Geographically spread across country, representing type of, and pressures on, water bodies*	*All those used in national monitoring programmes*	
Level of aggregation of reported data	*Annually averaged figures with maximum annual values*	*At the level available*	*Disaggregated sample data from each sampling station or annually aggregated data for each groundwater body with summary statistics*	*Annual average concentrations at each station with summary annual statistics for nutrients and organic matter indicators Disaggregated sample data from each station for hazardous substances*	*Annual average concentrations at each station with summary annual statistics for nutrients and organic matter indicators Disaggregated sample data from each station for hazardous substances*	*Disaggregated sample data from each station*	
Supportive and interpretative information	*Not relevant*	*Source category Raw pollution Purified pollution Final pollution*	*Maps. Groundwater characteristics: area, type, length, width, thickness,*	*Catchment area, altitude, flow, river length, geographic coordinates, name,*	*Catchment area, altitude, surface area, depth, volume, residence*	*Salinity, temperature, tidal range, depth, residence time, distance offshore, geographic coordinates, name, RBD, sea area, regional sea.*	

Aspect	Quantity	Emissions	Groundwater	Rivers	Lakes	Transitional and coastal waters	Marine waters
		Spatial scale Annual loads	*depth to groundwater. Type of monitoring station*	*catchment name, RBD, sea area*	*time, geographic coordinates, name, catchment name, RBD, sea area*		
Pressure (proxy) information	*Not relevant*	*Not relevant*	*Land cover in recharge area, abstraction and recharge details*	*Land cover in upstream catchment area, population density*	*Land cover in upstream catchment area, population density*	*Land cover in drainage basin of transitional and coastal waters, direct point source discharges, river load compilations, human activities (e.g. oil exploitations, marinas, ports).*	
Data exchange	*Reportnet tools*	*Electronic Template*	*Reportnet tools*	*Reportnet tools*	*Reportnet tools*	*Reportnet tools* *Data exchange with ICES for those countries who report the same data to OSPAR and HELCOM. Otherwise directly from NRCs.*	
Update frequency	*Annually, August to October.*	*Ad-hoc*	*Annually, August to October.*	*Annually, August to October.*	*Annually, August to October.*	*Annually, August to October.*	

Expert Group on the Analysis and Monitoring of Priority Substances

The AMPS expert group has also proposed a methodology for how data reported as below detection and quantification limits should be taken into account in the calculation of summary parameters. They suggested that the Priority Substances Daughter Directive should propose "less than values" be incorporated into summary statistics by the method of "double substitution". Data reported to the Commission, or made available upon request, should include contextual information for compliance checking chemical status. The group made proposals for a basis for mandatory reporting fields for data referring to individual measurements at each sampling point – for surveillance and operational monitoring:

- sample point co-ordinates (in a format to be specified);
- actual sampling date (and scheduled sampling dates if different);
- concentration of the individual sample measured, in reporting units that are specified and common to all;
- uncertainty of determination, in the same units;
- reporting limit, in the same units;
- data used to interpret measured result –, hardness for Cd, SPM concentration, salinity, lipid for biota, TOC and particle size characteristics (fraction <63μm) for sediments plus uncertainty of determination for these values;
- lowest level of application of analytical method;
- annual average concentration calculated as an arithmetic mean;
- for values where "less than" values are included both values of the double substitution rule shall be reported; and,
- for substances with intermittent releases/seasonal variations, the seasonal average shall in addition be reported.

Nitrates Directive

The Commission has produced an informal guidance document for reporting under the Nitrates Directive. It is proposed that reports should be presented under the following aspects: assessment and maps of water quality evolution; map of the vulnerable zones; development/promotion/implementation of code(s) of good practice; summary of the principal measures applied; evaluation of action programmes; and estimates of the future evolution of water quality.

Summary information on the current status of groundwaters and fresh surface waters was proposed based on annually aggregated data covering the four yearly reporting periods. In some cases this may have been for just one year in the reporting period or in others from every year in the reporting period. Aggregated or disaggregated data could be reported. Alternatively the data were also to be reported in map form in terms of a common classification (based on the French Seq-water, assessment system) and class colour coding. The information was to be reported either in a common GIS format or as a file with the geographic coordinates of each station.

The trends in nitrate concentrations between the reporting periods were to be reported in terms strong and weak increases, stable concentrations and, strong and weak decreases. Information on chlorophyll concentrations and other bioindicators was also requested. The requested information on agricultural activities (e.g. nitrogen

inputs from cattle, pigs, and poultry) in vulnerable zones and at national level would also potentially be of interpretative use in SOE assessments.

European Pollutant Emission Register (EPER) and the European Pollutant Release and Transfer Register (E-PRTR)

A first EPER guidance document was the official guideline of the European Commission that facilitates Member States to interpret and fulfil the reporting requirements of the EPER Decision 2000/479/EC without changing any of the actual requirements of the EPER Decision. For this, the Guidance Document addresses details of the EPER Decision on reporting requirements and formats, sector-specific sub-lists of pollutants for source categories and reference to emission estimation methods.

E-PRTR is the European Pollutant Release and Transfer Register, which will succeed the EPER. It is based on Regulation (EC) No 166/2006 and is intended to fully implement the obligations of the UN-ECE PRTR Protocol, which was signed in May 2003 by 36 countries and the European Community.

The obligations under the E-PRTR Regulation extend beyond the scope of EPER mainly in terms of more facilities included, more substances to report, additional coverage of releases to land, off-site transfers of waste and releases from diffuse sources, public participation and annual instead of triennial reporting.

The guidance document for implementation of the E-PRTR is available here[12]
The guidance document describes the reporting requirements and explains the mandatory reporting aspects and provides guidance to the Member States in order to facilitate and harmonise the reporting to the Commission.

The appendices include detailed explanatory examples, reference to standardised emission determination methods, and detailed sector-specific sub-lists of pollutants released from IPPC Annex I activities, both for air and water.

Urban Waste Water Treatment Directive

There are three main reporting requirements for the UWWT Directive: ***Article 17*** – Implementation programmes, ***Article 16*** - Situation reports, and ***Article 15(4)*** monitoring – treatment level, treatment performance, sewage sludge generated in urban waste water treatment plants and on specific food-processing industries listed in the Annex III of the Directive.

The previous reporting exercise was divided into three separate parts:

- Article15 reporting based on requests for data (questionnaires) issued by the Commission to the Member States. The reported data is currently stored in the UWWTD database (*electronic format*).

- Article16 reporting (Situation reports) on the status of urban waste water treatment, treatment performance, and the disposal of waste water and sludge. The purpose of the reports is to inform national governments, EU citizen and the Commission on the status and to ensure EU citizens a freedom of access to the

[12] http://ec.europa.eu/environment/air/pollutants/stationary/eper/index.htm

information on the environment. The reports have been published in national languages by each MS every two years and transmitted to the Commission. The recommended format of the report was agreed at the 12th UWWTD Committee in 17/06/1999, and the reports were in *hard-copy format.* The recommendation is informal and is not legally binding. Contains details of agglomerations (total nominal loads), UWWT works (treatment type, design treatment capacity, compliance with treated effluent standards (Y/N) sludge production, treatment and disposal, geographic location) linked to the agglomerations, discharge point (geographic location) and receiving water body.

- Article 17 reporting. The implementation programmes have been issued by each MS according to the format laid down in the Commission decision 93/481/EEC and provided to the Commission in '*hard copy' format (and/or electronic format - MS Word files)*. The programmes have to be updated (in case of changes) every two years and sent to the Commission[13].

In order to harmonise reporting for UWWTD as well as to make a coherent link-up with the other reporting for water at the EU level[14], the DG ENV has the intention:

- to set up a single reporting system for the entire directive (i.e. all articles to report) and setting a single reference year to report – as a short-term objective
- to integrate this single system into WISE - as a mid-term and long-term goal

This will help:

- to avoid double reporting under several pieces of EU legislation;
- to obtain an electronic format for all information for UWWTD[15];
- to keep all information in a single database;
- to synchronise reporting reference years;
- to increase accessibility of information for several users.

OSPAR

There are guidelines for OSPAR's study on Riverine Inputs and Directive Discharges (RID) that include the determinands that must be monitored, how they should be monitored, analytical limits of detection required for each determinand and methodologies for assessing riverine inputs and direct discharges. Templates for data submission are provided by OSPAR's secretariat with a reporting deadline of 30 September (30 November for Denmark) for data from the previous year.

The purpose of the HARP-NUT guidelines is to serve as a tool for Contracting Parties to report, in a harmonised manner, their different commitments with regard to

[13] Very few MS sent the updated information of these implementation programmes after 1993

[14] Especially with Water Framework Directive (WFD), as there is a coherent link-up of these two Directives through the programmes of measures required to develop for the WFD river basin management plans.

[15] *Information* means all raw data (e.g. monitoring data on treatment levels), textual, statistical, legal information as well as information on the monitoring results on the compliance-check provided by the MS on the implementation status of the UWWTD.

nutrients under the OSPAR Convention, and in particular with regard to the "Eutrophication Strategy". To this end, the HARP guidelines should enable Contracting Parties to quantify and report where appropriate, in a harmonised and transparent way, on both:

- nitrogen and phosphorus discharges and losses from point and diffuse sources into inland surface waters; and
- nitrogen and phosphorus inputs into the maritime area[16].

ICES provides a data handling service for data arising from OSPAR's CEMP. Data included are those on contaminants concentrations in biota and sediment, biological effects, nutrients, phytobenthos, zoobenthos and phytoplankton. Reporting formats are provided by ICES for entry into the ICES database: access to these formats is available through the ICES web page (http://www.ices.dk/env/repfor/), though it is not clear how data exchange is accomplished (e.g. via electronic templates). The deadline for reporting OSPAR data to ICES is 1 August for the previous years data.

Ministerial North Sea Conferences (HARP-HAZ)

The project was initiated by the Norwegian Pollution Control Authority to enable the harmonised reporting on hazardous substances to the Fifth North Sea Conference held in March 2002. The Guidance documents concern the quantification and reporting on discharges, emissions and losses of hazardous substances from various sources and entry routes. They provide an indicative overview of important sources and sub-sources of the various hazardous substances, as the importance of the different sources may vary from country to country. Furthermore, they include a description of general principles of this quantification/estimation. Emission loss factors are provided for some of the sources.

HELCOM

Data arising from HELCOM's COMBINE programme are also required to be reported to ICES in this case by 1 September for data on contaminants and biological community data collected in the previous year. Data are again reported using ICES formats.

HELCOM also produces guidelines for the compilation of waterborne pollution loads to the Baltic Sea (PLC-Water). These are to be reported annually for some components and once every 6 years for others. The quantification of the total load to the Baltic Sea from: monitored rivers; unmonitored areas (partly monitored rivers, unmonitored part of monitored rivers, unmonitored rivers and coastal areas); and point sources and diffuse sources discharging directly into the Baltic Sea has to be carried out and reported every year for each main Baltic Sea sub-region catchment area by each Contracting Party for defined variables (N and P, BOD7, heavy metals). All data will have to be reported electronically according to the reporting format prepared by a data consultant. More comprehensive load compilations are carried out every 6 years that include quantification of loads from different economic sectors (e.g. fish farms) and from natural sources. Guidance is given for both compilations including details of methods for load estimation using source-orientated or load-orientated approaches.

16 Excluding the quantification and reporting of atmospheric deposition of nitrogen and phosphorus on the waters of the maritime area.

UNEP-MAP

Reporting guidelines and format have been developed for the biennial reports to the MAP secretariat on the legal, administrative or other measures taken by them for the implementation of the Convention and Protocols including reports on the effectiveness of measures. The guidelines are in the format of questionnaires. For example, information is required on the numbers of authorisations, loads of substances discharged from specific sectors and total loads of specified substances released from all sectors under the Land-based Sources protocol. Contracting Countries are also obliged to submit their monitoring data annually to the MAP secretariat using standardised reporting formats since 2001.

UNEP-MAP Countries are obliged to submit their monitoring data annually. The data on trends and state monitoring should be submitted as raw data. Internal laboratory quality data is also required in order to check the analytical variances. As mentioned above, the monitoring data loaded to the Database in 2003 were those of the 1999-2002 period. Some more data was provided in the last few months of the current year and are at present available in original data files. Since standardised data reporting formats were utilized since 2001, data for previous years were in free format and did create a lot of difficulties during data loading. At present, data in the database is not yet validated in view of the fact that database has became operational very recently. However, in most cases, physical errors on formatting, units etc. have been identified and corrected. A full data verification/validation procedure is expected to function in 2004 (see below) and will be applied both for the 1999-2002 and new data for the year 2003.

Summary of main points

Task 1 has identified those aspects reported for compliance checking with European Directives that are of potential use in SOE assessments undertaken at a European level. Task 2 has identified guidelines produced by the Commission and other international organisations that should be used for the monitoring of the water environment at a national level and for the subsequent reporting of the collected data and information to those requesting it. The output of both Tasks will be used to define the scope of SOE parameters that should be included in WISE (Task 3).

There are differences in current reporting requirements. For example, in terms of the geographic coverage of waters to be included in reporting, Marine Conventions also require SOE information from open marine waters, information that is generally not required for Directive reporting. Reporting frequencies are also often different, for example annual reporting for Eionet-water, OSPAR (SOE and RID data), HELCOM (SOE data) and UNEP-MAP (SOE data), every 2 years for the UWWT Directive, every 4 years for the Nitrates Directive, and every 6 years for the WFD.

There are also clear overlaps where reporting for one obligation may contribute to another. For example, reporting for the E-PRTR and UWWT Directive should contribute to the reporting of nutrient discharge and losses from point sources to OSPAR using the HARP-NUT guidelines, though the latter have methodologies for reporting discharge and losses from other sources such as diffuse sources.

There are also commonalities in terms of the determinands to be reported. For example, nitrate concentrations are required for the Nitrates Directive, Eionet-Water and the Marine Conventions.

Agreement will have to be reached on the determinands to be reported and at what spatial and temporal aggregation that meets the needs of all those requesting and using such SOE data and information: in short lowest common denominators (e.g. level of disaggregation of data and information, reporting frequencies, all monitoring stations or subsets) will have to be agreed. This will allow the subsequent aggregation of the data and information in different ways to meet the different needs. For example, the Nitrates Directive requires maps of nitrate concentrations in surface waters every four years. Such maps could be produced using the annually reported disaggregated (individual sample) data on nitrate concentrations with the required geographic location information. Another example is the recommendation by the AMPS group for the use of the double substitution method for treating concentrations less than limits of detection when calculating annual average data. Eionet-Water currently requests disaggregated data for hazardous substances with analytical limits of detection and determination. The double substitutes method could be easily applied to the disaggregated individual sample data set for reporting on priority substances under the WFD, if required.

Annex 1

Summary and comparison of key aspects of monitoring required under different directives and international agreements

	Water Framework Directive	Nitrates Directive	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
Water categories covered	Groundwater, rivers, lakes, transitional waters and coastal waters of EU Member States.	Groundwaters, surface freshwaters, lakes, other freshwater bodies, estuaries, coastal waters and territorial marine waters	Natural freshwaters lakes, other freshwater bodies (e.g. streams), estuaries and coastal waters, waters within jurisdiction of Member States	Maritime area: the internal waters (up to freshwater limits) and the territorial seas of the Contracting Parties; the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state to the extent recognised by international law; and, the high seas	Open Baltic Sea and coastal areas (transitional and coastal waters) of Contracting Parties	Marine and coastal environment of Contracting Parties, rivers & sewage outfalls as pollution point sources.

A. Surface Water Bodies

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
			[18]	**Eutrophication monitoring programme**	**Eutrophication**	**Eutrophication monitoring strategy**
Water bodies covered	*Water bodies that are at risk of failing or are failing Environmental Objectives because of pressures arising from diffuse and point sources, abstractions, hydromorphological*	Waters that are eutrophic or may become eutrophic in the near future (Polluted waters), *Non-polluted waters*	Waters that are eutrophic or may become eutrophic in the near future (sensitive areas). Waters subject to discharges from UWWT plants and direct discharges from defined	Non-problem areas, Problem areas Potential problem areas	Coastal and marine waters	Eutrophic or sensitive to eutrophication

17 Non statutory draft guidelines for the monitoring required under the Nitrates Directive (91/676/EEC), March 2003

18 Methodology for identifying sensitive areas in England and Wales (UK, DOE 1993)

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
	changes and other anthropogenic activities (operational monitoring). Water bodies that are included in surveillance monitoring including water bodies not at risk.		industries. Non eutrophic waters (normal and less sensitive area)			
Selection of monitoring stations/water bodies	Sites representative of similar groups of water bodies. Operational monitoring: sufficient stations to assess magnitude and impact of pressures on water bodies. Surveillance monitoring: sufficient to provide an assessment of overall surface water status with each catchment and subcatchment of the river basin district. In addition specific points are to be included: including significant water bodies and transboundary water bodies.	One[19] river station per 300 to 1000 km^2 of land area. And 1 station per 5 to 30 km^2 of water surface (still waters). Increased density inside and at borders of designated vulnerable zones and "at risk" zones. Less dense in regions with low nutrient pressures and homogeneous soils and water bodies.	No EU guidance	Commensurate with anticipated extent of eutrophication in the area under consideration as well as its hydrographic characteristics. Optimum locations to be determined by each Contracting Party. Spatial coverage greatest in problem and potential problem areas, least in non-problem areas.	[20]Mapping stations for mapping of winter pool of nutrients, of oxygenation conditions in near bottom waters, zoobenthos High frequency stations for pelagic variables and for monitoring water exchange between the various basins and between the Baltic Sea and the North Sea.	Representative: - Marine sites - Off-shore fish farm sites - Coastal lagoons sites First two with hot spot (affected) sites and reference sites
Quality element used to assess State	**Measured parameters indicative of QE[21]**					
Phytoplankton	Composition, abundance, biomass, blooms	Chlorophyll in growing season. Algal blooms Paralytic Shellfish	Occurrence and duration of exceptional algal blooms	Chlorophyll a Species composition: (genera and	Core variables Chlorophyll a Species composition,	Short term programme Chlorophyll s. Total abundance, abundance

[19] Guide
[20] Combine Manual (http://sea.helcom.fi/Monas/CombineManual2/PartC/)
[21] Taken from CIS Guidance No.7 on monitoring

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
		Poisoning and Diarrhoeic Shellfish Poisoning Algal scums	Paralytic Shellfish Poisoning Algal scums	nuisance/potentially toxic species) in Problem and potential problem areas. Discretionary in Non-problem areas.	abundances, biomass Primary production, main variable[22] Vertical profiles of fluorescence, main variable in open Sea.	of major groups, bloom dominance.
Macroalgae/ Angiosperms	Composition, abundance, sensitive taxa, cover (coastal waters)	Deviation from normal species composition and changes in the portion of red, green and brown algae	Composition, depth distribution, cover	In shallow areas. Biomass (problem and non-problem areas) and species composition, coverage, and reduced depth distribution (problem areas).	Phytobenthos Composition and abundances, depth distribution Main variable in coastal areas	Composition and population dynamics of phytobenthos proposed for use in the future
Angiosperms	Composition and abundance (transitional waters)	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required
Macroalgae	Composition, abundance, cover (transitional waters)	Blooms, changes in growth (transitional waters)	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required
Macrophytes and phytobenthos	Composition, abundance (rivers and lakes),	Species composition (lakes) Changes in growth	Abundance and diversity Biomass, scums, blooms	Not explicitly required	Not explicitly required	Not explicitly required
Benthic invertebrate fauna	Composition, abundance, diversity, sensitive taxa	Biomass, species composition, mortality	Substantial increases or decreases in benthic biomass, shift in species composition and mortality	Biomass, species composition and eutrophication indicator species in problem areas. Discretionary in Non-problem areas.	Core Variable[23]: species composition, abundances, biomass	Composition and population dynamics of meio- and macrozoobenthos proposed for use in the future
Fish	Composition, abundance, sensitive species (all except coastal waters), age structure (rivers and	Composition and mortality	Mortality (coastal, rivers and lakes). Species composition (rivers, transitional waters, lakes)	Diversity and abundance (rivers and lakes)	Undertaken by ICES	Not explicitly required

[22] Main variables are of equal importance as the core variables for the Baltic Sea Periodic Assessments and have to be measured on a regular basis. However, for reasons of regional requirements as well as of competence and/or resources not all CPs will be required to carry out all measurements but all measurements will need to be covered on a work-sharing basis.

[23] Core variables comprise measurements that have to be carried out on a routine basis to produce comparable and accurate results from all regions of the Baltic Sea as a basic information for an assessment

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
	lakes).					
Zooplankton	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required	Main variable Species composition, abundances, biomass	Not explicitly required
Particulate matter	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required	Sinking rate of particulate matter Main variable in open sea	Not explicitly required
Hydrological regime	Rivers and lakes: quantity and dynamics of water flow Rivers and Lakes: Connection to groundwater bodies Lakes: Residence time[24]	Not explicitly required	Rivers: retention time	Not explicitly required	Not explicitly required	Not explicitly required
Tidal regime	Transitional waters: freshwater flow, wave exposure Coastal waters: direction of dominant currents and wave exposure.[20]				Coastal and marine waters: Current speed and direction, main variable	Coastal and marine waters: Prevailing current patterns, water mass dynamics and estimation of residence time in monitored areas proposed for future monitoring.
River continuity	Number and type of barrier and associated provision for fish passage.	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required
Morphological conditions	Rivers: Depth and width variation; structure and substrate of the bed; structure of the riparian zone Lakes: Depth variation; quantity, structure and substrate of the bed; structure of the lake shore.	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required	Not explicitly required

[24] See CIS Monitoring guidance for other examples of indicative parameters

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
	Transitional waters and coastal waters: depth variation; quantity (transitional waters only), structure and substrate of the bed; structure of the intertidal zone. [20]					
Transparency	Rivers: In relation to nutrient concentrations. Lakes: Secchi depth, turbidity, colour, TSS Transitional and coastal waters: Light penetration & quality	Rivers and lakes: Light intensity at benthic level Lakes: Secchi depth Transitional waters: changes in photic zone, light at benthic level. Coastal waters: in relation to nutrient concentrations. Suspended matter.	Lakes: Secchi depth	Not explicitly required	Light attenuation/ Transparency Core variable	Short term programme Transparency.
Thermal Conditions	Temperature Water column structure (in stratified waters) – all water categories	Not explicitly required	Not explicitly required	Temperature	Temperature	Short term programme Temperature.
Oxygenation Conditions	D.O. concentration O_2 % saturation TOC, BOD, COD, DOC	DO in deeper and stratified waters (transitional and coastal waters) Amplitude of daily variation (rivers and lakes)	DO deficiency in surface and deeper waters	D.O. concentration O_2 % saturation Discretionary in Non-problem areas.	Oxygen and Hydrogen sulphide, Core variables	Short term programme Dissolved oxygen
Organic matter conditions	Not explicitly required	Not explicitly required	Not explicitly required	Total Organic Carbon and: Particulate Organic Carbon in problem areas in association with phytoplankton measurement	Not explicitly required	Not explicitly required
Salinity	Conductivity in rivers and lakes ppt, psu in transitional and coastal waters	In relation to nutrient concentrations in transitional and coastal waters	In relation to nutrient concentrations in transitional and coastal waters	Salinity at same frequency as nutrients	Salinity, core variable	Short term programme Salinity psu

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
Acidification status	pH, ANC, Alkalinity	Amplitude of daily variation. pH in association with nutrients and oxygen in rivers and lakes	Not explicitly required	Not explicitly required	pH	Short term programme pH.
Nutrient condition	NO_3, NO_2, NH_4, $P0_4$, Si (transitional and coastal waters) concentration, total N, total P	Rivers, lakes, transitional and coastal waters: Nitrate between October and March. Orthophosphate over the year. Total nitrogen and total phosphorus during growing season. Coastal waters: Winter and early spring NO_3, TN (relative to type specific background), TP, N/P ratio	Coastal waters: Winter nitrate concentrations relative to a background concentration for a defined geographic area based on salinity	NH_4-N, NO_2-N. NO_3-N, PO_4-P, and SiO_4-Si in problem and potential problems areas. Same in non-problem areas except for silicate.	Core variables: Phosphate Total phosphorus, Nitrate+nitrite, Ammonium, Total nitrogen, Silicate.	Short term programme Orthophosphate, total phosphorus, nitrite, nitrate, ammonium, total nitrogen, silicate.
				Monitoring strategies for Chemicals for Priority Action: Monitoring under the Coordinated Environmental Monitoring Programme:		
Specific pollutants	Priority List Substances discharged into river basin or sub-basin included in surveillance monitoring, and those that lead water bodies to fail, or at risk of failing, their environmental objectives included in operational monitoring	Not applicable	Not applicable	Biota and sediment: Cd, Hg, Pb, PCBs and PAH Sediment: organic tins RID programme: (mandatory) Cd, Hg, Pb, Lindane (optional) PCBs and PAH Chemicals for priority action[25]: Brominated flame retardants, cadmium, clotrimazole,	Biota: Cd, Hg, Cu, Pb, Zn, DDT and metabolites, PCBs, HCB, alpha and gamma HCH. Water: Cu, Cd, Pb and Zn in dissolved and suspended particulate matter, mercury, DDT and metabolites, PCBs HCB, PAH and alpha, beta and gamma HCH in	Mandatory: total mercury and total cadmium in biota and sediment at coastal/reference areas and hot spots. Other heavy metals, DDT and metabolites, PAH in biota and sediment recommended.

