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Second River Basin Management Plans – Member State: Sweden

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)
Second River Basin Management Plans
First Flood Risk Management Plans

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Acronyms

EQS Directive	Environmental Quality Standards Directive
FD	Floods Directive
Km	Kilometre
km^2	Kilometre squared
KTM	Key Type of Measure
PoM	Programme of Measures
RBD	River Basin District
RBMP	River Basin Management Plan
WFD	Water Framework Directive
WISE	Water Information System for Europe
Annex 0	Member States reported the structured information on the second RBMPs to WISE (Water Information System for Europe). Due to the late availability of the reporting guidance, Member States could include in the reporting an Annex 0, consisting of a short explanatory note identifying what information they were unable to report and the reasons why. This Annex was produced using a template included in the reporting guidance. If Member States reported all the required information, this explanatory note was not necessary.

Foreword