[25] Individual monitoring strategies are set up for each of the substances (or group of substances) on the OSPAR List of Chemicals for Priority Action

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
				dicofol, dioxins and furans, endosulphan, lead, lindane, methoxychlor,	total water samples.	
	Other pollutants are included in surveillance monitoring if they are discharged in significant quantities in the river basin or sub-basin, and in operational monitoring if they cause failure or risk of failure of environmental objectives.	Not applicable	Not applicable	mercury, musk xylenes, nonylphenol, octylphenol, organo-tin, PAHs, PCBs, pentachlorophenol, short-chained chlorinated paraffins, tetrabromobisphenol-A, trichlorobenzenes, trifluralin, 2,4,6 tri-*tert*-butylphenol		
Frequency of monitoring	To achieve an acceptable level of confidence and precision in the assessment of the status of all water bodies. Frequencies can be tailored according to conditions and variability within water bodies. Seasonal and targeted sampling allowed. Guidelines given on minimum frequencies for all quality elements. Generally, minimum of once every 6 years for surveillance monitoring. Phytoplankton: once per 6 months Other aquatic flora, macroinvertebrates and	[26]For surface waters, nitrate at least monthly (more frequently) during flood periods, over a period of year and at least every 4 years (once every 8 years under defined conditions). Surface waters should be monitored at those times when elevated nitrate levels are expected (October to March). Estuarine, coastal and marine waters: Phytoplankton, minimum monthly with emphasis on bloom season Macrophytes, at least once a year during peak growth season	Review of sensitive and less sensitive areas no more than every four years (if this includes monitoring). The Directive does not stipulate the frequency of monitoring required under Article 15.2 and 15.3 in relation to discharges from UWWT works, from direct discharges from defined industries and disposal of sludge to surface water	Contracting Parties should determine the optimum frequency per year. Phytoplankton, macroalgae, angiosperms and benthic invertebrate fauna annually in problem and potential problem areas, discretionary in non-problem areas. Nutrients: annually in winter and during monitoring of direct and indirect effects in problem and potential problem areas. Every 3 years in non-problem areas. Each monitoring event should include	Benthic invertebrate fauna: once or few times a year at mapping stations Phytobenthos (in coastal areas), nutrients (winter), temperature, salinity: once or few times a year at mapping stations Oxygenation conditions: few times a year particularly in critical areas and seasons (e.g. summer/autumn) Phytoplankton, zooplankton, nutrients, temperature, oxygenation conditions, salinity: monthly but weekly in vegetative period at high frequency stations.	Short term strategy: Phytoplankton, nutrients, transparency, thermal conditions, oxygenation conditions, salinity, pH: seasonal, mandatory, but monthly (recommended) or following seasonal cycle (more frequent during periods of high variability and less frequent at more stable periods). Optimal sampling frequency, according to parameter, sampling area and able to detect changes over 10 years, to be determined by contracting Party. Hazardous substances:

[26] Non-statutory draft guidelines for the monitoring required under the Nitrates Directive (91/676/EEC), 2004

	Water Framework Directive	Nitrates Directive[17]	Urban Waste Treatment Directive	OSPAR JAMP	HELCOM COMBINE:	MEDPOL Phase III
	fish: once per 3 years. Nutrients and other physicochemical elements (except priority substances): once every 3 months. Hydro-morphological: up to once per 6 years. Priority Substances minimum of once per month. Other pollutants once every 3 months.	Benthic invertebrate, at least once a year in spring/early summer Deep water oxygen, minimum of once in each season, optimally every 15 to 30 days.		sufficient samples to confirm that the maximum winter nutrient concentration has been determined. Temperature, salinity at same frequency as nutrients Oxygenation conditions: annually during algal growing season in problem and potential problem areas, discretionary in non-problem areas. Organic matter conditions: in problem areas in association with phytoplankton measurement. RID Annual sampling with a minimum of 12 samples over a year, collected at regular intervals but also to reflect expected river flow pattern.	Contaminants in biota: Guidance given on species, number of samples per species, and sampling season.	Annually for biota at the pre-spawning period and annually for sediments at the most stable hydrographic conditions.

B. Groundwater

	Water Framework Directive[27]	Nitrates Directive[28]
Water bodies covered	**Quantity network:** Enough groundwater bodies or groups of groundwater bodies to provide a reliable assessment of the	*Those affected by agricultural nitrate pollution* *Groundwater in areas where eutrophication in surface waters is*

[27] Draft monitoring specification, version 2. Groundwater Monitoring drafting group
[28] Non-statutory draft guidelines for the monitoring required under the Nitrates Directive (91/676/EEC), 2004

	Water Framework Directive[27]	Nitrates Directive[28]
	quantitative status of all groundwater bodies or groups of bodies including assessment of the available groundwater resource Chemical status: **Surveillance monitoring** required in bodies or groups of bodies both at risk and not at risk of failing WFD objectives. **Operational monitoring** required only in bodies at risk of failing to meet WFD objectives.	*observed or expected.*
Selection of monitoring stations/water bodies	The design of all monitoring programme based on the conceptual model/understanding of the groundwater system. **Quantity monitoring**: a greater density may be required in more spatially variable systems or with more variable pressures on it. In GWB or groupings not at risk monitoring may be minimised. In those GWB or groupings at risk distribution of points reflects the receptors identified as being at risk and to their perceived importance. **Surveillance monitoring**: At risk bodies – stations coinciding with operational monitoring points; Not at risk bodies where confidence in the risk assessment is low – at least 3 points in the most suitable GWB per grouping; body groupings where pressures are limited (low or absent)- at least 1 point per grouping. **Operational monitoring** points: representative in relation to key receptors (e.g. dependent ecosystems and surface water bodies) and key pressures. Distributed across body when subject to diffuse pollution.	Based on conceptual model of aquifers. To obtain a representative picture of nitrate concentrations in groundwaters. Dependent on land use and hydrogeological conditions. Sampling points should be in the upper (the first 5m of saturated zone) and lower parts of aquifers that are connected to the soil
Parameters to be monitored	**Quantity monitoring**: groundwater levels in boreholes or wells, spring flows, flow/stage levels of surface water courses, stage levels in significant groundwater dependent wetlands and lakes (recommended) – chemical monitoring for saline or other intrusions may also be required. **Surveillance monitoring**: core parameters; oxygen content, pH value, conductivity nitrate, ammonium, and temperature and appropriate major and trace ions. Selected/case specific parameters indicative of pressures that are putting the GWB at risk e.g. pesticides and other hazardous substances. **Operational monitoring:** Both core and selective/case specific parameters latter based on conceptual models and risk assessments.	Nitrate, conductivity, pH and oxygen
Frequency of monitoring	Where monitoring is designed to pick up seasonal or annual variations, the timing of monitoring should be standardised from year to year. **Quantity monitoring**: Daily preferred (e.g. flows), minimum monthly. **Surveillance monitoring**: initial frequency, twice per year in confined	Guide: at least twice a year at each monitoring station. More frequent in vulnerable groundwaters and fast response systems. Seasonal or temporally targeted sampling could be appropriate. Directive stipulates monitoring every 4 years though monitoring every year may be required (at a number of representative sites) to detect

	Water Framework Directive[27]	Nitrates Directive[28]
	aquifers and quarterly in unconfined aquifers, less frequent over the longer term. **Operational monitoring**: Confined aquifers, annual. Unconfined aquifers: quarterly to annually depending upon groundwater vulnerability and nature of pressures (continuous or intermittent).	temporal trends.

Part 3

Guidance on scope of SOE-parameters

1. Introduction

In developing this reporting guidance for SOE-information there is a clear principle that there should be no double reporting – the aim is for a delivery of one data set that might be useful for compliance and SOE assessments. The compliance reporting drafting group has developed "reporting sheets" as the starting point for the reporting process where the required information is described. Reporting sheets are considered to be a useful tool to allow the process to be seen and discussed transparently also for the SOE reporting drafting group. The actual reporting process is through the XML schemas or the Data Dictionary subsequently developed from the agreed reporting sheets: how reporting is to be achieved is to be discussed under Tasks 4 and 5 of the SOE drafting group.

The SOE dataflow is voluntary; it is based on international agreements to provide data for the EEA, not on a compulsory basis but with some responsibilities on countries to do so. The compliance reporting to DG ENV is legally binding and an obligation arising from the WFD, it comprises mandatory and voluntary data submissions. All information can be useful in state of environment reporting and is in anyway arising from the same monitoring networks in the member states. Some of the base data are necessary to establish a reference dataset with which monitoring results can be related and exchanged between the Member States and the European bodies more easily at a later stage.

The output of this task is seen as updating and aligning (in terms of numbers of monitoring sites and determinands) beyond the existing Eionet-Water priority data flows. In which case new information would be needed on some aspects such as the typology of the old and the new sites, density of sites and the site identifiers/codes: these need to be kept to maintain the history of the dataflow. The EEA will continue to use existing Eionet stations/sites if possible and will maintain the history of previously reported stations/sites and data. The designation of sites and which ones are needed to make the assessment representative also needs to be redefined.

A phased approach will be taken in the development of the reporting sheets with the continuation and improvement of the well established and successful SOE reporting achieved through Eionet-Water as the starting point. The reporting of other determinands will then be progressively developed in the future as the (WFD) monitoring programmes become established in the MSs.

Table 1 provides an overview of the reporting sheets that might be developed and subsequently used for SOER reporting – this list is to be discussed and agreed with the drafting group.

Thirteen reporting sheets for SOER have been drafted to date relating to the reporting of:

- Concentrations of general physicochemical and hazardous substance determinands in surface waters and groundwaters;
- Water quantity;

- Physical characteristics of monitoring sites and catchment proxy pressure information;
- Geographic information;
- Data Quality;
- Loads of pollutants to surface waters; and,
- Benthic invertebrates in rivers, phytoplankton and other aquatic flora in lakes, and aquatic flora in coastal waters.

Some sheets are based on the current Eionet-Water data flows (indicated in Table 1), the specific details of which are defined in Reportnet's Data Dictionary. Those aspects that are not currently included in the Data Dictionary are pointed out. Links are also made with the relevant Article 5 and Article 8 compliance reporting sheets.

Table 1 Overview of the reporting sheets and their envisaged reporting dates

Reporting Sheet Code	***Reporting Sheet Title***	***Reporting dates***	***Serial Number***
1.Rivers (natural, canalised rivers and artificial canals) and lakes (natural, artificial (reservoirs) and mixed)			
NUT_ORG_RV_LK	State of rivers and lakes in terms of nitrogen, phosphorus, chlorophyll-a and organic pollution determinands in water	Regular reporting since 2008	1
HAZ_WAT_RV_LK	State of rivers and lakes in terms of Priority Substances and other hazardous substances in water	Regular reporting since 2008	2
BIO_INV_RV	State of river water bodies in terms of biological quality elements – benthic invertebrate fauna	*DD to be specified in 2009*	*5*
BIO_PHY_LK	State of lake water bodies in terms of biological quality elements – phytoplankton	*DD to be specified in 2009*	*6*
BIO_AQU_LK	State of lake water bodies in terms of biological quality elements – Macrophytes in lakes	*DD to be specified in 2009*	*7*
2. Surface water and groundwater			
QNT_SW_GW	State and quantity of water resources	*Test in 2008; DD to be specified in 2009.*	3
EMI_ *SW_GW*	Loads, discharges and emissions of pollutants to surface waters and groundwater	*Test in 2008; DD to be specified in 2009*	4
3. Groundwater			
NUT_GW	State of groundwaters in terms of nitrogen	Regular reporting since 2008.	*8*
HAZ_GW	*State of groundwaters in terms of hazardous substances*	Regular reporting since 2008	*9*
4. Transitional and coastal waters			
NUT_TW_CW	State of transitional and coastal waters in terms of nitrogen, phosphorus, oxygen and chlorophyll a in water	Test ongoing based on Eionet-water and then annually from 2009 onwards	*10*
5. Geographic, supportive and interpretative information for monitoring sites, data quality *(surface waters and groundwaters)*			
STA_CHA_PRE	*Site characteristics and proxy pressure*	*Reported once*	*14*

Reporting Sheet Code	Reporting Sheet Title	Reporting dates	Serial Number
	information. [Note: Proxy pressure information arising from inland sources will be derived by the EEA. Countries will be asked to validate this information.]	*unless information changes and/or a new site is reported*	
GEO_INF	*Geographic information*	*Reported once unless information changes and/or a new site is reported*	*15*
DQ	*Data Quality for reported SOE data*	*Test in 2007 based on Eionet-Water and then October 2008 and every four years thereafter*	*16*

DD: Data Dictionary

2. Monitoring sites to obtain representative information for SOE assessments

2.1 EEA assessments

The EEA has outlined the types of SOE assessments of Europe's waters it needs to undertake. These are:

1. Assessment of the state of, and trends in, the water environment following the basic principles of European policies such as the Water Framework Directive[29]. For the marine area SOE assessments will be developed in line with the development of the European Marine Strategy. These assessments are using indicators like the EEA Core Set Indicators (CSI) and other more specific indicators all requiring data and information representative of river stretches/water bodies and catchments.

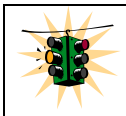
2. Broader assessment of specific water-related issues such as eutrophication, hazardous substances, water quantity/use and hydromorphological impacts in the relevant conceptual ecosystem frameworks.

3. Assessment of the impact of specific sectors, such as agriculture, energy industry, transport, and water management[30] on water and the relevant pressures, sectoral driving forces and possible responses. This could be based on conceptual models (such as for weighted water quality indices) or process models and with a focus on hot spots of sectoral (e.g. agricultural) activity.

The current developments carried out by the EEA are aimed at making these assessments more representative of the water body and catchment level.

2.2 Information required for SOE assessments

For SOE assessments the EEA requires data and information from the full range of the actual statuses of water bodies (high, good as well as moderate, poor and bad) enabling the production of representative assessments of the state of water bodies within and across catchments, River Basin Districts and countries based on comparable data and information.



Look Out!
The Directive mentions both basins and catchments but only defines "basins" in Article 2 (*River basin means the area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta*). The WFD glossary indicates that basins and catchments are considered to be equivalent. Therefore, catchment and subcatchment will be used in this document.

[29] The basis of the assessments under the Water Framework Directive are the water body, sub-catchment, catchment and River Basin District. In addition hydrosystems (including nested catchments, upstream and downstream relationships of water bodies) as outlined in seamless geographic dataset for Europe would be used for e.g. for modelling purposes.
[30] In this context taken to mean the abstraction and use of waters, and the collection and treatment of waste water

As described in other sections of the SOE guidance Member States are re-designing their monitoring networks to meet the requirements of the Water Framework Directive[31]. As a result they are likely to have an integrated network that provides the data and information that also meets the Agency's needs concerning assessment in relation to other water-related directives and policies. As data for the full range of statuses, types and sizes are required this might include data from both surveillance and operational monitoring depending on the design of the national monitoring network.

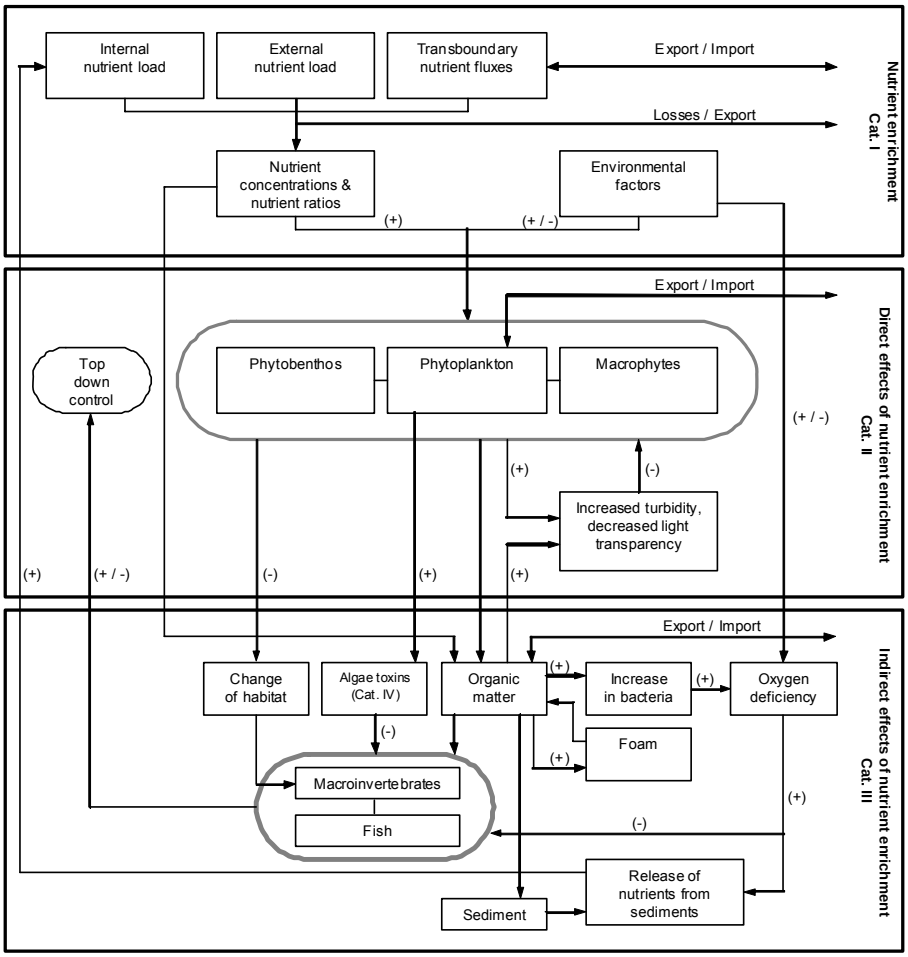
The assessment of specific water related issues such as eutrophication would use the DPSIR framework applied in the appropriate conceptual framework of the ecosystem's structure and function. Such a conceptual framework was included, for example, in the CIS guidance for eutrophication assessment for all surface water categories (see Figure 1). The conceptual framework shows that nutrient loads and nutrient concentrations are used as indicators of nutrient enrichment, and that biological elements are indicative of the direct and indirect effects of nutrient enrichment. These indicators would need to be formulated from the SOE reporting data flows.

The reported SOE data flow should also include data and information from water bodies impacted by, or at risk, from the full range of actual pressures within a catchment. Information on the proxy pressures in the catchment upstream of the site/water body will help the EEA in the identification of the appropriate sites and the processing of their data for the assessment of the impact of specific pressures and sectors. As soon as a river reaches a certain size, it's water quality is the result of diverse pressures. Hence the same site may reflect low pressure from one driver/activity and high pressure from a different one. This is why the EEA intends to calculate such proxy pressure information using the geographic information reported to WISE, along with the appropriate European databases of catchments, land cover and appropriate statistical data (e.g. population) considering the relevant set of pressures/impact relationships to be addressed. However, countries will be asked to validate the derived information for their monitoring sites/water bodies.

The EEA is also introducing the concept of "ecosystem services" extending the DPSIR to all relevant policies and socio-economic driving forces into its assessments. This would require appropriate data and information from beyond the WFD monitoring networks (e.g. in relation to the D and R aspects) from other (existing) sources. In terms of eutrophication, for example, statistical and socio-economic information or information on the measures adopted under EU legislation (as reported under the Nitrates and UWWT Directives) and national policies, and their effectiveness would ideally be required.

[31] Article 8.1: Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district.

Figure 1. **General conceptual framework to assess eutrophication in all categories of surface waters (from CIS Guidance on Eutrophication assessment in the context of European water policies**



2.3 Relationship between monitoring sites, determinands measured at the site and water bodies

At present data on rivers, lakes, transitional, coastal and marine waters used for the core set of indicators (CSI) are presented in terms of monitoring sites. For example:

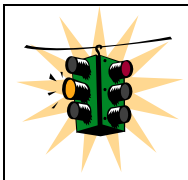
- trends in concentrations at a regional (e.g. western Europe) and European level from aggregated site concentrations;
- upward and downward trends in concentrations at monitoring sites at a country level; and,
- distribution (classification) of most recent concentrations across the sites at a country level.

Data will be in principle reported at the site level. Site level data may then be aggregated (by the EEA) spatially and/or temporally in ways appropriate to the assessment being undertaken.

However in coastal and marine waters there are practical difficulties in sampling the exact same geographic location on each sampling occasion. Different countries have different procedures when recording and reporting their data. Some report fixed approximate coordinates for monitoring sites whilst others report the exact coordinates of the ship during sampling. This can result in coastal and marine sites having slightly variable coordinates and thereby fragmenting time-series assessments if this is not taken into account during the processing of the data. This is overcome by the EEA by obtaining representative averages of the data within geographic grids (open water sites: 5.5 x 5.5 km, coastal sites: 1.4 x 1.4 km).

Furthermore, due to the special situation in groundwater in terms of water flow, dispersion and hydrogeological characteristics, some of the assessments for groundwater are not only based on the concentrations measured at sampling wells but also aggregated to, and presented at, a summary statistic concentration (e.g. mean) at the groundwater body level. However, aggregated data do not adequately present the uncertainty of the aggregate, all the more since the calculation of the uncertainty poses methodological problems.

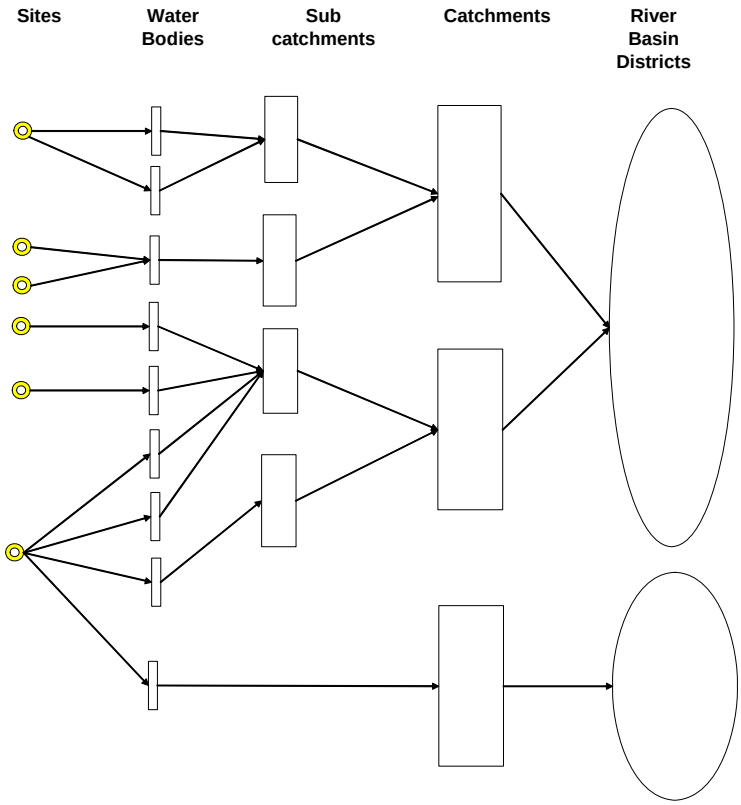
As illustrated in Figure 2, there are a number of different relationships possible between the monitoring sites and the water bodies they represent in terms of WFD monitoring and assessments. At the simplest level, one monitoring site represents one water body and the results of monitoring would be used in the assessment of the state of that water body. Where water bodies are grouped[32], one monitoring site may represent more than one water body, and, as Figure 2 illustrates, those water bodies may be in the same catchment, same RBD or in a separate RBD. In the case of grouping it would be expected that the results of monitoring would be extrapolated to the other 'represented' water bodies in the group. In other cases there may be more than one monitoring site in a water body, this may be for the same quality element or for a different quality element: different locations within a water body maybe required to represent the physicochemical quality elements from those representing the biological quality elements and the hydromorphological quality elements.



Look Out!
The uncertainty associated with assessments will also depend on the numbers of monitoring sites used to represent the total number of water bodies in a catchment and RBD. For example, uncertainty may be relatively low when assessments are based on data and information from several monitoring sites in a single small and homogenous water body compared to those resulting from an extrapolation process between a monitored water body and a distant one in another RBD. In practice Member States will have to balance the costs of monitoring against the reliability of the information obtained and the confidence in assessments subsequently produced. This potential uncertainty in the reported information will have to be recognised and taken into account in SOE assessments.

[32] The WFD permits the grouping (for monitoring, assessment and reporting) of similar types of water body subject to the same significant pressure or the same combinations of pressures.

Figure 2 Schematic diagram illustrating relationships between monitoring sites, water bodies, catchments and RBDs



If assessments were to be undertaken on a water body basis, information from non-monitored water bodies would have to represented and taken into account in the assessment (Figure 2). The CSI could then be presented (depending on the availability of information) in terms of numbers of water bodies (rather than sites) or % of total river lengths or % of total lake area with increasing and decreasing trends in determinand concentrations. The presentation of the distribution (classification) of most recent concentrations within water bodies at a country level would ideally be in terms of relative lengths of water body or relative areas of water body (or adequately defined units[33] for groundwater, rivers, lakes, transitional and coastal waters) in each concentration band rather than solely on numbers of water body. The former assessment would account for differences in sizes of water bodies identified by countries and give a more representative assessment of water status in the catchment.

Next to the water body, sub-catchment and catchment the WISE-GIS group discussed the concept of comparble sub-units. This might also be the right level of aggregation to reflect representativity related to the specific share a country has in a River Basin. The possible use in the data aggregation reporting and assessment is discussed in more detail in the section on task 4/5.

[33] Area is a possible proxy for free aquifers, it cannot be a unit for protected and deep aquifers

Reporting at the station level will ensure maximum transparency and flexibility in how data are subsequently compiled, aggregated, and analysed by the EEA. But this needs to be supported by information on how stations relate to water bodies and how a monitored water body relates to groups of water bodies of the same type and the respective catchment. This is vital to relate quality information in later assessments e.g. to information on pressures driving forces in the catchments and to develop EU-level integrated assessments across catchments.

2.4 Options for the treatment of data before reporting

There are a number of options on how sample data should be treated by countries before being reported for SOE. These are described in detail in the section entitled *"treatment of data before reporting"* in each of the relevant reporting sheets. The options used by, or available to, countries may be dependent on the level of aggregation of the data reported to the national reporting authorities by the data gatherers. For example, disaggregated data may not be available to the national organisation reporting to WISE. The method of data treatment may also be different for the different water categories and determinands. For example, for some of the biological and hydromorphological quality elements and determinands it might be more appropriate to aggregate and report data at the water body level rather than at the monitoring site level.

The options for reporting on the physicochemical/chemical determinands include:

1. Annual/seasonal aggregation of data for each monitoring site with aggregation of data from the sub-sites associated with the site.

   This is one of the two current methods for the reporting of nitrogen determinand data for a groundwater body for Eionet-Water.

   In this case the concentration value for a monitoring site is calculated at a national level from the results from several sub-sites associated with the principal monitoring site, or from the results from a number of sampling sites associated with a groundwater body.

   In terms of very wide rivers sub-sites are typically located on both banks and in the middle. A width-averaged concentration value should be calculated from the data measured at each sub-site. The width-averaged concentration should then be reported using the unique code of the principal monitoring site – ideally the central sub-site. If this type of aggregation/average is reported for SOE, all samples must have been taken from sub-sites outside of any mixing zone (e.g. around a point discharge), and must not from a water body of different status or type. If these conditions are not met, a biased average may be obtained, and instead the data from each sub-site should be reported each with a unique site code.

   Some countries already report data from individual sub-sites located across very wide rivers (e.g. the Danube) to the EEA and International River Conventions. In such cases individual sub-site (rather than width-averaged) data will still be acceptable to the EEA if countries wish to continue to report in this way.

   In terms of lakes, if samples have been taken at intervals/sub-sites throughout the entire water column at a monitoring site, then a depth-averaged concentration may be calculated and reported for specific determinands. If depth-averaged

concentrations have been produced for sites in relatively deep lakes (> 15 m) or vertically stratified lakes, surface sub-site (~1 m) concentrations and bottom water (below thermocline) sub-site concentrations are also requested for determinands such as chlorophyll a and dissolved oxygen, respectively. Further guidance is given in the relevant reporting sheets.

Details of the temporal aggregation and the spatial aggregation and the method used for each river and lake monitoring site and sampling occasion will be requested.

2. Annual/seasonal aggregation/averaging of data for each monitoring site with no aggregation of data from sub-sites.

   This is the main method used for the reporting of nutrients and organic pollution determinands in rivers for Eionet-Water.

   Details of the temporal aggregation method used will be requested.

3. No treatment: disaggregated, individual sample data for each monitoring site and sub-site.

   This is the case for Eionet-Water for the reporting on nutrients, oxygen, chlorophyll a in transitional, coastal and marine waters, on nitrogen in groundwater (alternative option), and on hazardous substances in rivers, lakes, groundwater, transitional, coastal and marine waters.

   This means that in cases where samples are taken from sub-sites across a river or from sampling stations within a groundwater body, the data from each sample and sub-site/sampling station should be reported. Similarly in cases where samples are taken from sub-sites located throughout the water column (lakes, transitional and coastal waters) data from each sample and sub-site should be reported.

2.5 Surface Waters: Criteria for the monitoring sites to be used for EEA/SOE assessments

Basic criteria

The monitoring sites to be used for the SOE-data flow are required to provide a representative assessment of the overall status of rivers, lakes, transitional and coastal waters[34] within each catchment and subcatchments within each river basin district in the country, preferably apportioned according to the main pressures that determine the status. The purpose of the overall SoE assessment is to compare across Europe, not at water body level within member states.

The proposed criteria for representative monitoring sites are as follows.

- Sites from all water categories: rivers[35], lakes[36], transitional, coastal and marine[37] waters);
- Including representative examples of all types[38]: different types of water body in a catchment would reflect, for example, differences in the hydrological regime, altitude, geology, depth and sizes of the rivers, lakes, transitional and coastal waters.
- Including representative examples from the complete range of statuses present[39] within each catchment;
- Including examples of sites monitored in different sizes[40] of water body: ideally there would be some sites in, and representative of, small water bodies[41] as well as on the largest water bodies. This would enable the identification and assessment of comparable types of water body;
- Including sites representative of all types of pressure present in the catchments of the River Basin District.

  The requirement of being representative for all conditions listed above means that the selected water bodies most reflect the different conditions, characteristics and pressures in the catchment or sub-catchments. Besides reflecting all conditions the selected water bodies must be weighted by their importance.

  It is likely that the number of sites will vary from catchment to catchment in relation to differences in pressures and variability of status. For example, more sites would be required to represent a very heterogeneous catchment in terms of variability in pressures, water body types and status compared to a homogenous one.

[34] Coastal waters have to be assigned to the nearest or most appropriate river basin district or districts
[35] Including canalised rivers and artificial canals
[36] Natural, artificial (reservoirs) and mixed
[37] Eionet-Water currently includes marine waters: new data flows would be developed in line with the work of EMMA
[38] The WFD requires surface water bodies to be defined using descriptors given in system A or system B: the types of water body within a RBD are required to reported to the Commission under Article 5.
[39] It is recognised that not all catchments/RBD would have water bodies of all statuses from high to bad
[40] Defined in terms of upstream catchment area for rivers and surface area of lakes
[41] They are differences in the minimum size of water body included by countries in WFD monitoring and assessments. For example, some countries have used the implied System A typologies de-minimis sizes. In terms of rivers, water bodies with catchments areas at least 10 km^2 would be included. Others have identified river water bodies with catchments smaller than 10 km^2 and that are not part of a larger catchment, but with a river stretch greater than 1 km in length.

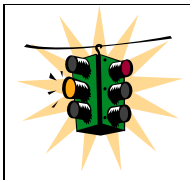
It is also probable that different sites within a water body are used to monitor for different quality elements (e.g. composition and abundance of aquatic flora and nutrient conditions) within the same water body. A different set of monitoring sites or a different processing of the same set may, therefore, be required to give a representative overview of quality in terms of the physicochemical, biological and hydromorphological quality elements.

In terms of WFD monitoring this would be likely to be sites included in surveillance monitoring and operational monitoring if surveillance monitoring does not cover all the different water statuses present. For some countries it could be all the sites included in surveillance monitoring. In addition, sites included in monitoring undertaken for other policies (e.g. Nitrates Directive) and purposes, but not used in WFD monitoring, could be included.

It is also probable that monitoring would be undertaken annually at these sites for some of the physicochemical (e.g. nutrients and organic pollution determinands), chemical (e.g. those priority substances and other pollutants in the catchment) and biological determinands (e.g. benthic invertebrates) required by the WFD.

2.6 Additional information to specify criteria

- Monitoring sites representative of the significant pressures[42] within each catchment and subcatchment. If possible, the sites/water bodies used will be subject to only one significant pressure so that the impact of the pressure on water quality/status of the water body will not be complicated by impacts arising from other pressures.



Look Out!
A practical issue is that significant pressures are seldom unique. Highly populated areas on large rivers are also subjected to intense agricultural pressures, just because large cities historically developed close to where food was abundantly available! When considering the distribution of activities in Europe, most catchments are subject to "significant" pressure with respect to one or another environmental target. Similarly, point or diffuse abstractions are significant pressures since they can directly or indirectly change substantially the discharge rate in rivers. In medium sized rivers and during dry period, this may lead to the virtual drying-out of the river, and having major impact on the freshwater ecology.

It is probable that these sites will be included in WFD operational monitoring but may be from other monitoring programmes such as for the Nitrates Directive. Many of these sites would be monitored annually for the determinands indicative of the significant pressure (e.g. nitrate concentrations indicative of diffuse agricultural pressures) over the duration of a RBMP or until the water body they are representing has reached its environmental objective (e.g. good status): at this stage they may no longer be included in operational monitoring. Some sites may be included in subsequent RBMP cycles if the water bodies they are representative of

[42] CIS Guidance Document No 3 (Analysis of Pressures and Impacts) defined a “significant pressure”, as a pressure that, on its own, or in combination with other pressures, would be liable to cause a failure to achieve the environmental objectives set out under Article 4

are assessed to be still at risk. In short, the time-series from these sites may be variable in length. However, they will be adequate for some assessments (e.g. type 3 above).

Additional meta-information on the significant pressures on the monitoring site/water body and the source of the pressure would be requested. This would help to identify the correct/appropriate sites/water bodies for use in the assessment of the impact of specific sectors on water bodies.

An indicative list of pressures is given in the Article 5 compliance reporting sheet SWP1 1 (summary of significant pressures on surface waters in the RBD). Examples of pressures, activities and indicative determinands of possible relevance to EEA assessments are given in Table 2. Information on these significant pressure/activities could be included in the meta information provided for each site/water body.

Table 2 Examples of pressures, activities and indicative determinands of possible relevance to EEA assessments

Pressure/source	Activity	Indicative determinands
Point sources	UWWT discharges	N, P, BOD, ammonium, DO, priority substances and other pollutants, biological indicators (e.g. river benthic invertebrates) Surfactants
	Storm overflows/urban discharges	N, P, BOD, ammonium, biological indicators (e.g. river benthic invertebrates) Heavy metals, hydrocarbons
	IPPC installations	Dependent on type of process but might include N, P, BOD, ammonium, DO, priority substances and other pollutants
	Non-IPPC installations	Dependent on type of process but might include N, P, BOD, ammonium, DO, priority substances and other pollutants
Diffuse sources	Agricultural activities (arable cultivation, livestock, orchards, vineyards)	N, P, BOD, ammonium, pesticides, biological indicators (e.g. river benthic invertebrates), suspended sediments
	Agriculture could be further sub-divided into: - fertiliser use - pesticide use (including sheep dip) - livestock	 N, P Pesticides N, P, ammonium, BOD suspended sediments
	Transport and infrastructure without connection to sewers	BOD, pesticides, heavy metals, NO_x (atmospheric deposition)
	Forestry	pH, N, P and pesticides
Water abstractions	Public Water supply	(To be elaborated at a later date)
	Industry	(To be elaborated at a later date)
	Irrigation	(To be elaborated at a later date)
	Cooling	(To be elaborated at a later date)
Water flow regulation and morphological alterations	Agriculture	(To be elaborated at a later date)
	Navigation	(To be elaborated at a later date)
	Power generation (hydropower)	(To be elaborated at a later date)
Natural/low impacted areas		Baseline, N, P, organic matter, suspended sediments

2.7 Groundwater: Criteria for the monitoring sites to be used for EEA/SOE assessments

The distribution and number of monitoring sites used should provide a coherent and comprehensive overview of groundwater chemical and quantitative status within each river basin and aquifer catchment and to detect the presence of long-term anthropogenically-induced upward/downward trends in pollution. Monitoring sites will be associated with a groundwater body and/or a group of groundwater bodies, and will provide representative information of the state of the water body(ies).

The WFD's definition of a groundwater body does not provide explicit guidance on how bodies should be delineated. The CIS horizontal guidance on the identification of water bodies indicates that they should be delineated in a way that enables an appropriate description of the quantitative and chemical status of groundwater. The guidance also

states that it is not possible to define a universally applicable scale below which subdivision is inappropriate. The degree of subdivision of groundwater into bodies of groundwater is a matter for Members States to decide on the basis of the particular characteristics of their River Basin Districts.

For Eionet-Water data and information was requested from the monitoring of all relevant groundwater bodies (groundwater in porous media, karst groundwater and others) and including both shallow and deep aquifers. Relevant groundwater bodies were those that met at least one of three criteria. These were:

- > 300 km² in area;
- . of regional, socio-economic or environmental importance in terms of quantity and quality;
- exposed to severe or major impacts, representing different possible pressures.

However, where appropriate groundwater bodies are grouped for monitoring purposes, the size criteria should not be applied to the overall group of groundwater bodies. If the size information of the individual groundwater body within the group of groundwater bodies is not available, only the second and third criteria should be applied. In cases where the size information is available, all criteria should apply.

For the above reasons, it is proposed that data and information requested for SOE reporting should be from all monitoring sites established for the Water Framework Directive and located in groundwater bodies that meet at least one of the Eionet-water criteria above.

3. Reporting Sheets for SOE data and information

Serial Number	1
Reporting Sheet Code	NUT_ORG_RV_LK
Reporting Sheet Name	State of rivers and lakes in terms of nitrogen, phosphorus, chlorophyll a and organic pollution determinands
Lead EEA	Beate Werner (Beate.Werner@eea.europa.eu)
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 20 March 2007 6
Collation of Comments on this version	

What should be reported?

Concentrations of nitrogen, phosphorus, organic pollution determinands and chlorophyll-a in river and lake water bodies – updated annually.

Why is it needed?

The information will be used to formulate indicators that will be used to assess state and trend of the determinand and monitor progress with European policy objectives.

The relevant EEA Core set indicators are:

- Oxygen consuming substances in rivers (CSI 019)[43]
- Nutrients in Freshwater (CSI 020)[44]

In addition, the information will be used develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level. Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), of particular issues (e.g. “Nutrients in European ecosystems”), and assessments based on methodologies for weighted quality indices. Such assessments will be improved by the reporting of more detailed and less aggregated data than currently collected by Eionet-Water.

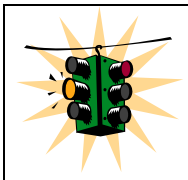
[43] http://themes.eea.eu.int/IMS/IMS/ISpecs/ISpecification20041007131940/IAssessment1116505271445/view_content
[44] http://themes.eea.eu.int/IMS/IMS/ISpecs/ISpecification20041007131957/IAssessment1116497150363/view_content

How should it be reported?

Data

Determinands

The concentration/value of the following determinands are required at each monitoring site included in SOE reporting.



Look Out!
If any of the listed determinands are not monitored nationally then they are not expected to be reported. The list is comprehensive to take account of all the differences in terms of determinands that are monitored in national programmes, and to maximise the number of countries with data on common determinands. Those determinands of the highest priority in terms of the EEA's needs are **bolded**: these are the ones currently used in EEA assessments (e.g. CSI). The non-bolded determinands are also requested to be reported if they are held in national databases with the priority determinands. This is because the scope and content of current EEA assessments may change in the future requiring these additional determinands.

- Nitrogen (**nitrate**, **total oxidised nitrogen**[45], **total nitrogen,** nitrite, total organic nitrogen,);
- Phosphorus (**total phosphorus, orthophosphate**);
- Organic pollution indicators **(BOD5, BOD7**[46], **total organic carbon**, **total ammonium,** COD_Mn, COD_Cr, oxygen concentration, oxygen saturation);
- **Chlorophyll a**
- Supportive determinands and information[47] (if available):
    - pH (rivers and lakes),
    - [48]temperature[49] (rivers and lakes),),
    - salinity[50] (rivers and lakes),
    - selected major and trace ions (e.g. Ca, Mg, Na, K, HCO_3, Cl, SO_4) (rivers and lakes) [51];
    - alkalinity (rivers and lakes),
    - conductivity (lakes),

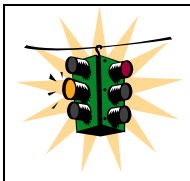
[45] Some countries measure total oxidised nitrogen rather than nitrate and nitrite.
[46] Countries generally measure either BOD5 or BOD7 and therefore would not be expected to report both. BOD5 is preferred.
[47] These can be used to interpret and analyse the main determinands. An example is given below. Some have been used in past EEA assessments, such as to assess eutrophication in rivers, and may be so in the future. Also many of these determinands are collected routinely in monitoring programmes and would be in the same national databases. Only those determinands available should be reported.
[48] Currently not in data dictionary
[49] pH, temperature (salinity is also important in saline waters) and ammonium allows the estimation of non-ionised ammonia, the most toxic form of ammonium
[50] Currently not in data dictionary
[51] Currently not in data dictionary

- colour/humic content (rivers and lakes).

- The determinands measured at each of the SOER monitoring sites are to be reported annually for determinands that are measured every year. Those determinands that are not measured every year should be reported in the year they become available at a national level e.g. once every 2 years, once every 3 years etc.

- As long a time series of concentrations/values of determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated annually with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

Quality of data



Look Out!
Meta-data on AQC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

Treatment of data before reporting

Data is required for each of the monitoring sites used for SOE reporting at which nutrients, organic pollution determinands and chlorophyll-a are measured. In some cases not all the sites will have data for each of the requested determinands.

The generic options for the treatment of SOE data by countries before reporting are described in Section 2.4.

The following should be reported for all options of data treatment:

- Unique monitoring site code (see reporting sheet on 'geographical information'). Where there has been spatial aggregation of data from sub-sites across a river, this should be the unique code of the principal river monitoring site. Ideally this would be the "middle" site when concentrations from three sub-sites across a river have been averaged);

- Determinand;

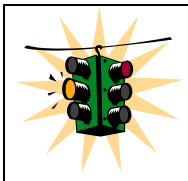
- Unit of measurement;

- Limits of detection and determination (if limit of detection is not available) of analytical method used.

- Sampling period;

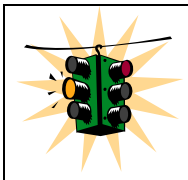
The following should also be reported when data have been annually/seasonally aggregated from a number of sub-sites or from just one monitoring site.

- Annual average and summer average concentrations for each determinand for the calendar year, and winter average concentrations for the hydrological year for each monitoring site calculated from each measurement made at:
  - the sub-sites associated with the principal monitoring site OR;
  - one monitoring site[52].



Look Out!
To ensure that aggregated values are comparable measured concentrations below the analytical limit of detection (or limit of determination if the limit of detection is not available) should be divided by two before the calculation of the required summary statistics.

- Annual and seasonal average concentration of determinands in the surface water layers[53] at the lake monitoring site;
- Number of sub-sites sampled at the monitoring site (if applicable);
- Method of aggregation of sub-site data (e.g. simple average, weighted average etc.) (if applicable);
- Number of samples per monitoring site per aggregation period;
- Standard deviation of the aggregated data;
- Median concentration of the aggregated data;
- Minimum, 10th percentile, 90th percentile and maximum concentrations of the aggregated data;



Look Out!
Some countries currently only sample once every 3 months. In these cases it will not be possible to calculate and report the requested summary statistics (such as the standard deviation and median concentration) for the seasonal averages as there will probably be only be one measured value for summer and winter. The one measured value should, however, be reported. The annual summary statistics should still be calculated and reported.

- Seasonal (often late summer) minimum measured concentration of dissolved oxygen in the bottom water layers at the lake monitoring site with depth and date of the minimum;

If the disaggregated data option is used by countries then the following should also be reported with the individual sample data for each monitoring site and sub-site:

- Sub-site code linked to the unique monitoring site code (where sub-sites have been used);

[52] Some countries already report data from individual sub-sites located across very wide rivers (e.g. the Danube) to the EEA and International River Conventions. In such cases individual sub-site (rather than width-averaged) data will still be acceptable to the EEA if countries wish to continue to report in this way.
[53] If the aggregated concentrations have been derived from sub-sites throughout the lake water column, please also calculate and report the average annual and seasonal concentrations for the surface water layers (i.e. ~1m).

- Relationship of the river sub-site to the principal monitoring site (e.g. right bank, middle or left bank);
- Date of sample;
- Concentration of determinand[54] in sample.
- Depth of sample (lakes);
- Total depth of water column at time of sampling (lakes).

Information on sites used for SOE reporting

The monitoring sites to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of reported monitoring sites is required:

- *Unique site code for linking concentration data with site and water body geographic information already reported for compliance purposes (see SOER sheet* **GEO_INF***);*
- *Meta data or data description with, for example, details of data/site aggregation methods when used for the requested determinands in this sheet;*
- *The reference conditions (concentration) for each of the requested determinands and monitoring site/water body used for SOE reporting. To be reported only once when they become available.*
- Physical characteristics of monitoring sites (to be reported only once for each site) – see SOER sheet **STA_CHA_PRE** for details.
- Proxy pressure information on monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;

[54] Sample concentration values measured as below the limit of detection (or determination if limit of detection not available) should be replaced with a value equivalent to half the limit of detection (or determination) in the concentration field with the value of the limit of detection or determination noted in the appropriate fields. If this occurs the separate 'limit of detection flag' field should be marked. Alternatively if the concentration field is left blank and the limit of detection flag used, the EEA will subsequently fill the concentration field with a value equivalent to half the LoD (or determination).

Serial Number	2
Reporting Sheet Code	**HAZ_WAT_RV_LK**
Reporting Sheet Name	State of rivers and lakes in terms of Priority Substances and other hazardous substances in water
Lead EEA	Beate Werner (Beate.Werner@eea.europa.eu)
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 20 March 2007 6
Collation of Comments on this version	

What should be reported?

Concentrations of priority substances and other main pollutants in water in river and lake water bodies.

Why is it needed?

The information will be used to formulate indicators that will be used to assess state and trend of the determinand and monitor progress with European policy objectives.

The relevant EEA indicators are:

- Hazardous substances in rivers (WHS2)[55]
- Hazardous substances in lakes (WHS3)[56]

In addition, the information will be used to develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level. Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), of particular issues (e.g. "Hazardous substances in the European marine environment – Trends in metals and persistent organic pollutants"[57]). Such assessments will be improved by the reporting of more detailed and less aggregated data than currently collected by Eionet-Water.

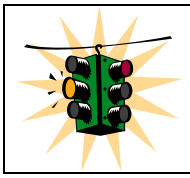
How should it be reported?

Data
Determinands

The concentration value of the determinands to be reported are all of those that are measured at the SOER monitoring sites and in particular those that are either:

[55] http://themes.eea.eu.int/Specific_media/water/indicators/WHS02%2C2004.05/index_html
[56] http://themes.eea.eu.int/Specific_media/water/indicators/WHS03%2C2003.1001/index_html
[57] http://reports.eea.eu.int/topic_report_2003_2/en

- Priority Substances as defined by the Water Framework Directive (these substances that are subject to a periodic review and revision under Article 16 of the Directive);



Look Out!
It is recognised that it is very unlikely that all the substances included in the Priority Substance List would be measured at each monitoring site, and therefore different numbers of substances will be associated with many of the sites.

- Other significant[58] chemical pollutants.

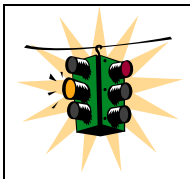
- Supportive determinands and information[59] (if available):

  - pH value;
  - Temperature[60],
  - Salinity,
  - Selected major and trace ions (e.g. Ca, Mg, Na, K, HCO_3, Cl, SO_4);
  - Hardness as $CaCO_3$;
  - Suspended particulate matter concentration;
  - Dissolved organic matter;

- The concentration/value of the requested determinands measured at each of the SOER monitoring sites are to be reported annually for determinands that are measured every year. Those determinands that are not measured every year should be reported in the year they become available at a national level e.g. once every 2 years, once every 3 years etc.

- As long a time series of concentrations/values of determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated annually with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

Quality of data



Look Out!
Meta-data on AQC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

[58] A significant pollutant could be one that is occurring at a concentration, which is liable to cause a failure to achieve the environmental objectives set out under Article 4 of the WFD.
[59] These can be used to interpret and analyse the main determinands. For example, some environmental quality standards are expressed in relation to water hardness, and data on water hardness would, therefore, help to interpret the data on some of the hazardous substances. Only those determinands available should be reported
[60] Those underlined are not currently in the Data Dictionary

Treatment of data before reporting

For Eionet-Water hazardous substance data in rivers and lakes are reported as the concentration measured in each sample taken, i.e. disaggregated data.

The preferred option is for **disaggregated**, individual sample data for each monitoring site used for SOE reporting at which priority substances and other significant pollutants are measured.

The following should be reported with disaggregated, individual sample data for each monitoring site:

- Unique monitoring site code (see reporting sheet on 'geographical information');
- Date of sample;
- Determinand;
- Fraction analysed (dissolved, total and suspended particulate matter);
- Concentration of determinand[61] in sample.
- Unit;
- Sampling method
- Sampling depth (lakes only if available);
- Limit of detection;
- Limit of determination (if limit of detection is not available);

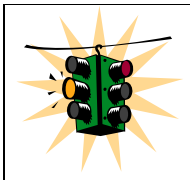
In cases where a determinand concentration at a monitoring site for each sampling occasion is represented by the averaged concentration from a number of sub-sites then the following additional information should be reported:

- Unique code of the principal river monitoring site (see reporting sheet on 'geographical information') where there has been spatial aggregation of data from sub-sites across a river. Ideally this would be the "middle" sub-site when concentrations from sub-sites across a river have been averaged);
- Date of the sampling[62] on which the average concentrations are based;
- Depth averaged concentration of the determinand at the lake monitoring site calculated from sub-sites in the water column below the site;

[61] Sample concentration values measured as below the limit of detection (or determination if limit of detection not available) should be replaced with a value equivalent to half the limit of detection (or determination) in the concentration field with the value of the limit of detection or determination noted in the appropriate fields. If this occurs the separate 'limit of detection flag' field should be marked. Alternatively if the concentration field is left blank and the limit of detection flag used, the EEA will subsequently fill the concentration field with a value equivalent to half the LoD (or determination).

[62] Samples would have been taken on the same day from the sub-sites

- Concentration of determinand in surface (~1 m) water layer at the lake monitoring site;
- Width-averaged concentration of determinand calculated from the sub-sites across the river;



Look Out!
To ensure that aggregated/averaged values are comparable measured concentrations below the analytical limit of detection (or limit of determination if the limit of detection is not available) should be divided by two before the calculation of the required summary statistics.

- Number of sub-sites used in calculating the width averaged concentration at a river site, and depth average concentration at a lake site;
- Total depth of water column at time of sampling (lakes).
- Method of aggregation of sub-site data (e.g. simple average, weighted average etc.);
- Number of samples per monitoring site per sampling;
- Standard deviation of the averaged data;

Information on sites used for SOE reporting

The monitoring sites to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of reported monitoring sites is required:

- *Unique site code for linking concentration data with site and water body geographic information already reported for compliance purposes (see SOER sheet* **GEO_INF***);*
- *Meta data or data description with, for example, details of data/site aggregation methods when used for the requested determinands in this sheet;*
- Physical characteristics of monitoring sites (to be reported only once for each site) – see SOER sheet **STA_CHA_PRE** for details.
- Proxy pressure information on monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;

Serial Number	3
Reporting Sheet Code	QNT_SW_GW
Reporting Sheet Name	State and quantity of water resources [this reporting sheet covers both surface and groundwater resources]
Lead EEA	Peter Kristensen, EEA (Peter.Kristensen@eea.europa.eu)
Lead ETC/WTR	Maggie Kossida, NTUA m.kossida@chi.civil.ntua.gr
Other inputs	Steve Nixon, Beate Werner; Member States comments
Status **Date** **Version**	final 16 October 2008 10

What should be reported?

Overview of freshwater resources availability for the River Basin District (RBD) or the sub-units, if available and where suitable on a monthly basis, else as annual and long term annual average.

Data on *river flow at selected gauging stations, depicting the hydrological conditions and input – outputs per sub-basin.*

Data on *surface water and groundwater abstractions and return flows* at a RBD or the sub-unit level by economic sector (NACE) and on a monthly/seasonal (if available) or annual temporal scale.

It is recognised that some information may not be available in first years of reporting in the level of detail ideally required. A phased approach has therefore been adopted with summary information at the RBD level required in the first years. It is assumed that detailed information will be available after 2010 and should be supplied by electronic means at this time.

Why is it needed?

The information will be used to formulate indicators used to assess the state and trends of the water resources and associated pressures, and monitor the progress with European policy objectives. The information needed in relation to water quantity and quality can generally be described as:

- **Drivers**: natural availability of water resources, hydrometeorological parameters, reservoirs management
- **Pressures**: water demand, water abstraction, return flows by source and sector
- **State**: assessment of trends by source
- **Impacts**: ecosystem integrity, use value

- **Responses**: Are policies working towards targets? such as are the rates of extraction from our water resources sustainable over the long term and

The relevant EEA Core set indicator is:

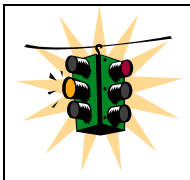
- Use of freshwater resources (CSI 018)[63]

One particular problem is that of water scarcity which may be exacerbated in parts of Europe by the predicted changes in climate. In general there is a need for indicators describing water availability/scarcity in connection with water use and water use efficiency to assess the extent and intensity of the problem. Assessments are also made periodically on the impact of particular socio-economic sectors on water abstraction (e.g. water abstraction by agriculture) and new assessments/needs such as:

- Assessment of riverine fluxes at key outlets;
- Identification and development of statistics adapted to inland (eco)systems assessments and fragmentation issues assessment following the Integrated environmental and economic accounting (SEEA) as agreed to use for Europe between DG ENV, JRC, Eurostat and EEA)
- Regional assessment of changes and trends (in relation to climate change) including mid and long-term evaluation of extreme events at a large scale (droughts and floods);

Such assessments will be improved by the reporting of more detailed and less aggregated data than currently collected by Eionet-Water.

It is intended that all relevant reporting initiatives are streamlined in one data flow and incorporated into WISE. For the moment Member States report data on water resource and water abstraction at country level via the “Eurostat/OECD Joint Questionnaire on the State of the Environment" (JQ). The methodology used in the Eurostat/OECD JQ has been reflected in this reporting sheet. Further alignment with the economic sector specification (NACE) is under development jointly with Eurostat. To reflect the spatial variability of water resources the requested information has been scaled down to each particular RBD and sub-unit (compare process developed in WISE technical group). Additionally, the minimum proposed monthly time step will allow distinguishing seasonal patterns and assessing dry periods within a hydrological year.



Look Out!
EEA is exploring the possibility of using information from other sources to fill in or model some of the requested information. One possible information source is the detailed climate information (precipitation and estimated evaporation) held by the European Centre for Medium range Weather Forecasting (ECMWF) or further information available at e.g. national hydrological and meteorological services. If such available data are at the appropriate level of aggregation and can serve the purposes of this reporting sheets with the remaining requested determinants they can be used as a resource. Nevertheless, for sustainability purposes a regular assured data flow from the member countries would better serve the common goals and would eliminate the margin of uncertainty and the risk of error-generation.

[63] http://themes.eea.eu.int/IMS/ISpecs/ISpecification20041007131848/guide_summary_plus_public

How should it be reported?

1) Information on water resource availability (monthly (if available), annual and long term average (LTA) values)

Data

A River Basin District / sub-units assessment of water availability is proposed that would report on indicators of the status and trends in the hydro-meteorological parameters and the hydrological freshwater resources budget (see annex 1 for definitions).

This regional information will be spatially aggregated on RBD/ sub-unit level, and temporally on a yearly, seasonal or monthly basis. The scaling down will enable the assessment of the spatial variability of water resources. The proposed sub-unit as a reporting unit is aligned with the recent developments in the Working Group D where sub-units are now generally accepted as a way forward as a reference data set in WISE for reporting and data management. Member States have identified the respective RBDs and sub-units [summarised in: REP 07/5: Preliminary analysis of proposed sub-units – fourth draft (v5, 31/01/2008)]. Those are proposed also to be the spatial reporting units of the current SoE reporting sheet.

The proposed monthly time step, where data are available, will allow distinguishing seasonal patterns and assessing dry periods within a hydrological year, as well as investigating additional indices such as the "Dry season flow index, WRI" which requires data from the dry season. Finally, it will allow the EEA to produce water accounts (data needs: calculable catchment, rainfall data, discharge data, reservoir data, abstraction and return flow data).

Some additional data will be collected on water storage volume (for the natural or man-made reservoirs in the RBD / sub-unit, groundwater and snow pack). These will allow for comprehensive and integrated analyses of the water resources' availability trends over long-term and deeper assessment of water scarcity issues.

Run-off at selected gauging stations

To provide a more complete national picture and assess additional hydrological trends, such as flood patterns, changes in the 7-day low flow etc., daily stream flow data will be collected for selected gauging stations.

Groundwater level at monitoring stations reported under the WFD Article 8:

The groundwater level reporting has to be linked to the general ground water reporting under the WFD and the quality related SoE GW reporting. The GW stations available at EEA (as reported under WFD art. 8) will be the basis for the reporting also of the GW level**.** To this purpose, representative stations will have to be defined out of the set of the WFD stations reported. The representativity criteria of selecting ground water monitoring sites have bee described in section 2.7 p. 54.

Determinants

Water Resources Availability		
A. Hydrometeorological Parameters		
Determinant	**Spatial Scale**	**Temporal Scale**
Precipitation (P)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Actual Evapotranspiration (ET_a)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Internal flow ($D = P - ET_a$)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Total actual external inflow (Q_i)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Total actual outflow ($Q_o = Q_{o,s} + Q_{o,n}$) of which $Q_{o,s}$ into the sea of which $Q_{o,n}$ into neighbouring territories	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)

B. Water Storage		
Snowpack (Estimates of changes in storage; volume of snow)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Surface water Reservoir inflow-outflow [storage](*for natural and man-made*)	R (within the RBD/ sub-units)	Monthly (*if available*) annual LTAA
Changes in groundwater storage	MAS	Monthly (*if available*) Annual (long replenishment time) long term annual average (LTAA)

C. Surface and Ground Water		
Stream flow	GS	daily monthly averages
Groundwater level	MS	Monthly (*if available*) annual long term annual average (LTAA)

D. Additional water resources		
Return flow (amount & to which recipient) *Of which:* 1. Returned Before Use (Losses) 2. Reused water 2a. Treated effluent 2b. Non-treated (e.g. from construction activities)	RBD/ sub-units	Monthly (*if available*) annual long term annual average (LTAA)
Desalinated water (amount & to which recipient)	Per item (large) Total: /RBD/sub-unit	Monthly (*if available*) annual long term annual average (LTAA)
Water imports (amount & from/to which recipient)	Per item (large) Total: /RBD/sub-unit	Monthly (*if available*) annual long term annual average (LTAA)
Water exports (amount & from/to which recipient)	Per item (large) Total: /RBD/sub-unit	Monthly (*if available*) annual long term annual average (LTAA)
Note: RBD = River Basin District GS = Selected Gauging station R = Reservoir MAS = Major Aquifer System MS = monitoring stations as reported under WFD Arf. 8		

Regarding water transfers, water imports often are related to a specific user category and might be reported in the water abstraction table. If this is the case it has to be specified to avoid double counting. Water exports can occur either from a water collection and supply system, or they can occur from an RBD/subunit as bulk water diversion (different from the natural outflow). Clarifications in the reporting (e.g. to/from which recipient) may be necessary to avoid miscalculations and double counting.

The EEA supports that the calculation of the water resources availability determinants is more reliable and unbiased when carried out by the countries. Hydrological models (analytical, deterministic etc.) are vastly available and are the supporting tool in the RBMPs; the latest are to be reported under the WFD.

River flow at selected gauging stations

- Data is required for the selected river flow gauging stations (see next section). The selection is at the discretion of Member States since regional expert knowledge is highly important in this aspect. The number of stations does not necessarily have to be high since emphasis should be paid to the quality of the measurements and the representativity of the station in relation to regional conditions (see also section two of the SOE task 3 – document on station selection)

- Daily data for the representative gauging stations. A minimum of continuous measurements for the past 10 years is desirable;

- Each representative gauging station and year should be described by a set of summary statistics such as mean, maximum (with date), mean annual minimum flow (MAM), etc.;

- Long-term statistics at the representative gauging stations.: long-term monthly and yearly averages (series length indicated) and frequency distribution of flow

Station selection and information required for stream flow gauging stations
A selection (subset) of stream flow (discharge) gauging stations:

- Representative selection of gauging stations for the River Basin District/ sub-units such as:
  - Downstream stations at the relevant catchments and main tributaries
  - Stations located on the main river near the inflow to or outflow from a catchment
  - Stations depicting natural regime (upper stations, less influenced)
  - Stations with continuous measurements and long duration (ideally without discontinuity)

  Stations representing the runoff from a small fraction of a catchment can not be assumed representative for this catchment and should be only used if no alternative can be found. Stations may also be selected to describe natural flow such as stations unaffected by reservoirs or water abstractions. One gauging station 1000 km^2 may be used as an indicative density. In complex terrain information from more gauging stations might be suitable to be provided.

- Type of river discharge gauging station (e.g. measurement or warning; stations with natural flow, for calculation of fluxes (code list to be established);

- Unique site code for linking quantity data with hydrosystem segment (and water body information if already reported for compliance purposes - see SOER sheet **GEO_INF**).

- Geographic and other details of gauging stations if not already reported for compliance purposes (see SOER sheet **GEO_INF** for details). - provided once per station unless there are changes between reporting periods.

- Physical characteristics of the selected river discharge gauging stations (see SOER sheet **STA_CHA_PRE** for details) - provided once per station unless there are changes between reporting periods.

- Information on the duration of the records at the selected gauging stations and on the quality of data reported (provisional, doubtful, validated), and if relevant, information on any changes in calibration curves.

2. Data on surface water and groundwater abstractions at a RBD/ sub-unit level

The goal of this element is to strengthen and enhance the assessment of indices, complementarily with the OECD/Eurostat work, by including the aspects of seasonality and spatial variability. Annual assessments carried out at national level do not reflect regional trends and patterns, thus a regionalization at RBD/sub-unit level is required, and a monthly/seasonal (*if available*) scale analysis is needed to accurately capture the development of water abstractions by source and sector.

The request for water abstraction information has to take into account the heterogeneity of demands and returns.

A good rule of thumb is to provide water abstracted volumes for all those individual users that are submitted to the dispositions of the E-PRTR directive (large industrial sites), Urban waste water directive (large urban systems) and the bigger energy devices: large hydropower plants (generally they are large dams as well) and thermal sites (nuclear power plants, classical plants) distinguishing the open cooling and the evaporation cooling devices.

The determinants are summarized in the following table. The coding specification in this table will be further developed jointly with Eurostat into the Data Dictionary **according to NACE** economic sectors' classification in order to facilitate the reporting. The reasoning behind the requested determinants is to try to capture abstractions by source and sector from public systems, but also the self-abstractions (often major). Furthermore the large units (per item) should be differentiated from the aggregated values, because in many cases they bring great leverage misleading the overall assessments[4].

Water Abstraction by source		
Determinant	**Spatial Scale**	**Temporal Scale**
Total Volume of freshwater abstraction (from both SW + GW) ⇨ *if available separated by SW and GW*	RBD/sub-unit	seasonal (preferable monthly) annual long term annual average
Total Volume of freshwater abstraction (from both SW + GW) **for public water systems** ⇨ *if available separated by SW and GW*	RBD/sub-unit	seasonal (preferable monthly) annual long term annual average
Total Volume of freshwater (from both SW+ GW) **self-abstractions** ⇨ *if available separated by SW and GW*	RBD/sub-unit	seasonal (preferable monthly) annual long term annual average
Of which **Water Use by sector (according to NACE classification)**		
Determinant	**Spatial Scale**	**Temporal Scale**
Total Volume of freshwater (from both SW + GW) used **by sector** (according NACE* classes) ⇨ *if available separated by SW and GW*	RBD/sub-unit	seasonal (preferable monthly) annual long term annual average
Volume of freshwater (from both SW + GW) used per **item (large) **** ⇨ *if available separated by SW and GW* The item classified according to NACE.	Per Item (large)	seasonal (preferable monthly) annual long term annual average
Note: SW = Surface Water GW = Groundwater		

For the moment Member States report data water abstraction using the abstraction categories from "Eurostat/OECD Joint Questionnaire on the State of the Environment" (JQ). These abstraction categories have also been used in the WFD Reporting sheet on significant abstractions (SWP5 & GWP5). Further alignment of the abstraction categories with the economic sector specification (NACE) is under development jointly with Eurostat.

* NACE Statistical Classification of Economic Activities[64] (related to the table above):

NACE	Description
A	AGRICULTURE, FORESTRY AND FISHING
B	MINING AND QUARRYING
C	MANUFACTURING
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES

****** Differentiating large units (often known at the MS statistical office level) from the aggregates aims at the accurate placement of abstractions and returns at the relevant subunit disaggregation level[65]. Clarifications are necessary in order to diversify and avoid double counting as usually those items are included in NACE class E.

NOTES:
- A reference to the E-EPTR and UWWD aims at providing unique entry for the MS to identify these sources would cover all the EEA needs under WISE and water accounts.
- Water losses (Volume of water lost during transport through e.g. leakage) from the point of abstraction and the point of use, or between points of use and reuse are not included in the current version as further clarifications is required concerning their introduction in the water resources availability or water abstractions table of determinants. This process will be further developed jointly with the Eurostat.

Water exploitation index (WEI), or withdrawal ratio (mean annual total abstractions of freshwater (in the RBD/catchment/) divided by the mean annual freshwater resources (in the RBD/catchment)).

Treatment of data before reporting

Information on available water resource and water abstraction by source and sectors should generally be reported for the RBD (or national RBD) -sub-unit as aggregated information on a monthly (*if available*) or annual temporal scale. A summary of the methodology used for estimating the water balance and water abstractions by sectors should be provided.

[64] NACE Rev. 2.0 (http://epp.eurostat.ec.europa.eu/portal/page?_pageid=3233,73049386&_dad=portal&_schema=PORTAL)

[65] Less than 500 major urban areas group more than 50% of the European population, and probably abstract more than 70% of the urban water volumes (population, urban activities, etc.).

Annex 1: Information on available water resource (long term annual average (LTAA) values/annual values)

Sources: Information from Eurostat 2006,
USGS Circular 1223 (2002). Concepts for National Assessment of Water Availability and Use

The core of information on water availability is a water budget for the River Basin District/sub-unit. The underlying water budget equation is:

[WATER INFLOW] - [WATER OUTFLOW] = [CHANGE IN WATER STORAGE]

$Q_{IN} - Q_{OUT} = \Delta S$

where

Q_{IN} is the total water inflow
Q_{OUT} is the total water outflow
ΔS is the total change in storage

The typical parameters under the above 3 components are shown below:

WATER INFLOW	WATER OUTFLOW	CHANGE IN WATER STORAGE *increased/decreased water in:*
Precipitation P	Actual Evapotranspiration ET_a	Snowpack
Total Actual External Inflow Q_i further separation in: surface water inflow Q_i^{SW} + groundwater inflow Q_i^{GW}	Total Actual Outflow Q_o (of which $Q_{o,s}$ into the sea and $Q_{o,n}$ into neighbouring territories) further separation in: surface water outflow Q_o^{SW} + groundwater outflow Q_o^{GW}	Surface water reservoirs (natural and manmade)
Water imports	Water exports	Groundwater (saturated and unsaturated zones)

A schematic illustration is given in Figure 1:

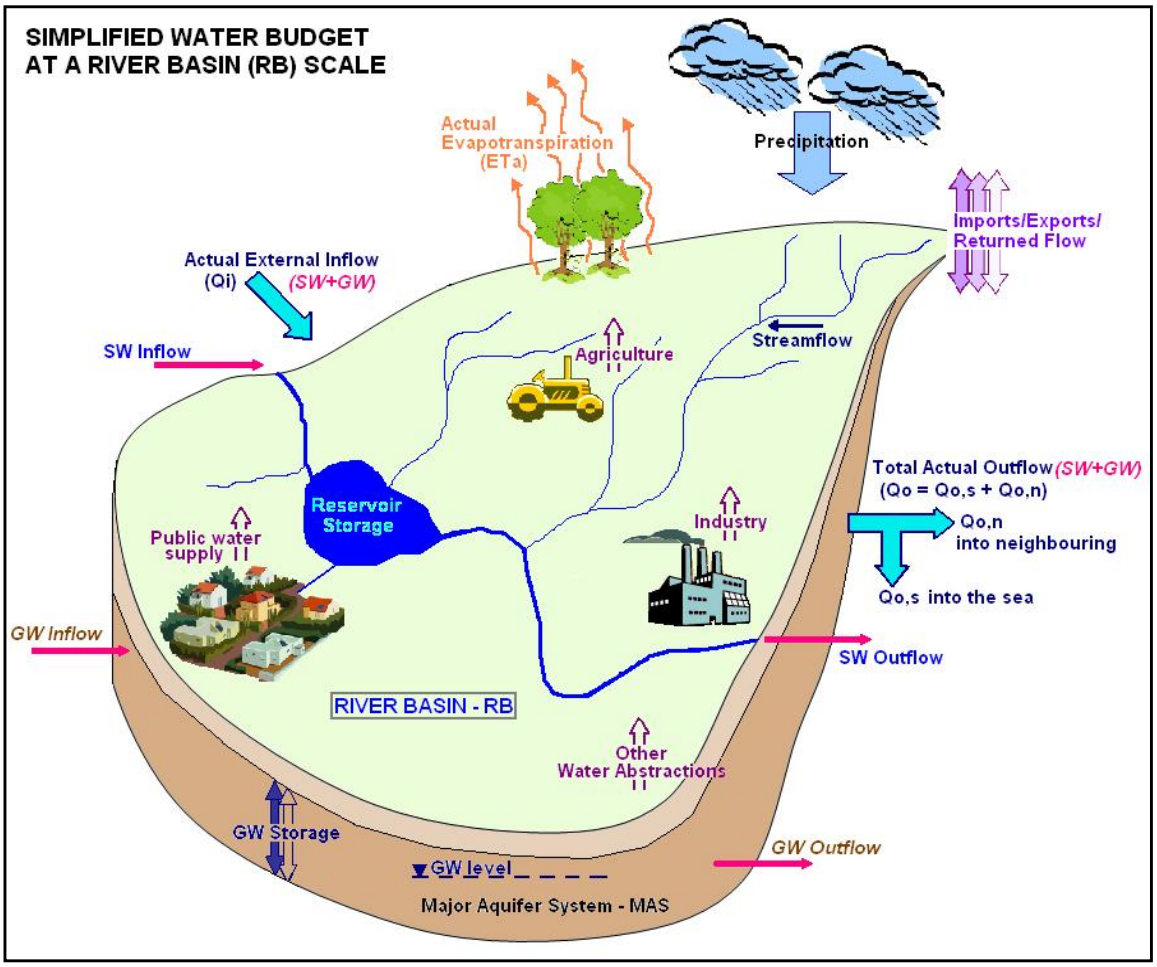


Figure 1: Schematic illustration of the simplified water budget

Reference period

For water balance purposes, commonly a hydrological year is preferred which helps to overcome problems of estimating storage in a snow cover or in the soil zone. In many countries, the hydrological year starts on October 1st, when soil and groundwater is often low and snow cover has not yet started to accumulate. Please indicate, whether the reported quantities refer to the calendar or to the hydrological year.

Long-term annual averages (LTAA)

For all items, also long-term annual averages (LTAA) are asked for. These should be based on annual values, averaged over a period of at least 20 consecutive years. It is recommended that the LTAA values are consistent with the annual values provided, using the same methods and basic data.

Definitions:

Precipitation: Total volume of atmospheric wet precipitation (rain, snow, hail, ...). Precipitation is usually measured by meteorological or hydrological institutes.

Actual evapotranspiration: Total volume of evaporation from the ground, wetlands and natural water bodies and transpiration of plants. According the definition of this concept in hydrology, the evapotranspiration generated by all human interventions is excluded, except rain-fed agriculture and forestry. The 'actual evapotranspiration' is measured or calculated using different types of mathematical models, ranging from very simple algorithms (Turc, Penmann, Budyko, Turn Pyke, etc) and corrections related to vegetal cover and season to schemes that capture the hydrological cycle in detail. **Please do not report potential evapotranspiration** which is "the maximum quantity of water capable of being evaporated in a given climate from a continuous stretch of vegetation covering the whole ground and well supplied with water".

Internal Flow: Total volume of river run-off and groundwater generated, in natural conditions, exclusively by precipitation into a territory. The internal flow is equal to precipitation less actual evapotranspiration and can be calculated or measured. If the river run-off and groundwater generation are measured separately, transfers between surface and groundwater should be netted out to avoid double counting.

Total actual external inflow: Total volume of actual flow of rivers and groundwater, coming from neighbouring territories.

Total actual outflow: Actual outflow of rivers and groundwater into the sea plus actual outflow into neighbouring territories. *Total actual outflow – of which into the sea*: The total volume of actual outflow of rivers and groundwater into the sea. *Total actual outflow – of which to neighbouring countries*: The total volume of actual outflow of rivers and groundwater into neighbouring countries.

Snowpack: Volume of snow accumulated stored over a period which can result (fully or partially) in snow melted water. It does not include glaciers, and it is measured at a reference time (relevant codes in the SEEAW could be EA.1314).

Return flow (amount & to which recipient): Water abstracted from any fresh water source and discharged into fresh waters before or after use. Discharges to the sea are excluded. It is further broken down between "returned before use" which basically reflect the losses from the system, and "reused" as treated effluent or as non-treated (from mining, construction activities etc.)

Desalinated water: Water obtained through the process of desalination and available for use

Water imports: Traded bulk water from another territory outside the RBD/sub-unit (bottled water is not included)

Water exports: Traded bulk water to another territory outside the RBD/sub-unit (bottled water is not included)

.

Water abstraction: Water removed from any source, either permanently or temporarily. Mine water and drainage water are included. Water abstractions from groundwater

resources in any given time period are defined as the difference between the total amount of water withdrawn from aquifers and the total amount charged artificially or injected into aquifers. Water abstractions from precipitation (e.g. rain water collected for use) should be included under abstractions from surface water. (the definition here differs from the one given in the SEEAW) The amounts of water artificially charged or injected are attributed to abstractions from that water resource from which they were originally withdrawn. Water used for hydroelectricity generation is an in-situ use and should be excluded.

Water use: water use refers to water that is actually used by end users for a specific purpose within a territory, such as for domestic use, irrigation or industrial processing. It excludes returned water (see definition above).

Serial Number	4
Reporting Sheet Code	EMI_SW_GW
Reporting Sheet Name	*Loads, discharges and emissions of pollutants to surface and groundwaters*
Lead EEA	Robert Collins (Robert.Peter.Collins@eea.europa.eu)
Lead ETC/WTR	Veronika Jaglova (Veronika_Jaglova@env.cz)
Other inputs	
Status **Date** **Version**	final 22nd October 2008 8

What should be reported?

- Total emission loads of each identified pollutant emitted from **significant** point and diffuse sources at national River Basin Districts (RBD) level.
- In the first years of reporting, a summary of all significant (with respect to SoE reporting) pollution emissions to surface waters in the RBD and an assessment of the relative importance of the sources in the RBD should be reported. Pollutants emitted and aggregated at the national RBD level are required. A phased approach to reporting is expected, with the level of detail increasing progressively over time. Consequently, it is intended that RBD scale data provided in the first years of reporting be replaced as RB (sub-unit), or waterbody information becomes available (by 2010) and should be supplied by electronic means at this time.
- If more detailed information is available at sub-unit or water body level this information is appreciated.
- Emissions load data from both source (gross) and load (net) oriented approaches should be reported where available, with full methodological details provided.

Why is it needed?

Almost all human activities can and do impact adversely upon the water. Water quality is influenced by both direct point sources and diffuse pollution, which comes from urban and rural populations, industrial emissions and farming.

Member States are required to identify **significant** point and diffuse sources of pollution in the River Basin District and the WFD requires that Member States collect and maintain information on the type and magnitude of significant pressures.

The information reported will be used to formulate indicators of emissions that will be used in the assessment of pressures and states of Europe's waters. These indicators will identify trends and help to evaluate the effectiveness of European policy and legislation. In addition, improved assessment of the marine environment should result from the quantification of emissions of land based pollutants (also in support of the work done by marine conventions).

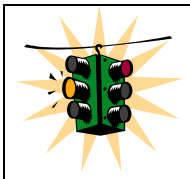
Newly developed indicators based on the requested data could include:

- Time series of annual emissions and any derived indices aggregated at a RBD/RB scale for each individual source (e.g. urban, industry, agriculture). Inter-annual hydrological variation will need to be accounted for when interpreting emissions time series.

- Apportionment of emissions by source and by determinand within each national RBD/RB, showing where there are statistically significant increases, decreases and no changes over time. Such source apportionment identifies the key sectors to be targeted by measures.

Streamlining of SoE and Legislative (mandatory) emissions reporting

The SoE-WISE emissions data reporting process has been established in order to address the gaps in information associated with legislative reporting requirements, for example, with respect to UWWT discharges. However, given that much of the SoE information requirements are already met via the existing water related legislation (e.g. industrial emissions under E-PRTR and the new EQS Directive that requires an inventory of discharges, emissions and losses – Article 4[66]), the process has also been established with the key aim, over time, for a progressive 'streamlining' of SoE-WISE and legislation emissions reporting. This process will also account for the Eurostat/OECD joint questionnaire. The streamlining will remove duplication and reduce the overall emissions reporting burden via a 'report once' process under WISE. The table in Annex 1 provides an overview of different pollutants to be reported under both legislation and the Eurostat/OECD reporting processes. Gaps in the table illustrate where SoE reporting requirements are additional to these reporting processes and where reporting of data, where available, would be of value.



Look Out!
EEA together with DG ENV will aim to streamline SoE and legislative reporting (e.g. UWWT Directive and EPER/E-PRTR) to avoid duplication of reporting by Member States. However, there may be some quality assurance benefits from the countries/RBD authorities doing the emission aggregation at the RBD or sub unit level; instead of aggregation by EEA.

How should it be reported?
Data

Determinands
The annual load estimates (kg or tonnes/year) of the pollutants from significant point sources and diffuse sources aggregated at national RBD level (or sub-unit level)

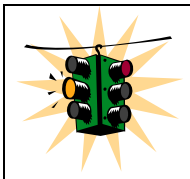
Organic load (as BOD and COD) (TOC or TSS only if available);

- Nitrogen (as $N\text{-}NH_4^+$, $N\text{-}NO_3^-$ and total N);
- Phosphorus (total P);
- Priority Substances (33 substances identified in Decision 2455/2001/EC);
- Other significant pollutants (especially those listed in Annex VIII of the WFD).

[66] Available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0397:FIN:EN:PDF

- Flow data (e.g. mean annual flow at the mouth of an RBD) or link to flow data reported under QNT_SW_GW. This flow information is required to enable inter-annual hydrological variation to be accounted for when interpreting emissions time series. If data has already been flow corrected, then details of the flow correction method are required

Quality of data
The provision of a textual summary of how these estimates have been made as outlined at the end of this sheet will enable this information to be interpreted.



Look Out!
Meta-data on AQC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

Spatial aggregation of data

Pollutants emitted and aggregated at the national RBD level are required. If more detailed information is available at; sub-unit or water body level this information is appreciated. Statistical information at an administrative scale e.g. different Nuts-levels should be reallocated to RBD units (in cooperation with ESTAT and EEA)

The spatial aggregation of the unit of assessment is likely to vary between countries at this stage depending on what is currently available in each country. However, as countries progressively implement the WFD, the aggregation unit would usefully tend to become the RBD, water body or comparable sub unit.

Temporal aggregation of data

- For point sources: Annual emissions, updated on a 3 yearly basis. However, if major changes have occurred, annual reporting is requested.

- For diffuse sources: Annual emissions, updated on a 3 yearly basis if possible.
- Time series for emissions for point and diffuse sources from before 2008 of all pollutants in kg or tonnes per year. To facilitate the interpretation textual information to explain seasonal distribution of the load -if it is significantly irregular. should be reported The duration and period of emissions should preferably be reported.

- To facilitate comparison of emissions data between years, it is preferred that assessment methods remain consistent for any given RBD. Any change in method should be clearly indicated.

Aggregation by source categories

The load estimates to surface water and groundwater should be reported from each of the following sources where appropriate.

Categorisation of activities should follow standard code lists (NACE from OECD/Eurostat). The establishment of a data dictionary will provide explanation of codes, nomenclature and pollution pathways for both point and diffuse sources.

a) Point sources

Loads from Urban Waste Water Treatment (UWWT) plants. If possible the reporting may be split by agglomerations in the following categories divided according to the number of population equivalent (p.e.) (Categories from the UWWT Directive). (if data have been reported to WISE for the purposes of the UWWT Directive they do not need to be reported again.

- p.e. < 2000 (only if they are significant , may also be reported as other sources/scattered dwelling under diffuse pollution)
- 2000 ≤ p.e. ≤ 10 000
- 10 000 < p.e. ≤ 100 000 (or 10 000 < p.e. ≤ 15 000; 15 000 < p.e. ≤ 100 000)
- p.e. > 100 000
- Loads from industrial point sources (both E-PRTR facilities and non E-PRTR facilities if available) including those direct to water and off-site transfers;
- Other point sources (e.g. collected untreated agglomerations, fish farms, large animal units, mining, peat production)
- Distinction must be made between point sources discharging to coastal waters and those discharging to inland waters.

Information already reported to different directives will be dealt with on an EU level. For example, information submitted to E-PRTR will **not** have to be reported twice.

b) Diffuse sources, emissions with disaggregation for:

- Agriculture activities and pathways (available information such as nutrient balances, root zone leaching, erosion, direct drainage discharges, gross and net agricultural emissions);
- Atmospheric deposition to water
- Scattered dwellings – including releases from facilities for the storage and/or treatment of domestic effluent in areas without sewerage networks (e.g. leaks from septic tanks etc.);
- Background (from natural areas etc.)
- Other diffuse sources

Further explanation on the different point and diffuse sources, their key pathways and the distinction between source and load based emissions will be given by a flow chart developed by cooperation between DG ENV, ESTAT and EEA and taking into account aspects from WFD-reporting sheet (SWP13, SWP14, GWP13 and GWP14)..

Data description

Meta data or data description with, for example, details of data aggregation methods when used for the requested determinands in this sheet: thresholds for considering an emission as significant, detailed list of sources considered in each category. A summary of the methodology used for identifying significant point and diffuse sources should be provided including a description of the following where appropriate:

The definition of “significant” used;

Screening criteria;

Numerical models (including whether they are source (gross) or load (net) based);

Pressure and impact quantification tools;

State assessment tools;

Data sources (e.g. whether existing data were used, whether data was collected specifically for the purpose or whether it has been estimated (and how)); and

Information explaining a trend in the reported emission data.

Geographic information

To be provided only once for each assessment unit (RBD, sub-unit, water body) unless there are changes between reporting periods.

- Unique site code for linking emission data with hydrosystem segment (and water body information if already reported for compliance purposes - see SOER sheet **GEO_INF**).

- Geographic and other details of discharge points and aggregated emissions if not already reported for compliance purposes (see SOER sheet **GEO_INF** for details). - provided once per point unless there are changes between reporting periods.

Physical characteristics of each assessment unit

To be provided only once for each assessment unit unless there are changes between reporting periods if not reported under WFD. Countries may refer to relevant information reported in relation to WFD Article 3, Article 5 and in STA_CHA_PRE

- Area of assessment unit;
- Water type the assessment unit relates to (river, lake, groundwater, coastal or transitional water);
- Permanent population in assessment unit;
- Maximum population in assessment unit – this incorporates tourists, seasonal workers and other non-permanent populations;
- Total agriculture, arable agriculture, pasture, forest, urban, industrial and commercial area in the assessment unit based on Corine Land Cover.

Annex 1: Pollutants reported under other reporting obligations

It is intended that all relevant reporting initiatives are streamlined in one data flow and incorporated into WISE. This is relevant for the Commission and Member States discussing reporting under the Urban Waste Water Treatment Directive (91/271/EEC), some of which should be of direct relevance to this reporting sheet. Similarly it is intended that reporting for the EPER and E-PRTR will also be brought into WISE at the appropriate time as well as the EUROSTAT/OECD Joint questionnaire on emission related information. Table 1 provides an overview of the different pollutants to be reported under the above mentioned processes. Gaps in the table illustrate where SoE reporting requirements are additional to these reporting processes and where reporting of data, where available, would be of value. In addition despite the legal requirements associated with table 1, emissions reporting is often incomplete, limiting SoE assessment.

Table 1. Pollutants to be reported
*EEA will check pollutants in Eurostat (JQ) with Eurostat

Pollutant	UWWT Directive	E-PRTR	Eurostat JQ* Wastewater
BOD	x		x
COD	x		x
TOC		x	
(Total) Suspended solids	x		x
$N\text{-}NH_4^+$			
N - inorganic			
$N – NO_3^-$			
Total – N	x	x	x
Total – P	x	x	x
As		x	
Cd		x	x
Cr		x	x
Cu		x	x
Hg		x	
Ni		x	x
Pb		x	x
Zn		x	x
Fe			
Mn			
Ba			
Al			
Tl			
1,2,3,4,5,6 – hexachlorcyclohexane (HCH)		x	
Alachlor		x	
Aldrin		x	
Anthracene		x	
Asbestos		x	
Atrazine		x	
Benzene		x	
Benzo(g,h,i)perylene		x	
Brominated diphenylethers (PBDE)		x	
Chlordane		x	
Chlordecone		x	
Chlorfenvinphos		x	
Chlorides		x	
Chloro-alkanes, C10-C13		x	
Chlorpyrifos		x	

Cyanides		x	
DDT		x	
Di-(2-ethyl hexyl) phthalate (DEHP)		x	
Dichlorethan – 1,2 (DCE)		x	
Dichlormethane (DCM)		x	
Dieldrin		x	
dioxins and furans			
DIS (dissolved inorganic salts)			
Diuron		x	
DS (dissolved substances)			
Endosulphan		x	
Endrin		x	
Ethyl benzene		x	
Ethylene oxide		x	
Fluoranthene		x	
Fluorides		x	
Halogenated organic compounds (AOX)		x	
Heptachlor		x	
Hexabromobiphenyl		x	
Hexachlorbenzene (HCB)		x	
Hexachlorobutadiene (HCBD)		x	
Isodrin		x	
Isoproturon		x	
Lindane		x	
Mirex		x	
Naphthalene		x	
NES			
Nonylphenol and Nonyl phenol ethoxylates (NP/NPEs)		x	
Octylphenols and Octylphenol ethoxylates		x	
Organotin - compounds		x	
PCDD + PCDF (dioxins+furans)		x	
Pentachlorobenzene		x	
Pentachlorophenol (PCP)		x	
Phenols		x	
Polychlorinated biphenyls (PCBs)		x	
Polycyclic Aromatic Hydrocarbons (PAH)		x	
Simazine		x	
Sulphides			
Tetrachloroethylene (PER)		x	
Tetrachloromethane (TCM)		x	
Toluene		x	
Toxaphene		x	
Tributyltin and compounds		x	
Trichlorbenzenes (TCBs)		x	
Trichlorethylene		x	
Trichlormethane		x	
Trifluralin		x	
Triphenyltin and compounds		x	
Vinyl chloride		x	
Xylene		x	

Serial Number	5
Reporting Sheet Code	BIO_INV_RV
Reporting Sheet Name	State of river water bodies in terms of biological quality elements – benthic invertebrate fauna.
Lead EEA	Peter Kristensen (Peter.Kristensen@eea.europa.eu)
Lead ETC/WTR	Anne Lyche Solheim (anne.lyche@niva.no)
Other inputs	Sandra Poikane, Wouter van de Bund, JRC (IES-EEWAI), Jorge Rodriguez Romero and Ursula Schmedje, DG Env
Status **Date** **Version**	final 24th Sept 2008 7

What should be reported?

National EQR value for macroinvertebrates for each water body chosen for reporting

National EQR class boundaries for macroinvertebrates for all types of rivers reported (to be reported only once, and if revised)

(see determinand section for further description)

Why is it needed?

The information will be used to formulate indicators that will show progress in reaching a good ecological status in an overall European perspective, and to develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level.

The new EEA indicator that will be developed using this data flow is:

- Ecological status of river macroinvertebrates

Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), and of particular issues (e.g. Nutrients in European ecosystems). Such assessments will be improved by the reporting of data on the biological elements of water bodies.

The national EQR values will be translated to normalised EQR values by EEA, based on the national EQR class boundaries and a simple interpolation technique, to allow the data to become comparable between countries and across regions.

The normalised data could be used to elaborate a new EEA indicator, including for example:

- Summaries of the normalised EQR values grouped into high, good, moderate, poor and bad classes at different spatial scales: national,,River basin district (RBD) or the sub-units .

- Time series of the normalised EQR values aggregated for different European regions (e.g. GIG-regions) and different river types (e.g. small lowland river).

- Proportion of river water bodies within each country or within each RBD for which there are statistically significant increases, decreases and no changes in normalised EQR values over time.

How should it be reported?

Determinands

The generic options for the treatment of SOE data by countries before reporting are described in Section 2.4.

National EQR-value for macroinvertebrates for each of the reported water bodies

-
- The determinand should be reported annually if measured every year. In cases where benthic invertebrates are not measured every year, the determinand should be reported in the year it becomes available at a national level e.g. once every two years, once every three years etc.

National EQR class boundaries for macroinvertebrates for all types of rivers reported (to be reported only once, and if revised

Treatment of data before reporting

The generic options for the treatment of SOE data by countries before reporting are described in Section 2.4.

Temporal aggregation:
Annual average values of the determinands at each river water body are requested.

Spatial aggregation (sites):
If samples at a monitoring site within the river water body are taken at discrete sub-sites representing different habitats within the monitoring site, then a site-averaged value should be calculated before reporting. Then, the average and/or median value for all monitoring sites within each river the water body should be calculated before reporting.

The reported values should then be the annual average or median value of the determinand for the water body as a whole.

Methodological details
Methodological details of sampling and data/site aggregation methods used for the requested determinands in this sheet; to be reported only once and if changed

- Sampling month and year;
- Number of samples used to calculate annual average and/or median values and standard deviation for any site within the water body.
- Number of sites and sub-sites used to calculate the average and/or median values for the water body as a whole.

Information on water bodies used for SOE reporting

The following information for each of the water bodies is required (see also Section 2 of this document):

- Unique water body code (see reporting sheet on 'geographical information');
- Physical characteristics and type data of each water body (to be reported only once for each water body and whenever changes) – see SOER sheet **STA_CHA_PRE** for details.
- Proxy pressure information on water bodies (to be reported only once for each water body, and whenever changed) – see SOER sheet **STA_CHA_PRE** for details;
- Information as to whether the water body is heavily modified or artificial should be given.

Geographic and pressure info for the water bodies is not needed if already reported in Article 5 reports. Only the water body code is then needed.

Serial Number	6
Reporting Sheet Code	BIO_PHY_LK
Reporting Sheet Name	State of lake water bodies in terms of biological quality elements – phytoplankton
Lead EEA	Peter Kristensen (Peter.Kristensen@eea.europa.eu)
Lead ETC/WTR	Anne Lyche Solheim (anne.lyche@niva.no)
Other inputs	Sandra Poikane, Wouter van de Bund, JRC (IES-EEWAI), Jorge Rodriguez Romero and Ursula Schmedje, DG Env
Status **Date** **Version**	final 24th Sept 2008 7

What should be reported?

Option 1 (for countries that have completed and successfully intercalibrated their national assessment methods for the whole element phytoplankton in lakes):

National EQR value for phytoplankton for each water body chosen for reporting

National EQR class boundaries for phytoplankton for all types of lakes reported (to be reported only once, and if revised)

(see determinand section for further description)

Option 2 (voluntary additional single metrics for countries and types where data are relevant and available):

Annual and summer (specify period) average values for each lake water body of the following determinands:

- Chlorophyll a concentrations in μg/L- updated annually
- Total phytoplankton biomass in mg/L (or mm^3/L) - updated annually[67].
- % of Cyanobacteria[68] of the total phytoplankton biomass - updated annually

For reservoirs, interannual average values should be reported (based on three years of monitoring) to reduce variation caused by water level fluctuations.

Why is it needed?

The information will be used to formulate indicators that will show progress in reaching a good ecological status in an overall European perspective, and to develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level.

[67] Not currently included as a EEA Priority Data flow and not incorporated into the Data Dictionary

[68] %Cyanobacteria may only be relevant to some, but not all lake types. This metric is especially relevant in low-moderate alkalinity clear water lake types in lowland areas. The Chroococcales species should be excluded, except Microcystis and Woronichinia, which should be included before calculating the metric (see Intercalibration technical report from Northern GIG).

The new EEA indicator that will be developed using this data flow is:

- Ecological status of lake phytoplankton

Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), and of particular issues (e.g. Nutrients in European ecosystems). Such assessments will be improved by the reporting of data on the biological elements of water bodies.

For option 1 data:
The national EQR values will be translated to normalised EQR values by EEA, based on the national EQR class boundaries and a simple interpolation technique, to allow the data to become comparable between countries and across regions.

The normalised data could be used to elaborate a new EEA indicator, including for example:

- Summaries of the normalised EQR values for lake phytoplankton grouped into high, good, moderate, poor and bad classes for different lake types and at different spatial scales: national,,River basin district (RBD) or river basins (RBs).
- Time series of the normalised EQR values aggregated for different European regions (e.g. GIG-regions) and at the lake type level (e.g. shallow, moderate alkalinity lakes).
- Proportion of lake water bodies within each country or within each RBD for which there are statistically significant increases, decreases and no changes in lake phytoplankton over time.

For option 2 data:
The reported data could be used to elaborate a new EEA indicator, including for example:

- Summaries of the other determinands of lake phytoplankton for different lake types using the intercalibrated boundaries as a basis for grouping the lake water bodies into high, good, moderate, poor and bad classes at different spatial scales: national,,River basin district (RBD) or river basins (RBs).
- Time series of the other determinands of lake phytoplankton aggregated for different lake types (e.g. shallow, moderate alkalinity lakes) and in different European regions (e.g. GIG-regions)
- Proportion of lake water bodies within each country or within each RBD for which there are statistically significant increases, decreases and no changes in the determinands for lake phytoplankton over time.

How should it be reported?

Determinands

Option 1 *(for countries that have completed and successfully intercalibrated their national assessment methods for phytoplankton in lakes)*

National EQR-values for phytoplankton for each of the reported water bodies

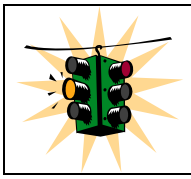
- The determinand should be reported annually if measured every year. In cases where lake phytoplankton are not measured every year, the determinand should be reported in the year it becomes available at a national level e.g. once every 2 years, once every 3 years etc.

National EQR class boundaries for phytoplankton for all types of lakes reported

- The determinand should be reported only once, and if changed

Option 2: *(voluntary additional single metrics for countries and types where data are relevant and available)*

- Chlorophyll a concentrations in µg/l.
- Total phytoplankton biomass in mg/L or mm^3/L
- Relative contribution (%) of cyanobacteria to the phytoplankton biomass;



Look Out!
Chlorophyll-a is already reported under the Eionet-water priority data flow for lakes. See reporting sheet NUT_ORG_RV_LK for details.

- Depth (epilimnion or euphotic zone)-averaged and annual average and/or summer (June to Sept) or growth season (April – Oct) average values for each determinand for the calendar year for each water body;
- Standard deviation of each average value reported for all samples from one year (or summer or growth season) and one water body, if data from >2 samples are available;
- Median concentration of the aggregated data.
- Unit of measurement for each determinand;

- The value of the reported determinands for each of the water bodies are to be reported annually when they are measured every year. In cases where phytoplankton is not measured every year, the classification result should be reported in the year it becomes available at a national level e.g. once every two years, once every three years etc.
- As long a time series of values of metrics/indices as possible for each water body is also requested. The time series need only be reported once and then subsequently updated annually (or when new data are available) with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

Treatment of data before reporting

Temporal aggregation:
Annual and /or summer (June/July/August/September) and / or growing season (April-October) average values and concentrations of the determinands at each lake water body are requested[69].

[69] Only data representing the same period of the year will be compared when making analyses from the reported data.

Spatial aggregation (a) depth and b) sites):

a) If samples at a monitoring site within the water body are taken at discrete depths located at intervals throughout the water column or epilimnion or euphotic zone, then a depth-averaged value should be calculated before reporting.

b) The average value for all sites within the water body should be calculated before reporting.

The reported values should then be the average and /or median value of each determinand for the water body as a whole, and for the year and/or summer and/or growth season.

Methodological details (option 2):

Methodological details of sampling and data/site aggregation methods used for the requested determinands in this sheet; to be reported only once and if changed

- Sampling period (whole year or summer or growing season from month x to month y);
- Depth of sample (integrated water column or epilimnion or euphotic zone or other discrete depth);
- Number of discrete depth samples used in calculating the depth (water column or epilimnion or euphotic zone) averaged concentrations at the site;
- Total depth of water column at the monitoring site at the time of sampling;
- Number of samples used to calculate annual or summer average values.
- Method of data aggregation for discrete depth samples (e.g. simple average, weighted average etc.) (if applicable);

1.1.1 Information on water bodies used for SOE reporting

The water bodies to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of the water bodies is required:

Option 1 and 2:

- Unique water body code (see reporting sheet on 'geographical information')
- Physical characteristics of the water body, including type data (to be reported only once for each water body) – see SOER sheet **STA_CHA_PRE** for details.
- Proxy pressure information on the water body – see SOER sheet **STA_CHA_PRE** for details;
- Please indicate whether the water body is heavily modified or artificial.

Geographic and pressure info for the water bodies is not needed if already reported in Article 5 reports. Only the water body code is then needed.

Option 2 only:

- *The type-specific reference conditions for each of the requested determinands for each monitoring site/water body used for SOE reporting. To be reported only once when they become available and whenever revised.*

Serial Number	7
Reporting Sheet Code	**BIO_AQU_LK**
Reporting Sheet Name	State of lake water bodies in terms of biological quality elements – Macrophytes in lakes
Lead EEA	Peter Kristensen (Peter.Kristensen@eea.europa.eu)
Lead ETC/WTR	Anne Lyche Solheim (anne.solheim@jrc.it)
Other inputs	Sandra Poikane, Peeter Noges, JRC (IES-EEWAI), Jorge Rodriguez Romero and Ursula Schmedje, DG Env
Status **Date** **Version**	final 24th Sept 2008 7

What should be reported?

Option 1 (for countries that have completed and successfully intercalibrated their national assessment methods for macrophytes in lakes):

National EQR value for macrophytes for each water body chosen for reporting

National EQR boundaries for macrophytes in all types of lakes reported (to be reported only once, and if revised)

(see determinand section for further description)

Option 2 (voluntary additional single metrics for countries and types where data are relevant and available):

- Macrophyte depth limit[70] (in m)
- Relative abundance or presence/absence of Charaphytes (alkaline lakes) or Isoetids (low-moderate alkalinity lakes)

Why is it needed?

Macrophyte depth limit, as well as abundance of Charaphytes and Isoetids, are clearly related to the ecological status of lakes in an overall European perspective. These metrics are thus most suitable to develop a European picture on ecological quality in a comparable way and to identify potential problem areas at the European level.

The new EEA indicator that will be developed using this data flow is:

- Ecological status of lake macrophytes

Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), and of particular issues (e.g. Nutrients in European ecosystems). Such assessments will be improved by the reporting of data on the biological elements of water bodies.

[70] Depth limit may not be relevant in very shallow lakes (max. depth < 3 m)

For option 1 data:
The national EQR values will be translated to normalised EQR values by EEA, based on the national EQR class boundaries and a simple interpolation technique, to allow the data to become comparable between countries and across regions.

The normalised data could be used to elaborate a new EEA indicator, including for example:

- Summaries of the normalised EQR values for lake macrophytes grouped into high, good, moderate, poor and bad classes for different lake types and at different spatial scales: national,,River basin district (RBD) or river basins (RBs).
- Time series of the normalised EQR values aggregated for different European regions (e.g. GIG-regions) and at the lake type level (e.g. shallow, moderate alkalinity lakes).
- Proportion of lake water bodies within each country or within each RBD for which there are statistically significant increases, decreases and no changes in the normalised EQR values for lake macrophytes over time.

For option 2 data:
The reported data could be used to elaborate a new EEA indicator, including for example:

- Summaries of the other determinands of lake macrophytes for different lake types grouping the lake water bodies into categories according to the relative abundance of charaphytes or isoetids at different spatial scales: national, River basin district (RBD) or sub-units
- Time series of each determinands of lake macrophytes aggregated for different lake types (e.g. shallow, moderate alkalinity lakes) and in different European regions (e.g. GIG-regions)
- Proportion of lake water bodies within each country or within each RBD for which there are statistically significant increases, decreases and no changes in the determinands for lake macrophytes over time.

How should it be reported?

Determinands

Option 1 *(for countries that have completed and successfully intercalibrated their national assessment methods for macrophytes in lakes)*

National EQR-vaue for macrophytes in each of the reported water bodies.

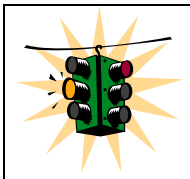
- The determinand should be reported in the year it becomes available at a national level e.g. once every two years, once every three years etc.

National EQR class boundaries for macrophytes for all types of lakes reported

- The determinand should be reported only once, and if changed

Option 2: *(voluntary additional single metrics for countries and types where data are relevant and available)*

- Depth limit (maximum macrophyte colonisation depth in m);



Look Out!
The mean and maximum depth of the lake as described in SOER sheet STA_CHA_PRE is also needed for the assessment of this indicator. Remark that in lakes with fluctuating water levels textual descriptions of the phenomenon may be relevant for evaluating the macrophyte results.

- Relative abundance and/or presence/absence of Charaphytes (alkaline lakes) or large Isoetids (low-moderate alkalinity lakes) (e.g. Isoetes sp., Lobelia dortmanna, Littorella uniflora)

- Unit of measurement for each determinand; for the determinands Charaphyte and large Isoetids, please give data as % cover of total colonisable area, give the values as actual % or as 1 (<10%), 2 (10-20%), 3 (20-30%), 4 (30-50%) or 5 (>50%). If this is not possible, then data can be reported as presence/absence, or as relative abundance using 1 (very low), 2 (low), 3 (moderate), 4 (abundant) or 5 (totally dominant).

- Average value for each determinand for the calendar year for each water body (if applicable);

- Standard deviation of each average value reported for all samples from one year and one water body, if data from >2 samples or transects are available;

- Median concentration of the aggregated data.

- The values of the requested determinands measured at each water body are to be reported in the year they become available at a national level e.g. once every two years, three years or six years.

- As long a time series of the values of the determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

1.1.2 Treatment of data before reporting

Temporal aggregation:
Annual average values of the determinands at each lake water body are requested.

Spatial aggregation (sites):
The average value for all sites/transects within the water body should be calculated before reporting.

The reported values should then be the average and /or median value of each determinand for the water body as a whole, and for the year. The average value of the

determinand at the time of maximum biomass and development (in many cases this will be August or September) is requested for each lake water body for which data are available.

Methodological details:

Methodological details of sampling and data/site aggregation methods used for the requested determinands in this sheet; to be reported only once and if changed

- Macrophyte survey / sampling method used (describe or refer to published report)
- Number of discrete samples used in calculating the averaged concentrations at the site or transect, if applicable;
- Number of sites or transects used to calculate average values for the water body as a whole, if applicable
- Sampling period and date of survey (at time of maximum biomass and development of macrophytes);

Information on sites used for SOE reporting incl. reference conditions and correlation of national and common metrics

The monitoring sites to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of reported monitoring sites is required:

Option 1 and 2:

- Unique water body code (see reporting sheet on 'geographical information')
- Physical characteristics of the water body, including type data (to be reported only once for each water body) – see SOER sheet **STA_CHA_PRE** for details.
- Proxy pressure information on the water body – see SOER sheet **STA_CHA_PRE** for details;
- Please indicate whether the water body is heavily modified or artificial.

Geographic and pressure info for the water bodies is not needed if already reported in Article 5 reports. Only the water body code is then needed.

Option 2 only:

- *The reference conditions for each of the requested determinands for each monitoring site/water body used for SOE reporting. To be reported only once when they become available.*

Serial Number	8
Reporting Sheet Code	**NUT_GW**
Reporting Sheet Name	State of groundwaters in terms of nitrogen
Lead EEA	
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 20 March 2007 6
Collation of Comments on this version	

What should be reported?

- Concentrations of nitrate, nitrite, total ammonium and dissolved oxygen in groundwater.

Why is it needed?

The information will be used to formulate indicators that will be used to assess state and trend of the determinands and monitor progress with European policy objectives.

The relevant EEA Core set indicators is:

- Nutrients in Freshwater (CSI 020)[71]

In addition, the information will be used to develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level. Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), of particular issues (e.g. Groundwater quality and quantity in Europe[72]). Such assessments will be improved by the reporting of more detailed and less aggregated data. In Eionet-Water both detailed and aggregated data are already reported. The focus should be shifted to disaggregated data.

How should it be reported?

Data

Determinands

The concentration/value of the following determinands are required at each monitoring site included in SOE reporting. Those determinands of the highest priority in terms of the EEA needs are **bolded**.

- **Nitrate,** nitrite**;**
- **Total ammonium, oxygen;**

[71] http://themes.eea.eu.int/IMS/IMS/ISpecs/ISpecification20041007131957/IAssessment1116497150363/view_content
[72] http://reports.eea.eu.int/groundwater07012000/en

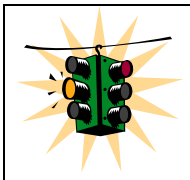
- Supportive determinands and information[73] (if available);

    - pH-value
    - electrical conductivity
    - Temperature
    - Selected major and trace ions (e.g. Ca, Mg, Na, K, HCO_3, Cl, SO_4, $P0_4$, Total organic carbon)
    - Water level

- The determinands measured at each of the SOER monitoring sites are to be reported annually for determinands that are measured every year. Those determinands that are not measured every year should be reported in the year they become available at a national level e.g. once every 2 years, once every 3 years etc.

- As long a time series of concentrations/values of determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated annually with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

Quality of data



Look Out!
Meta-data on AQC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

Treatment of data before reporting

For Eionet-Water data are reported at different levels of aggregation:

- Disaggregated: concentrations in each sample and date of sample taken at each monitoring site in the groundwater body;

- Aggregated: annual average concentrations for the groundwater body.

Data measured for each groundwater body may be reported in one of two ways.

The preferred option for SOE reporting is **disaggregated**, sample data.

1. Disaggregated, individual sample data for each sampling site;

    The following information should be reported with the disaggregated data:

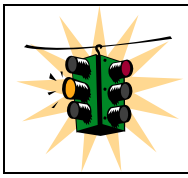
    - Unique sampling site/monitoring site code (see reporting sheet on 'geographical information')

    - Date of sample

[73] Not currently included in the Data Dictionary

- Determinand
- Concentration of determinand
- Unit
- Limit of detection
- Limit of determination (if limit of detection is not available)

2. Annual average concentrations for the groundwater body



Look Out!
To ensure that aggregated values are comparable, measured concentrations below the analytical limit of detection or quantification should be divided by two before the calculation of the required summary statistics.

The following statistical information should also be calculated and reported with the annual average concentration:

- Total number of sampling sites within a groundwater body
- Number of each type of sampling site within a groundwater body
- Number of samples taken per site per year
- Classification of the sampling sites in the GWB in terms of the measured annual average concentrations of the requested determinands[74]
- Mean, median, minimum, maximum and percentile concentrations[75]

Information on sites used for SOE reporting

The monitoring sites/groundwater bodies to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of reported monitoring sites/groundwater bodies is required:

- Unique site code/water body code for linking concentration data with site and groundwater body geographic information already reported for compliance purposes (see SOER sheet **GEO_INF**);
- Meta data or data description with, for example, details of data/site aggregation methods when used for the requested determinands in this sheet;

[74] Countries providing aggregated data are asked to classify their sampling stations according to defined concentration criteria. For example, the number of sampling sites with annual average concentrations of nitrate <10 mg/l, numbers with annual average concentrations nitrate between 10 and <25 mg/l etc. The classification criteria will accompany the schema for reporting the data.
[75] Only possible where more than one sample is taken per year

- Physical characteristics of monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;

- Proxy pressure information on monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;

- Digital (GIS) map of your country showing the boundaries of the groundwater bodies and the coordinates (latitude/longitude) of all sampling sites[76]. These maps are intended to provide an overview of groundwater bodies in Europe. (Superposition should be indicated).

Above elements are mostly defined in the Data Dictionary of Reportnet (groundwater http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2383).

[76] Not included in Article 8 reporting

Serial Number	9
Reporting Sheet Code	**HAZ_GW**
Reporting Sheet Name	**State of groundwater in terms of hazardous substances**
Lead EEA	
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 20 March 2007 6
Collation of Comments on this version	

What should be reported?

- Concentrations of hazardous substances in the EU Groundwater Directive (2006/118/EC) and other main pollutants in groundwater bodies;

Why is it needed?

The information will be used to formulate indicators that will be used to assess state and trend of the determinands and monitor progress with European policy objectives.

The relevant EEA Indicators for water is:

- Pesticides in Groundwater (WHS1a)[77]

In addition, the information will be used to develop a European picture on water quality in a comparable way and to identify potential problem areas at the European level. Assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), of particular issues (e.g. "Groundwater quality and quantity in Europe"[78]). Such assessments will be improved by the reporting of detailed data.

How should it be reported?

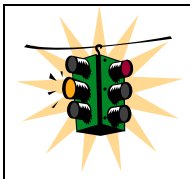
Data

Determinands

The concentration/value of the following determinands are required at each monitoring site included in SOE reporting.

- Hazardous substances;

[77] http://themes.eea.eu.int/Specific_media/water/indicators/WHS01a%2C2004.05/WHS1a_PesticidesGroundwater_110504.pdf
[78] http://reports.eea.eu.int/groundwater07012000/en



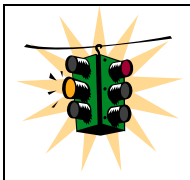
Look Out!
It will not be necessary to monitor each of the WFD priority substances in groundwater bodies. Those hazardous substances that will be monitored will be selected on the basis of the characterisation and potential risks to groundwater and other associated receptors, e.g. surface waters. Therefore different numbers of substances will be associated with many of the sites/groundwater bodies, and only those substances that are monitored should be reported for SOE.

- Other significant[79] pollutants;

- The determinands measured at each of the SOER monitoring sites are to be reported annually for determinands that are measured every year. Those determinands that are not measured every year should be reported in the year they become available at a national level e.g. once every 2 years, once every 3 years etc.

- As long a time series of concentrations/values of determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated annually with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

Quality of data



Look Out!
Meta-data on AQC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

Treatment of data before reporting

For Eionet-Water data are reported as concentrations in each sample taken at each monitoring site in each of the groundwater bodies;

The preferred option for SOE reporting is **disaggregated**, sample data.

The following information should be reported with the disaggregated data for each groundwater monitoring site included in SOE:

- Unique sampling/monitoring site code (see reporting sheet on 'Geographical Information')

[79] A significant pollutant could be one that is occurring at a concentration, which is liable to cause a failure to achieve the environmental objectives set out under Article 4 of the WFD.

- Date of sample
- Determinand
- Concentration of determinand
- Unit
- Limit of detection
- Limit of determination (if limit of detection is not available)

Information on sites used for SOE reporting

The monitoring sites/groundwater bodies to be used for SOE reporting are discussed in Section 2 of this document.

The following information for each of reported monitoring sites/groundwater bodies is required:

- Unique sampling site code/monitoring site code/water body code for linking concentration data with site and groundwater body geographic information already reported for compliance purposes (see SOER sheet “Geographic Information”);
- Meta data or data description with, for example, details of data/site aggregation methods when used for the requested determinands in this sheet;
- Physical characteristics of monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;
- Proxy pressure information on monitoring sites and groundwater bodies (to be reported only once for each site and groundwater body) – see SOER sheet **STA_CHA_PRE** for details;
- Digital map of your country showing the boundaries of the groundwater bodies and the coordinates (latitude/longitude) of all sampling sites[80]. These maps are intended to provide an overview of groundwater bodies in Europe. (Superposition should be indicated).

Above elements are mostly defined in the Data Dictionary of Reportnet (groundwater http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2383).

[80] Not included in Article 8 reporting

Serial Number	10
Reporting Sheet Code	NUT_TW_CW
Reporting Sheet Name	State of transitional and coastal waters in terms of nitrogen, phosphorus, oxygen and chlorophyll a in water
Lead EEA	Trine Christiansen
Lead ETC/SYKE	Antti Räike (**antti.raike@ymparisto.fi**)
Other inputs	Eionet WS, Monika Peterlin, IWRS
Status **Date** **Version**	final October 1, 2008 3

Formatted: German (Germany)

What should be reported?

Concentrations of nitrogen (NO2+, NO3+, NH4, TN), phosphorus (PO4-, TP), chlorophyll-a, and dissolved oxygen in transitional and coastal water bodies including nutrients and dissolved oxygen in territorial waters[81].

Why is it needed?

The information will be used in existing EEA indicators to assess state and trends of the specific determinands, and to monitor progress with achieving European policy objectives. As a first priority, the data will be used to strengthen the transitional and coastal components of the EEA's Core Set Indicators:

- Nutrients in transitional, coastal and marine waters (CSI021)[82]
- Chlorophyll in transitional, coastal and marine waters (CSI023)[83];

Dissolved oxygen concentrations are requested to allow the possibility of developing a future indicator on this parameter. In addition, the information will be used develop a pan-European assessment of water quality in a comparable way and to identify potential problem areas at the European level.

EEA assessments are also made periodically on the impact of particular socio-economic sectors on water (e.g. the impact of agriculture on water), of particular issues (e.g. "Eutrophication in Europe's coastal waters"). Disaggregated data are needed to compile indicators that are comparable across regions.

The marine component of SoE reporting will be further developed as envisaged in the frame of the 2008-2009 mandate of the Water Framework Directive Common Implementation Strategy Working Group D on 'Reporting and WISE'. This outlines the need for 'cooperation with respective groups under the Marine Strategy Framework Directive (MSFD) to develop a

[81] WFD Coastal waters are defined in 1nm zone 'from the nearest point of the baseline from which the breadth of territorial waters ('12 nm zone') is measured' (Artcle 2/7) and coastal and territorial waters extend from the same baseline.In coastal waters both ecological and chemical status are addressed, whereas only chemical status is addressed in territorial waters.

[82] http://ims.eionet.europa.eu/IMS/ISpecs/ISpecification20041007132008/IAssessment1204714151163/view_content

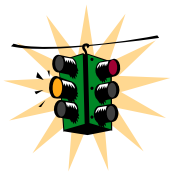
[83] http://ims.eionet.europa.eu/IMS/ISpecs/ISpecification20041007132031/IAssessment1205412447537/view_content

coherent SoE reporting on the status and trends of transitional, coastal and marine waters', which will be achieved, e.g., via discussion in joint experts workshops.

How should it be reported?

Data

Determinands
The concentration/value of the following determinands is required at each monitoring site included in SoE reporting.



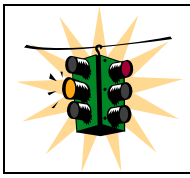
Look Out!
If any of the listed determinands are not monitored nationally, then they are not expected to be reported. The list is comprehensive to take account of all the differences in terms of determinands that are monitored in national programmes, and to maximise the number of countries with data on common determinands. Those determinands of the highest priority in terms of the EEA's needs are **bolded**: these are the ones currently used in EEA assessments (e.g. CSI) and are in the data dictionary. The non-bolded determinands are also requested to be reported if they are held in national databases with the priority determinands. This is because the scope and content of current EEA assessments may change in the future requiring these additional determinands.

- **Nitrogen** (**total nitrogen, nitrate**, nitrite, **total oxidised nitrogen**[84], **ammonium**);
- **Phosphorus** (**total phosphorus, orthophosphate**);
- **Chlorophyll a;**
- Oxygen concentration**;**
- Oxygen saturation**;**
- Supportive determinands and information:
    - **Salinity**;
    - Temperature;

- The determinands measured at each of the SoE monitoring sites are to be reported annually for determinands that are measured every year. Those determinands that are not measured every year should be reported in the year they become available at a national level e.g. once every 2 years, once every 3 years etc.
- As long a time series of concentrations/values of determinands as possible for each site and determinand is also requested. The time series need only be reported once and then subsequently updated annually with the most recent year's data. In some cases a country may wish to re-submit their whole dataset, for example, when errors are subsequently found in national databases and corrected by the country.

[84] Some countries measure total oxidised nitrogen rather than nitrate and nitrite.

Quality of data



Look Out!
Meta-data on QC/QA is not currently included in the Data Dictionary. This information is currently collected from NRCs/NFPs separately from the Eionet-Water data flows: the information is formulated as the Data Quality Index. Reporting sheet 16, describes the information requested on data quality.

Treatment of data by countries before reporting
For Eionet-Water data from transitional and coastal waters are reported as disaggregated, sample data which are subsequently aggregated (summer, winter and annual means) by the EEA/ETC for use in the indicators and assessments. Disaggregated data refers to Individual samples for each monitoring site/sub-site used for SoE reporting.

The following should be reported for each site used for SoE reporting:

- Unique sampling site/monitoring site code (see reporting sheet on '**GEO_INF**');
- TC waterbody type according to WFD intercalibration. (WFD typology should be assigned to TC stations reported according to national division of TC waters typology and intercalibration results (WFD Art 5 report and common intercalibration types assignment) to enable the use of intercalibration work on classification scheme in the assessments);
- Date of sample;
- Determinand;
- Concentration of determinand[85];
- Unit;
- Depth of sample/sub-site below water surface;
- Sampling method (see data dictionary);
- Limit of detection;
- Limit of determination (if limit of detection is not available);
- Total depth of water at time of sampling;

Treatment of data by the EEA after reporting
- Winter averages are produced for the nutrient data. The winter period is January, February and March for stations east of longitude 15 degrees (Bornholm) in the Baltic Sea, and January and February for all other stations.

[85] Sample concentration values measured as below the limit of detection (or determination if limit of detection not available) should be replaced with a value equivalent to half the limit of detection (or determination) in the concentration field with the value of the limit of detection or determination noted in the appropriate fields. If this occurs the separate 'limit of detection flag' field should be marked. Alternatively if the concentration field is left blank and the limit of detection flag used, the EEA will subsequently fill the concentration field with a value equivalent to half the LoD (or determination).

- Summer averages are produced for the chlorophyll a data. Summer is defined as the period May-September, except in the Baltic Sea north of latitude 59º N (Gulf of Bothnia and Gulf of Finland), where summer is defined as the period June-September.

- Those samples taken at sub-sites with depths of <10 m are used to create a depth averaged concentration for use in the indicators based on nutrients and chlorophyll a.

- For the indicator on the frequency of low bottom oxygen concentrations, data from the deepest sub-sites (>10 m) with the minimum oxygen concentration in the water column are used.

- Different countries have different procedures when recording and reporting their data. Some report fixed approximate coordinates for monitoring sites whilst others report the exact coordinates of the ship during sampling. In practice this means that in some cases reported positions do not match any WFD station in TC waters, which results in fragmenting time-series assessments. Consequently, in the processing of the data, representative averages of the data within geographic grids (open water sites: 5.5 x 5.5 km, coastal sites: 1.4 x 1.4 km) are calculated. The EEA will omit this step when WFD stations match the locations where the monitoring is reported to be taking place.

Information on sites used for SoE reporting

The monitoring sites to be used for SoE reporting are discussed in Section 2 of this part of the guidance document:

The following information for each of the reported monitoring sites is required:

- *Unique site code for linking concentration data with site and water body geographic information already reported for compliance purposes (see SoE sheet No. 15 **GEO_INF**");*

- ***Type specific reference conditions and boundary values***[86] *(concentration) for chlorophyll in accordance to WFD intercalibration work for each monitoring site/water used for SoE reporting. Preliminary reference conditions and boundary values can be reported if they are used and the list will be finally updated when the final values become available. Reference concentrations and boundary values for chlorophyll will be reported latest in March 2010.*

- *Physical characteristics of monitoring sites (to be reported only once for each site) – see SoE reporting sheet No. 14 - **STA_CHA_PRE** for details.*

- *Proxy pressure information on those human activities and sources of pressures that may be affecting the water bodies (to be reported only once for each water body) – SoE reporting sheet No. 14 - **STA_CHA_PRE** for details.*

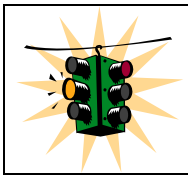
[86] Boundary values for chlorophyll-a include concentrations (mg/l) for High/Good and Good/Moderate boundary.

Serial Number	14
Reporting Sheet Code	STA_CHA_PRE
Reporting Sheet Name	Site characteristics and proxy pressure information
Lead EEA	
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 16 February 2009 7
Collation of Comments on this version	Updated according to the latest WFD consolidated guidance (November 2008)

What should be reported?

- Physical characteristics of the monitoring sites (groundwater, river, lake, transitional and coastal waters) and of the groundwater and surface water bodies in which they are located – provided once per monitoring site unless there are changes between reporting periods.

- Validation of proxy pressure information on the upstream catchments of the river, lake, transitional and coastal[87] monitoring sites/water bodies, and on groundwater body recharge area.



Look Out!
Proxy pressure information will be derived by the EEA (see section 2 of this document). Countries will be asked to validate this information, once per monitoring site unless there are changes between reporting periods.

- Additional information on the presence of human activities within or affecting the water body.

Why is it needed?

The information will be used to provide supportive and interpretative information for the quality data (concentration data and biological metric data) reported annually and described in the other reporting sheets. The information improves the assessments possible by identifying the type (e.g. size) of water body in which the sites are located and the predominant pressures in the upstream catchment or on the groundwater body. For example, this information is used to allow integrated assessments and a comparative analysis between quality results and possible pressures and driving forces at the EU-scale.

[87] Not relevant to marine monitoring stations

How should it be reported?

Data

Linkages between geographic information, concentrations/values of the determinands data and supportive information are made through the unique identity code of the monitoring site reported by countries as part of WFD Article 5 requirements.

Monitoring site and water body characteristics

Physical characteristics of the monitoring sites and the water bodies in which they are located – provided once per monitoring site and water body unless there are changes between reporting periods. This information will enable the types of water body to be identified, in particular to those types used in the intercalibration exercise, and allow appropriate comparisons of water bodies to be made.

a) River and lake water bodies, and monitoring sites

- Characteristics of inland surface water bodies should be reported according to the WFD consolidated reporting guidance (latest version November 2008 is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d) – reference to water body code used has to be made. No duplicate reporting is needed.

- Reference monitoring sites information reported under Article 8 should be made. See the above WFD consolidated guidance. No duplicate reporting is needed, so the below information only should be reported if the information was not reported under Article 8 or the information has changed.

- Name/unique identity code of monitoring site[88];

- The type of monitoring site in rivers, lakes, transitional, coastal and marine waters according to the criteria defined in section 2 referring to the specific determinands of this document (i.e. R = representative monitoring site, P = sites monitoring single significant pressures[89]);

- Location of lake monitoring site (e.g. main outlet of lake, centre of lake, etc.);

- Catchment area upstream of river monitoring site, and/or of the water body in which the site is located measured at the downstream limit of the water body;

- Catchment area of lake water body measured at the main outlet of the water body or in the case where there are more than one water body in a lake, then measured at the dividing line/point between adjacent water bodies;

- Altitude of lake and at the river site;

- Surface area[90] and average depth of lake water body;

[88] As reported by countries under WFD Article 8 requirements. This also includes the name of the site/station.
[89] Examples of pressures are given in Table 2 of this document. Information will be requested on the type of the significant pressure for each "P" monitoring site.
[90] Need not be reported again if already reported for Article 5

- Average width and depth of river at monitoring site (where available);
- Long term average river flow (where available);
- Predominant upstream catchment geology (where available);
- Long term average colour of river and lake water body
- Long term average alkalinity of river and lake water body
- Sampling depth in lake water body;
- Residence time of the lake water body;

b) Transitional, coastal and marine water bodies, and monitoring sites

- Characteristics of transitional, coastal and marine water bodies should be reported according to the WFD consolidated reporting guidance (latest version November 2008 is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d) – reference to water body code used has to be made. No duplicate reporting is needed.
- Reference monitoring sites information reported under Article 8 should be made. See the above WFD consolidated guidance. No duplicate reporting is needed, so the below information only should be reported if the information was not reported under Article 8 or the information has changed.
- Name/unique identity code of monitoring site[91];
- The type of monitoring site in rivers, lakes, transitional, coastal and marine waters according to the criteria defined in section 2 referring to the specific determinands of this document (i.e. R = representative monitoring site, P = sites monitoring single significant pressures);
- Distance of marine monitoring sites from nearest mainland and/or closest coast;
- Purpose of monitoring site (EU, Marine Conventions, national or combinations of these purposes);
- Environmental compartments measured at the monitoring site;
- Sampling depth in transitional, coastal and marine water body;
- Average annual depth of transitional and coastal water body at the sampling site/location;
- Minimum, mean and maximum salinity of transitional and coastal water body at the sampling site/location;

[91] As reported by countries under WFD Article 8 requirements. This also includes the name of the site/station.

- Mean tidal range of transitional and coastal water body at the sampling site/location;
- Mean annual temperature of transitional and coastal water body;
- Residence time of the transitional and coastal water body;
- Mixing characteristics of the transitional and coastal water body.

c) Groundwater bodies and aquifers, and monitoring sites (if available)

- Characteristics of groundwater bodies should be reported according to the WFD consolidated reporting guidance (latest version November 2008 is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d) – reference to water body code used has to be made. No duplicate reporting is needed.
- Name/unique identity code of groundwater body (for aggregated and disaggregated data);
- Reference groundwater monitoring sites information reported under Article 8 should be made. See the above WFD consolidated guidance. No duplicate reporting is needed, so the below information only should be reported if the information was not reported under Article 8 or the information has changed.
- Name/unique identity code of groundwater monitoring site (for disaggregated data);
- National code of groundwater body and monitoring site
- Location of groundwater body (region, province)
- Groundwater body area
- Main aquifer type
- Detailed information on horizon and superpositioning
- Maximum length and width
- Minimum, mean and maximum long term annual precipitation
- Stratigraphy: Description of the stratigraphy (geological period) of the groundwater body
- Petrographic: Description of the main components of the groundwater body
- Minimum, mean and maximum thickness of the groundwater body
- Overlying strata
- Minimum, mean and maximum depth from the surface to the groundwater body
- Main recharge source

- Minimum, mean and maximum hydraulic conductivity
- Minimum, mean and maximum annual groundwater level amplitude
- Information if groundwater body is transboundary and in case neighbouring countries the groundwater body is also located in.
- Capacity m³ if available
- Reference year above data refers to

Proxy pressure information to be calculated by the EEA and validated by countries

Information on the proxy pressures in the catchment upstream of the site/water body (river, lake, transitional and coastal monitoring sites/water bodies), and on groundwater body area will help the EEA in the selection of the appropriate sites/water bodies for the assessment of specific pressures and sectors. It should be noted that transitional and coastal water bodies are not only influenced by pressures originating in upstream catchments but also by coastal currents, offshore marine waters and upwelling events from deeper waters. This is why additional human activity/pressure information listed in section (b) is requested. If a quantitative assessment of pressures (rather than a qualitative assessment based on proxy pressures and activities) on specific coastal or transitional water bodies were to be required in the future some form of modelling might be necessary.

It is intended that the EEA will calculate such proxy pressure information using the geographic information reported to WISE, and the appropriate European databases of catchments (CCM2), land cover (e.g. Corine Land Cover) and statistical data (e.g. population).

Countries will be asked to validate the EEA's information once per monitoring site/water body unless there are changes between reporting periods. It is acknowledged that it might be difficult for countries to validate this information for transboundary water bodies as the relevant information from upstream countries may not always be available to them.

Proxy pressure information to be provided by countries if relevant and significant to the status of a water body

Pressure information related water bodies should be reported according to the WFD consolidated reporting guidance (latest version November 2008 is available here http://circa.europa.eu/Members/irc/env/wfd/library?l=/water_directors/documents_november_2/documents_meeting/reporting_guidance/_EN_1.0_&a=d) – reference to water body code used has to be made. No duplicate reporting is needed

Presence of the following human activities within or affecting the water body
a) Rivers and lakes

- Aquaculture
- Dam constructions
- Direct discharges from sewage treatment works and industry. [Note: Some of this information may be required to be reported under the Urban waste Water Treatment and IPPC Directives, and would therefore eventually be available in WISE]

b) Transitional and coastal waters

- Direct discharges from sewage treatment works and industry [Note: Some of this information may be required to be reported under the Urban waste Water Treatment and IPPC Directives, and would therefore eventually be available in WISE].
- Oil or gas Extraction
- Dredged spoil or waste disposal ground
- Directly impacted by leachate from landfill disposal sites
- Mariculture
- Fishing
- Marina
- Port facilities
- Other Activities
- Other Discharges
- Details of the downstream river monitoring site representing the main land-based influences on the transitional and coastal water body.

c) Groundwater bodies:

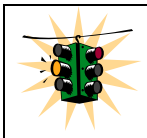
- Water abstracted from the groundwater body, and its purpose
- Artificial recharge and of the groundwater body, and its purpose
- Main infrastructures affecting the dynamics of the groundwater body, and their description
- Associated Aquatic Ecosystems and their description

The above site characteristics and proxy pressure information elements are mostly defined in the Data Dictionary of Reportnet (rivers http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2386 , lakes http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2384 , transitional and coastal waters http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2385, groundwater http://dd.eionet.eu.int/dataset.jsp?mode=view&ds_id=2383).

Serial Number	GEO_INF
Reporting Sheet Code	15
Reporting Sheet Name	Geographic information
Lead EEA	
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 16 February 2009 7
Collation of Comments on this version	Updated according to the latest WFD consolidated guidance (November 2008)

What should be reported?

Details of the SOER monitoring sites and survey sites including their geographic location for only those sites not established and reported for Water Framework Directive purposes. Information that was already reported under Art. 8; 5 or 3 WFD into WISE will be taken from there and does not need to be provided again.



Look Out!

Member States first reported under Article 5 in 2005 and under Article 8 in 2007. In 2010, data may be resubmitted in relation to RBMP reporting if any was missing from the original submission or if any of the information has since changed.

Information that was already reported under WFD into WISE will be taken from there and does not need to be provided again.

Why is it needed?

The identification and geographic location of each reported monitoring site and water body is needed in the state and trend assessments to enable different regional stratifications and to undertake proper EU level assessments of spatial and regional trends.

Most of the required information will be reported to WISE as part of the compliance information defined in:

- Article 5 reporting sheets
  - SWB 1 - Identification of surface water bodies
  - GWB 1- Identification/delineation of groundwater bodies

- Article 8 reporting sheets
  - SWM 1 – Summary of Surface Water Monitoring Programmes;
  - GWM 1 - Summary of Monitoring Programmes for Groundwater

This information is summarised in this reporting sheet **(Section 1)** and need not be reported again for SOE purposes.

However, countries may wish to incorporate into SOE reporting the data arising from monitoring sites that have been established for other purposes and policies, and not for the

Water Framework Directive. These sites may be required to meet the EEA's needs for representative data and information. For these sites there will be a need to obtain equivalent information to that reported for WFD monitoring sites: the required information is summarised in **Section 2** of this sheet.

Linking geographic information to SOE data

Linkage of the concentration data measured at each site (and reported for SOE purposes) with the geographic information on the monitoring site and water body will be made through the unique site/site code which is requested to be reported with the data.

Section 1 Information that is relevant to SOE reporting but has been reported under the compliance data flow

a) For each **surface water monitoring site**, the following data are required:

- Site name;
- Is the site a surveillance monitoring or operational monitoring site, or both?;
- Unique site identifier;
- Link to the code/s of WB or WBs reported under Article 5 to which the site is associated (1 to 1-, 1 to many- or many to 1-relationship possible);
- X/Y co-ordinates (latitude/longitude) of the site;
- Identify if the site located in protected areas (Y/N). If so, the type of the protected areas (in accordance to Annex IV WFD) is required;
- Identify if the site is part of the intercalibration network (in accordance with Decision 2005/646/EC) or the national network of reference sites (i.e. determining reference conditions);
- Identify if the site is part of existing international monitoring networks (e.g. TNMN of the Danube river basin or WISE-SoE site);
- QE identifiers[92].

b) Surface water body data

For each **surface water body** the following data are required:

- Water body code;
- Water body name;
- Shapefile/GML file:
  - Rivers: for water bodies on rivers with catchments>500 km^2;
  - Lakes: for all lakes identified as water bodies by Member States;
  - Coastal and transitional waters: for all water bodies identified.

[92] Development of an identifier system for QEs should be developed.

- Centroid (for all surface WBs) (technical specification for the calculation of the centroid to be developed in the context of the updated GIS guidance);
- Size (total length or area) at 1:250 000;
- Whether the water body (WB) is heavily modified (HMWB) or artificial (AWB);
- Type;

c) Groundwater monitoring site data

For each **groundwater monitoring site**, the following date are required:

- Unique site identifier;
- Identify the type of monitoring site:
  a) Is the site a well or a spring?;
  b) Is the site a quantitative or chemical monitoring site, or both?
- Identify the use of monitoring site:
  Is the site used for monitoring, drinking water supply, industrial supply, irrigation or others?
- Unique code of GWB or group of GWBs to which the site is associated (1 to 1-, 1 to many- or many to 1-relationship possible);
- X/Y co-ordinates (latitude/longitude) of the site;
- Identify if the site is part of existing international monitoring networks (e.g. TNMN of the Danube river basin or WISE-SoE site);
- Information on sampling depth (site allows for sampling of upper, medium or deeper layer of the GW-body or for mixed samples);
- Parameter identifier

d) Groundwater bodies

For each **groundwater body (GWB)** the following data are required:

- Water body code;
- Water body name;
- Shapefile/GML file:
  - Groundwaters: boundaries of groundwater bodies or groups of groundwater bodies larger than 100 km^2.[93]
- Centroid (for all groundwater bodies) (technical specification for the calculation of the centroid to be developed in the context of the updated GIS guidance);
- For groundwater bodies or groups of groundwater bodies, if available:
  - Layered (Y/N);
  - Average depth to groundwater body (m);

[93] When providing all GWB boundaries in one file please take care that the GWBs are not intersected. Alternatively provide separate files for each GWB horizon.

- Average thickness of groundwater body (m);
- Assignment to a depth range where the main part of the GWB is situated in (depth ranges: 0-20m, 20-50 m, 50-200 m, >200m);
- Directly dependent aquatic ecosystems (Y/N);
- Directly dependent terrestrial ecosystems (Y/N);
- Geological formation – aquifer type (according to a predefined typology);
- Type of vertical orientation of GWB (indicated by category and visualised by symbols);
- Volume of aquifer (m^3) (if possible).

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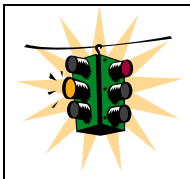
Section 2. Information that is relevant to SOE reporting but has NOT been reported under the compliance data flow

Some countries may wish to incorporate into SOE reporting the data arising from monitoring sites that have been established for other purposes and policies. These sites may be useful, sometimes essential to meet the EEA's needs for representative data and information. For these sites there will be a need to obtain equivalent information to that reported for WFD monitoring sites.

For each monitoring site not included in WFD monitoring programmes (and hence not already reported for WFD compliance purposes) the following information should be reported for SOE purposes:

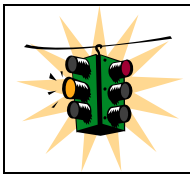
a) Surface water monitoring sites

- Site name;
- Unique site code and the codification system to which it refers (in the event a same location might be coded differently by different monitoring programmes);



Look Out!
Information will be required on the elements of identification that allows the EEA to attach the site to the rivers and catchments GIS system. For example, area of catchment, river name, next city code, road code and bridge name are elements generally collected at the MS level to identify more accurately its sites. When possible, a map extract would be the welcome[94].
The same information may also be required for those sites already reported under the compliance data flow (Section 1) if the monitoring sites cannot be correctly located on rivers and in catchments in the GIS database.

- Unique code of water body to which the site is associated;



Look Out!
Even though the monitoring site may not been established for WFD purposes it is likely that the site will be in a water body identified and characterised as part of the Water Framework Directive Article 5 requirements.

- X co-ordinate (latitude) of the site;
- Y co-ordinate (longitude) of the site; and,
- Purpose of the monitoring site in terms of Directives (e.g. Nitrates Directive) or other policies.

[94] Some countries have installed a system to clip an extract of digitised map around the point coordinates and out put it as electronic file. Such map suppresses all uncertainty in attaching the station to the river system the EEA will use.

b) Groundwater monitoring sites

For each monitoring site, the following information is requested:

- National site name;
- Unique site code and the codification system to which it refers (in the event a same location might be coded differently by different monitoring programmes);
- The type of monitoring site: in a well or a spring, and the equipment of the well (permanent pumping, irrigation, water supply, monitoring place, etc., see below);
- The use of monitoring site: for monitoring, drinking water supply[95], industrial supply, irrigation or others
- Unique code of GWB or group of GWBs to which the site is associated [Even though the monitoring site has not been established for WFD purposes it is likely that the site will be in a water body identified and characterised as part of the WFD Article 5 requirements];
- X co-ordinate (latitude) of the site; and,
- Y co-ordinate (longitude) of the site.
- Identify if the site is part of existing international monitoring networks (e.g. EIONET Water);
- Information on sampling depth (e.g. site allows for sampling of upper, medium or deeper layer of the GW-body or for mixed samples)
- Determinand identifier

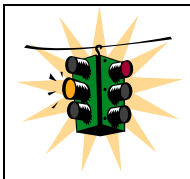
This information need only be reported once for each site unless there is a change in its status in terms of use for monitoring or its geographic relocation.

[95] Note: the geographic coordinates of drinking water well will not be published or released by the EEA

Serial Number	16
Reporting Sheet Code	DQ
Reporting Sheet Name	Data Quality for reported SOE data
Lead EEA	
Lead ETC/WTR	
Other inputs	
Status **Date** **Version**	 20 March 2007 6
Collation of Comments on this version	

What should be reported?

Information on the analytical methods used and on the quality assurance/quality control procedures associated with national sampling/monitoring, analysis and data screening.



Look Out!
The requested information will only be requested every four years or when there are changes at the national level (not annually) to chart progress in quality control in relation to the expected changes in national monitoring programmes as the monitoring and analytical methodologies for the different quality elements are developed and refined over the coming years. The information is requested for each relevant regional or national monitoring programme providing data for SOE reporting.

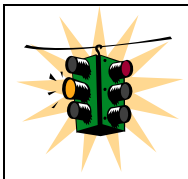
Why is it needed?

The SOE data flows (covering rivers, lakes, groundwater and transitional, coastal and marine waters) (currently delivered through the Eionet-Water process and in the future the WISE process) are derived from data and information sources that already exist in the member countries. Prime responsibility for quality therefore lies with the member country.

It is widely recognised that the quality of assessments made by the EEA and others, based on the data in Waterbase (and in the future in WISE), is dependent on national/sub-national QA/QC processes, about which relatively little is known. The requested information attempts to bridge this knowledge gap and provide comparable judgments about the quality of data in WISE.

The reported information will be used to derive the Data Quality Index which was developed by the ETC/EEA in 2002/03. The Data Quality Index (DQI) is a semi-quantitative and objective tool that will allow users of WISE to make comparable judgements between the member countries about the quality of data and to act as a stimulus for countries to improve QA/QC procedures where it can be shown to be necessary.

The DQI has previously been tested in a number of volunteering countries and appears to give a robust and useful indicator of the quality of data in national systems and allows comparisons to be made between countries.



Look Out!
There are other requirements for the reporting on the quality of data. These include the requirements/requests associated with the reporting of data by the Contracting Parties to the OSPAR and Helsinki Conventions to ICES.
There is also a proposal for the collection of data required for the review of the WFD Priority Substances. The scope of the proposed data collection is greater than that required for SOER. There will also be a request for more detailed information on data quality relating to the laboratories undertaking the analysis of the reported determinands

How should it be reported?

Information on eight key aspects determining the quality of data is requested, covering national/regional sampling/monitoring, analysis and data screening. The information is to be provided in terms of yes/no answers to questions on the key aspects and will enable the EEA to subsequently derive the DQI.

The information should be provided for each national or regional programme undertaking monitoring of the different quality elements in rivers, lakes, groundwater, transitional and coastal waters. For example there may be different monitoring programmes for each water category and for the different quality elements where, for example, different laboratories may be undertaking the analysis of physicochemical, and biological determinands.

Information is also requested on the methods used for the analysis or measurement of the priority chemical determinands identified in other SOE reporting sheets.

Monitoring programme

- Name and/or identifier
- Water Category(ies) monitored
- Determinands monitored

The DQI is derived from a series of eight questions given below (Yes/No answers only) covering national sampling/monitoring, analysis and data screening. The questions are weighted (from 1-3) to reflect their importance and the DQI can range from 0 to 12. The DQI has previously been tested in a number of volunteering countries and appears to give a robust and useful indicator of the quality of data in national systems and allows comparisons to be made between countries.

The questionnaire should be completed for each national or regional programme undertaking monitoring of the different quality elements in rivers, lakes, groundwater, transitional and coastal waters. For example there may be different monitoring programmes for each water category and for the different quality elements where, for example, different laboratories may be undertaking the analysis of physicochemical, and biological determinands.

Meta data (yes/no answers) is requested on the following aspects for each monitoring programme identified above:

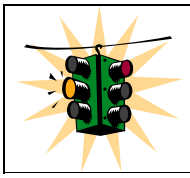
	Sampling	***Score if YES***	***Answer YES/NO***
1	*Is sampling (and any field measurements) carried out to a documented protocol by staff who have undergone specific training?*	1	
	Analysis		
2	*Are the analytical laboratories accredited by a national accreditation body – to ISO 9000 or EN45000 series standards?*	1	
3	*Are the laboratories subject to external audit?*	1	
4	*Have numerical accuracy requirements been defined for all relevant determinands?*	2	
5	*Do laboratories have performance test data for their own analytical systems – indicating the precision of analysis, spiking recovery and limits of detection?*	1	
6	*Can the laboratories produce routine quality control charts for all relevant determinands?*	3	
7	*Is the monitoring programme linked to a series of routine and regular interlaboratory tests – for all relevant determinands either on a national or international basis?*	2	
	Data Screening		
8	*Is the monitoring data automatically (i.e. using specific software) screened for statistical outliers or checked for unusual results before being stored on a national or regional database?*	*1*	

The information provided for the key aspects 1 to 8 above will be used by the EEA to derive the DQI, reported back to countries submitting SOE data and will be available on WISE.

Analytical methods used for each of the priority chemical determinands to be reported for SOE.

- Determinand name;
- CAS number and EU-number[96] of determinand (where appropriate);
- CEN/ISO code of the method(s) used:
- Name of method used when there is no CEN/ISO standard method or when the CEN/ISO standard method has not been used.

[96] European Inventory of Existing Commercial Chemical Substances (EINECS) or European List of Notified Chemical Substances (ELINCS).



Look Out!
In cases where there is no CEN or ISO standard method available, a detailed method description and documentation on method validation might be subsequently requested.

Part 4

Guidance on data processing, handling and reporting and requirements for technical integration

This part has been drafted by EEA for the Drafting Group meeting of 3.October 2007. it is based on earlier drafts discussed in the Drafting Group, to summarise the state of play on the issues outlined for this tasks in the mandate and to set the discussions in the Drafting Group in relation to the ongoing work in the WISE Technical Group.

1. Introduction

To ensure a streamlined, comparable data set to be used in European-level assessments agreements have to be reached on how data from the established monitoring networks have to be processed and prepared at national, river basin or European level to feed into a reliable and relevant assessment.
The Water Information System for Europe (WISE) in its first phase has been developed into a well established tool for reporting and display of assessments. The SOE-reporting EEA is compiling with the Member Countries also through the Eionet is by now fully integrated into WISE (WISE-Themes and Data).
The SOE-drafting group followed this process and the discussions supported the development of WISE in its first phase considerably.
At the same time the conceptual discussions towards a Shared Environmental Information System (SEIS) emerged and developed into a overarching framework for the development of streamlined reporting, which provides an efficient basis for a broad access to already collected data and assessments and bridges the gap to ensure information supply meets the demand of all users required to provide EU-level or regional assessments (EEA, Eurostat, JRC, DG ENV, Regional Conventions, Transboundary River Basin Networks)

This part of the guidance document covers both task 4 and task 5 of the mandate given to the SOE-drafting group, which was to provide guidance and recommendations for the future data processing, handling and reporting of SOE-data (4) and set out the requirements for the technical integration into WISE (5).

It has to be recognised that the tasks of the SOE-drafting group in regard of its composition and expertise were limited to conceptual discussions, the definition of the set of SOE-parameters and to provide recommendations towards the further technical development from a conceptual perspective.
The technical development of WISE itself is taken forward with the Member States in the WISE Technical Group (led by EEA), which is reporting also directly to the Working Group D – Reporting. Therefore it is recommended that the open questions addressed in the drafting group and outlined in section 4 below are further discussed and developed by the WISE technical group

In terms of the further development of the SOE assessments and questions related to e.g. quality assurance and assessment methodologies EEA is continuously working with the Member States through the Eionet. This also ensures communication to some Member countries outside the EU (EEA membership covers EU 32). During the work of the SOE-drafting group the coordination between the Eionet and the WFD- community largely improved and can now support the integration of SOE-reporting into WISE also in a networking perspective in an optimal way.

The following sections describe the current processes of the SOE-reporting, the future development in 2007, 2008 and beyond, and the further requirements in terms of technical development in WISE toward a distributed system and for the further improvement of the EU-level assessments.

2. Main steps of the reporting in 2007 - Transition towards a future SOE-reporting for water

The recent development of WISE, its launch on the 22 March 2007 and the successful reporting of most of the data under Article 8 are the basis for the further development also of the input side of WISE.
The first reporting exercise under WISE in 2007 is based on the first set of SoE - reporting sheets (task 3 of the drafting group) agreed with water Directors in June 2007.
These reporting sheets have been summarised and presented also to the EIONET NFPs, in May 2007, who agreed on the procedure, provided that the 2007 exercise is seen as a test case still and with this allows for a prolonged deadline until end of December 2007 and less stringent evaluation of evaluation of country benchmarking regarding the reporting performance.

First focus in 2007 needed to be on the station selection. The new established networks under the WFD had to be taken as the basis for (re)selecting and expanding the set of SOE-sites (i.e.Eionet sites). The reporting relates to 2006 data and with this only data from Stations that were established before 2007 can be considered, data from SOE-stations new established in 2007 could only deliver data one year after their establishment (e.g. from 2008 onwards).

The procedure of the Eionet water reporting under SOE-WISE in 2007 is strongly depending on the success of the first step of the exercise, the definition of the suitable set of SOE-sites and on the technical developments in WISE to hold these data, implemented during summer 2007. The criteria for station selection have been discussed and agreed in the SOE-drafting Group and were documented under task3 of the Drafting Group.
Using the 2007 exercise as a test also for the recent technical WISE developments it is expected that the reporting of Eionet water data into SOE-WISE will find a more continuous shape in 2008.

This new Eionet water reporting scheme under SOE-WISE replaces the old Eionet-water reporting (also called Eurowaternet).

The request sent out in September 2007 to all EEA Member States.
consists of two parts (see details below):
1) Selection and agreement on the sites, and
2) Reporting of data for the reporting sheets 1, 2, 8 and 9 (for Nutrients and Hazardous Substances in Surface waters Groundwater)

2.1. Checking of monitoring sites

The selection of monitoring sites is a one-off event, to establish the link with the WFD Art. 8 reporting to efficiently use the station characterisation provided there (one reporting – multiple use).
It was agreed in the drafting group to make available data from all monitoring sites necessary to provide a representative picture of the overall status of rivers, lakes and

transitional and coastal waters within each catchment/subcatchment within each river basin district. The SOE set of monitoring sites has to meet the set of criteria for representativity. This should ensure the most suitable selection and amount of monitoring sites needed for SOE-reporting. The representativity will be evaluated later with the data reported (see also section 5.1.1). In case countries report a change of the dimension of the water bodies this evaluation might need to be adapted.
The station selection consists of the following steps:

- EEA/ETC sends out the compilation of WFD Article 8 monitoring sites specifying the on links with former Eionet sites and water bodies, for clarification and agreement of the new SOE sites based on WFD Art. 8 reporting (September 2007).
- Countries (re)select their new Eionet/SOE sites, probably enlarge the set of sites and specify it for EEA as basis for the future SOE-data flow. (during September/October 2007)

The details of the site selection are described in the letter sent out with the data request 13.09.2007 (available at http://water.eionet.europa.eu/announcements/soe_data_2007). The criteria for the selection of monitoring sites have been described in Task 3 section 2 (Monitoring sites to obtain representative information for SOE assessments). Moreover, the required site characteristic and proxy pressure information and geographic information are described in reporting sheets 14 and 15, respectively. This information is necessary for the analysis of representativity of the sites.

2.2. Reporting of data

The reporting of data as described below will continue in the future as a yearly event.

The following steps have been taken to prepare for the transition towards the new Eionet-water – reporting under SOE-WISE for 2007, 2008 and beyond.

- Preparation to use the data dictionary. EEA/ETC has revised the data dictionary for the revised reporting sheets as presented to SCG and NFPs.
- The drafting group has to some extend discussed questions of data processing and reporting: statistical aspect; spatial and temporal aggregation. Some of these elements are implemented in the recent development of WISE (see section 4 and 5). For other areas described also in section 4 and 5 further technical discussions with member states are necessary.

The following steps are currently in process. Similar actions will be performed routinely in connection with the annual SOE-reporting in the future.

- Data request. EEA/ETC sends out the request (incl. guidance on data processing) to countries for data from 2006 for the new reporting sheets (1, 2, 8, 9, 14, 15, 16) and for old TCM reporting sheets, using the updated Data Dictionary. These data should be from new EIONET sites (usually within the WFD Article 8 monitoring sites). The request is sent to the national reference centres (NRC) or the relevant main contact point nominated by the country with a copy to the national focal points (NFP) in the countries. All countries who have reported monitoring sites under the WFD will provide data for those sites, which were established before 2007, for the new established sites the reporting starts in the year following the establishment. The other 8 EU countries and all non-EU countries will report for their old EIONET sites.
- Preliminary data quality assurance. Countries are requested to perform a basic quality assurance before submitting their data (see below section 3).
- Data reporting. Countries submit their data to EEA Reportnet central data repository (CDR; http://cdr.eionet.europa.eu), in the format specified by EEA (see section 4.1).

3. Quality assurance and metadata use, requirements for consistent datasets in a shared information system.

Eionet-Water derives data from databases and information sources that already exist within the member countries. The data are aggregated on the level of single sites to annual averages (or seasonally averaged data for some parameter). The aggregation is carried out by the member states themselves from the "raw data" from the national monitoring systems (which might include also subsites and more detailed station information). In this context, therefore, the prime responsibility for quality lies with the member state. The quality checking that the EEA can perform on aggregated data level will be less sensitive to outliers and errors. This responsibility is further reinforced through the process whereby the data in WISE, or in assessment reports using data derived from WISE, is passed to the National Focal Points for validation (quality checking) prior to publication.

Quality control and quality assurance are required on the technical side as well as on the content side (Figure 1), and on different spatial levels (regional, national or river basin, EU).

3.1. Preliminary data quality assurance by data providers

The QA/QC components to be carried out by the data providers are described in reporting sheet 16. These procedures are based on the Index of Data Quality developed by EEA for the national data in WISE (http://reports.eea.europa.eu/technical_report_2003_98/en).

Regional level:
The main sources of error at the regional level derive from sampling procedures, analytical procedures, data handling and reporting. There are recommended protocols and procedures (including standard analytical methods) which, if followed will ensure that error is minimised and comparability of data assured (according to the statistical performance characteristics of the analytical method). Data quality must address at all levels of data production, storage and treatment in order to get an assessment of the uncertainty: This part of the quality assurance is in the responsibility of the Member States. The following aspects calculation and assessment methods are chosen on national level taking into account guidance documents and the WFD where relevant.

- Monitoring strategy design: how accurate and representative is the selected monitoring sites, parameters, sampling frequency?
- Monitoring assessment methods: how accurate and representative is the sample taken? (necessary for comparability of monitoring assessment methods and EQRs.)
- Analytical methods: Good laboratory practice and QA/QC of sampling results, validation of results.
- Data supply: how complete or representative are data sets? Do they meet the data needs?
- Data providers also need to check the units (such as μg/l or mg/l), and specify whether e.g. nitrates are reported as nitrate-nitrogen (mg/l NO_3-N) or as nitrate (mg/l NO_3)).

National/river basin level:
This will be primarily concerned with data validation and screening processes aimed at producing a common, homogenous national set of data. Data "validation" or "screening"

procedures for individual data points fall into either logical or statistical categories and they are particularly important for identifying outliers. This is a national responsibility. This component is also described in reporting sheet 16.

It is assumed that the data provider do the basic data-technical QA/QC, connected with the aggregation and transfer of the raw data into the reporting format. This is supported by a easy structure of the Data Dictionary and the respective templates. On EEA side this is accomplished by automatic control protocols (so called GDEM QA) after the data are uploaded to the Central Data Repository (CDR) and providing immediate feedback to the data provider.

3.2. *Data quality assurance at EU level*

Integrity of data when they enter the water data centre (currently managed by ETC-Water) is a responsibility at the EU level. Efforts at the ETC are directed towards screening for outliers and transposition errors which may have got through national screening procedures or may have been introduced during the transfer from national to European level. The ETC routinely carries out pre-upload checks on correct format, station information (missing or new sites) etc. Progressive development of Reportnet tools by EEA (and contractors) and their subsequent use by the countries has improved the quality of the dataflow and reduced the checking time for the ETC but there are of course some tasks which can only be carried out by water experts rather than data experts.

Examples of validation rules for aggregated data used by the ETC are:

- Mean >= Minimum
- Mean <= Maximum
- Median >= Minimum
- Median <= Maximum
- Minimum <= Maximum
- StandardDeviation < Maximum
- IF Minimum < Maximum THEN (Mean > Minimum AND Mean < Maximum)
- IF Minimum < Maximum THEN (StandardDeviation > 0)
- IF NumberOfSamples = 1 THEN (StandardDeviation = 0)
- IF NumberOfSamples = 0 THEN (AllValueType Is Null)
- All Values > 0

A simple ‘relative’ method was developed by EEA to help identify outliers. It compares relative distances between individual measurements values, adjacent values and average/median values of respective time series and calculates their aberrancy. The values with the highest aberrancy are usually outliers. As it requires water expertise and knowledge of the respective data the results of this test are then the basis for further communication with the data providers in the Member States to confirm the correctness of the reported data.

The ETC develops then regularly a set of questions on data quality for each MS, based on the data quality and plausibility checks on outliers that are performed by the EEA/ETC for each national data set. In order to open a dialogue with the MS to improve the data quality EEA refers these questions back to the NFP/NRCs for clarification by national water experts. An agreed procedure as currently in place for the quality control of the Eionet water data needs to be continued and improved to ensure reliability of data process on the EU level (validation, feedback on outliers, agreed methods on further aggregation).

3.3. *Application of the data*

Questions of reliability/applicability and comparability are closely connected to the later statistical processing of data and the application of models. These manipulations of the data would be done by ETC, EEA and others in for example, the construction of indicators and the production of assessment reports. The statistical use of the data again addresses the questions on the comparability of methods and the pros and cons of bringing the information together in a European context. These questions require water expertise.

The next step should be to develop procedures for a quality control on the assessment side, including questions of aggregation and representativity regarding spatial, temporal, Type specific and pressure related representativity. and.

3.4. *Metadata*

The SOE metadata by and large conform to the Dublin Core metadata standard (ISO), with appropriate modifications, and this is reflected in the metadata components of the ROD and DD. The Reportnet Contents Registry is currently satisfactory in terms of registering who uploaded what, where and when but is lacking in any metadata descriptors of completeness of data and quality/fitness for purpose of data.
Further needs for the development of metadata in Reportnet are discussed in Section 4.1.

4. Needs for a conceptual approach for the SOE reporting under WISE in a distributed System (SEIS and INSPIRE compatible) – streamlining and access

The aim of this part of the guidance is to give recommendations for the technical development of one homogeneous data structure (not necessarily one physically integrated dataset) that can meet the requirements for both the compulsory WFD Compliance reporting needs and the voluntary SOE reporting needs.

As outlined in the WISE implementation plan (*link to CIS document*) it is intended to develop WISE as the water related part of the shared environmental information system (SEIS) into a distributed system by 2010. With the current implementation of the WISE Map viewer, this has been partly realised especially regarding use of map service protocols between EU-institutions. Regarding the input side, more development is needed to realise the requirements of a shared system also between the EU-level and member States.

Regarding the integration of different reporting streams, the intention of the WISE implementation plan from the beginning was full integration of the current and future SOE data flows (Eionet Water) and WFD compliance data flows (including RBMP reporting in 2010) into WISE. This has been realised by using the reporting of the monitoring sites und the Art. 8 WFD when selecting the representative set of monitoring sites for the subset of SOE-sites and using the information on station characteristic once reported.

Further efforts are needed to develop a fully satisfactory common conceptual structure and data structure for WISE to:

- address as well the data streams for the other water directives that require reporting (e.g. UWWTD; (91/271/EEC), Bathing Water Directive (2006/7/EC), Nitrates directive (91/676/EEC); Drinking water Directive (98/83/EC) IPPC and EPRTR.
- take into account other datasets such as WFD Article 3 reporting of River Basin Districts (RBD) and water bodies and Article 5 reporting of status of Water bodies CCM, CORINE Land Cover, and Intercalibration.

Developments so far are:

- A common ***logical*** data structure to hold the building blocks, their spatial inter-relationships, their influences and performance data that will enable integration and harmonisation across the data flows used in the WISE viewer launch in March 2007. This logical data structure also shows that common codes and definitions of organisations and people can be defined across data sets and that a set of rules can be used to create derived values such as indicators.
- Updated/integrated ***physical*** data models for the current WISE application (holding the SOE/Eionet-Water data) to ensure linkage between those and the data models of WFD Articles 3, 5 and 8. This is visible e.g. in the recent updates of the Data Dictionary (http://dd.eionet.europa.eu/dataset.jsp?mode=view&ds_id=2501#model):
- Development of common data exchange standards considering that the Data Exchange Modules (DEM) will need to have schemas that will support validation process and that separate specialist validation tools may be required.

The current challenge is to bind together those different approaches/solutions into a structure which assures interoperability between the conceptual and physical level.

The SOE-drafting group recommends for all the issues described in the following sub sections to follow up the further technical development within the WISE technical group which is reporting regular progress to the Working Group D, SCG and water Directors.

As EEA is leading the WISE Technical Group, countries not participating in this group will also be informed regularly via the Eionet.

4.1. Use of Reportnet tools and needs for further development

Reportnet is a system of integrated tools which are designed to ensure comprehensible data exchange between Member States and EU-level. A set of rules for data exchange already ensures a certain level of interoperability and comparability (data standards embedded in the data dictionary so far).

The most important current Reportnet tools for data handling are:

- Reporting Obligations Database ROD (EEA's database of reporting obligations) (http://rod.eionet.europa.eu/)

ROD is EEA's reporting obligations database. It contains records describing environmental reporting obligations that countries have towards international organisations.

- Central Data Repository (CDR) (http://cdr.eionet.europa.eu/)
  CDR is a web interface to upload reported data. It is organised in collections, the root level is country. Main functionalities are storage of uploaded data, user-friendly navigation of data workflow, and checking and converting of data to XML format.
  The workflow differs for each type of obligation.

- Data Dictionary (DD) (http://dd.eionet.europa.eu/)
  DD is a database of detailed specifications of how data should be collected and delivered. This information is main knowledge base for the MS. The DD also provides data reporters with Excel templates to facilitate reporting, and definitions of parameters as input for technical quality control and automated validation of the reported data. [ensuring first level quality assurance]
  The DD user guide is available at http://dd.eionet.europa.eu/DD-User-Guide.pdf

In a future distributed system, common data standards and data definitions need more attention to ensure full interoperability of the system so that information held within different databases can be accessed, viewed, exchanged and analysed across systems.

In areas where hard data are combined and assimilated across the system, a common data model is essential to enable data interoperability.

Regarding the different scales, embraced by a distributed system, conceptual, referential and semantic aspects have been considered to ensure that the data are interoperable and comparable when moving between the national/river basin/European levels.

The above calls for Reportnet enhancements in particular related to interoperability, data quality checks in a distributed node environment and extended XML-based exchange.

4.2. Business rules for data handling, presentation and dissemination

The detailed up-to-date guiding material related to business rules can be found in two libraries: Material more related to the WFD reporting in the DG Environment maintained library and material with reference to WISE SOE or of more technical nature in the libraries maintained by EEA. Both are accessible under http://www.eea.europa.eu/themes/water/data-center-services/document-libraries .

- Business rules will be developed under the WISE implementation plan jointly by the four EU institutions and a text on the conditions of use of geographical (spatial) data is published which gives guidance for the broader business rules.
- The business rules should consider what products and services will be offered, how they will be experienced and used by the customers and how the delivery of these will be experienced by the data suppliers. For GIS aspects this is partly already covered by the WISE GIS guidance developed in the WISE technical group, (see below).
- The complex nature of the reporting process requires explanation of the context of the parameters recorded in the data dictionary and used for reporting. This is contained within the reporting sheets. The documentation of WISE dataflows – including the description of the various quality assurance steps on the input side and the services and databases on the output side is currently being finalised.

4.3. Common spatial tool for visualisation and assessment (under INSPIRE)

The long-term objective is to have a geographic data set/infrastructure which allows the easy and automated transfer of national/river basin data to WISE which is interoperable in accordance with INSPIRE in order to allow the use of the data for:

- Visualisation tool for (national) input data: Work so far has concentrated on the WISE output visualisation. There is no generic spatial tool for visualisation of the input data. For QA purposes, .kml files are displayed in Google Earth.
- Visualisation tool for viewing European data (output): This is being handled by EEA who is further developing the WISE web-viewer.
- Revised specification of the user needs, development of the data models and the user queries is currently being undertaken by ETC Water and EEA staff.

In terms of granularity of spatial data in cases of very large river-basin districts, these units may not enable a comparable assessment. The right medium-level aggregation of water bodies (elementary catchments) might be the so-called comparable sub-units. In the Working Group D and WISE technical group a process started to identify them and define their spatial boundaries.

An updated WISE GIS Guidance is being developed by the WISE GIS Technical Group which will address these and related issues. The Publications is foreseen for 2008.

5. Future improvement of EU-level assessments

As with the updated SOE/Eionet data flow the information from national monitoring sites has a better geographical reference and a clear type-specific characterisation, there are some possibilities to improve future EEA assessments. This opens up for an improvement of the EU-level assessments as e.g. in the EEA Core set of indicators. In future, they will meet the requirements of type-specific, pressure related and spatially referenced assessments using Art. 3 and 5 information.

The further development of the EEA indicator assessments in the context of WISE needs to take into account the practical experiences with the 2007 reporting as first test and 2008 reporting as first regularly established reporting scheme.

The improved indicator assessments need to be integrated into WISE. The data should be made traceable to the data source. In the future WISE, further developed towards a distributed system, data could even be left at source. The further development has to ensure consistency between the national and the EU-level indicator assessments. The visualisation of the assessments should use common spatial tools in accordance with INSPIRE (see section 4.3).

However, the question of statistical treatment of data, rules and procedures for aggregation and the use of models for data provision needs further attention and have to be addressed in further Workshops which EEA will organise with its Member States.

The following sub sections describe the state of the art and the requirements for further developments.

5.1. Statistical aspects – relation between EU-level and national statistics

The SOE-data flow is a sub-set of the national/river basin data sets which should give a representative picture of information related to water quality and quantity for the respective area (river basin district or comparable sub-unit), which has to be robust enough to draw a robust, comparable picture of state and trends of the agreed environmental parameter.

This includes both the aspect of representativity from a geo-statistical point of view as well as the robustness of the statistics for the station values aggregated by data providers (in particular for data on concentrations) and reported to EEA, (how are mean-values and standard deviations calculated?).

5.1.1. Representativity and geo-statistics

When monitoring sites are selected and a first data flow from these representative sites is established, the statistical robustness of the station selection will need to be proven in terms of representativity to ensure the robustness of the EEA assessments.
The issue of representativity of sites and site selection has been considered by the Drafting Group under Task 3 and is described in section 2 of the respective chapter on task 3. There the criteria for the selection of representative sites are listed.

The proposed criteria for representative monitoring sites are as follows.

- Sites from all water categories: rivers[97], lakes[98], transitional, coastal and marine[99] waters);
- Including representative examples of all types[100]: different types of water body in a catchment would reflect, for example, differences in the hydrological regime, altitude, geology, depth and sizes of the rivers, lakes, transitional and coastal waters.
- Including representative examples from the complete range of statuses present[101] within each catchment;
- Including examples of sites monitored in different sizes[102] of water body: ideally there would be some sites in, and representative of, small water bodies[103] as well as on the largest water bodies. This would enable the identification and assessment of comparable types of water body;

[97] Including canalised rivers and artificial canals
[98] Natural, artificial (reservoirs) and mixed
[99] Eionet-Water currently includes marine waters: new data flows would be developed in line with the work of EMMA
[100] The WFD requires surface water bodies to be defined using descriptors given in system A or system B: the types of water body within a RBD are required to reported to the Commission under Article 5.
[101] It is recognised that not all catchments/RBD would have water bodies of all statuses from high to bad
[102] Defined in terms of upstream catchment area for rivers and surface area of lakes
[103] They are differences in the minimum size of water body included by countries in WFD monitoring and assessments. For example, some countries have used the implied System A typologies de-minimis sizes. In terms of rivers, water bodies with catchments areas at least 10 km^2 would be included. Others have identified river water bodies with catchments smaller than 10 km^2 and that are not part of a larger catchment, but with a river stretch greater than 1 km in length.

- Including sites representative of all types of pressure present in the catchments of the River Basin District.

In a process of quality checking, the representativity of the station finally reported with the first test reporting in 2007 and the first regular reported data in 2008 has to be checked when doing the first assessments.

This should include e.g. a check of number of station by type of WB, and within that type of pressure and furthermore a check if these results are consisted with national level results.

5.1.2. Robustness of data from SOE-station in EU- level trend analysis

EEA indicator assessments use the data from national SOE-monitoring sites with a certain aggregation, for example sub-sites (see below). Because data are aggregated already once for the further statistical analysis on European level, for both the trend analysis of several years as well as the stratification, the statistical robustness of the aggregated data should be known. For information on concentration values the number of sub-sites used to arrive at the mean value and the confidence interval/standard deviation is necessary to recognise uncertainties and to prevent unreasonable assessments.

The statistical treatment of the data in the further EEA assessments needs to be included with the further discussions together with the Member States when the first assessment with the new data are available and needs to be linked also with the process of quality checking (see section 2 this chapter.)

5.2. Data processing – aggregation

The data processing required for different determinands, pressures and quality elements for different water categories are described in detail in the reporting sheets (Working Group D - Reporting Activity on State of the Environment reporting: Contribution to draft guidance on Reporting required for assessing the state of, and trends in, the water environment at the European level). In brief, the following three options are currently used in EIONET-Water for the following determinands:

Options for data processing	Used for which determinands
1) Annual or seasonal aggregation of data for each monitoring site with aggregation of data from the sub-sites associated with the site	Nitrogen in groundwater (alt. 1)
2) Annual or seasonal aggregation of data for each monitoring site with no aggregation of data from sub-sites	Nutrients and organic pollution determinands in rivers and lakes
3) No aggregation: individual sample data for each monitoring site and sub-site	Nutrients, oxygen and chlorophyll-a in TCM Nitrogen in groundwater (alt. 2) Hazardous substances in all water categories

Use of models for provision of data

Use of models on national level

See also WISE RTD, Harmoni-Ca concerted action to facilitate information exchange between MS

With the implementation of the WFD and especially the reporting under Art. 5 various national attempts were made to use environmental modelling on catchment scale to provide pressure information for catchments (River Basin), in particular on diffuse sources from agriculture. These have been bundled on EU level in research activities and concerted actions with scientists and member states representatives (Harmoni-Ca; Euroharp, etc.).

In the context of climate change research, an increasing amount of modelling approaches is available for water quantity drought and flood risks.

Parts of these activities are available already via WISE. Under the WISE-RTD and the EU Harmoni-CA research project a first overview of tools has been established (see box).

Box:: Overview of tools related to water assessments (from the WISE-RTD homepage http://www.wise-rtd.info/wpis/wise.html)

- Precipitation/runoff modeling tools
- River and urban drainage modeling tools
- Groundwater modeling tools
- Coastal and estuarine modeling tools
- Flood forecasting tools
- Biota (ecological) modeling tools
- Socio-economical tools
- Quality assurance in modeling tools
- Uncertainty analysis tools
- Model calibration tools
- Model sensitivity analysis tools
- Model linking tools
- Tools for public participation
- Decision support tools
- Data management tools
- Monitoring tools

It has to be further evaluated to which extend these model can also be used to fill gaps in time series or for hindcasting and forecasting where data does not exist.

5.4.2 use of models in EU-level, large scale assessments

During the coming years, activities on developing European GIS-based data sets and modelling tools are important to support e.g. the European assessment and to also provide information under complex situations such as the estimation of diffuse sources as needed under the E-PRTR process. The GIS-based data sets should, among others contain available information on main pressures and the main drivers affecting water abstraction and pollution, (e.g. nutrient balances), the main climate elements of the water balance (precipitation, evaporation and crop water requirements) and the routing of water flow. Modelling tools should be established to provide a comprehensive picture of the different elements of the water balance at continent scale and regional scale. Activities to establish such a system have already been established for some years at the JRC, EEA and in different EU RTD projects (Euroharp, Scenes, MARE-Nest, etc).

In terms of future SOE analysis and assessment (incl. scenario/modelling analysis), - A seamless catchment database is needed for analysing pressure impact relationships, visualisation **and** analysis, which need to be integrated in WISE and provide a comparable basis for assessments from all EU institutions requiring such information (EEA, JRC, Eurostat, DG Environment, as well as regional conventions for their regional purposes).

Those needs and requirements need to be taken into account in the WISE development in the medium term, as foreseen already in the WISE implementation plan, and will be further discussed with Member States taking part in the WISE development, e.g. in the WISE technical group and regular WISE workshops organised by EEA.

Abbreviations

BQE = biological quality element
CCM = Catchment Characterisation and Modelling
CDR = Common Data Repository
CEN = Comité Européen de Normalisation
COM = Commission
CORINE = Coordination of Information on the Environment
DD = data dictionary
EEA = European Environment Agency
DEM = Data Exchange Modules
EIONET = European Environment Information and Observation Network
ETC = European Topic Centre
GIS = geographical information system
GLP = Good Laboratory Practice
INSPIRE = INfrastructure for SPatial InfoRmation in Europe
MS = Member State
NFP = National Focus Point
NRC = National Reference Centre
QA = Quality Assurance
QC = Quality Control
QE = quality element
RBD = river basin district
RMBP = River Basin Management Plan
ROD = reporting obligations database
SCG = Strategic Co-ordination Group
SEIS = Shared Environment Information System
SOE = State of Environment
SQL = Structured Query Language
TCM = Transitional, Coastal and Marine waters
UWWTD = Urban Waste Water Treatment Directive
WFD = Water Framework Directive
WISE = Water Information System for Europe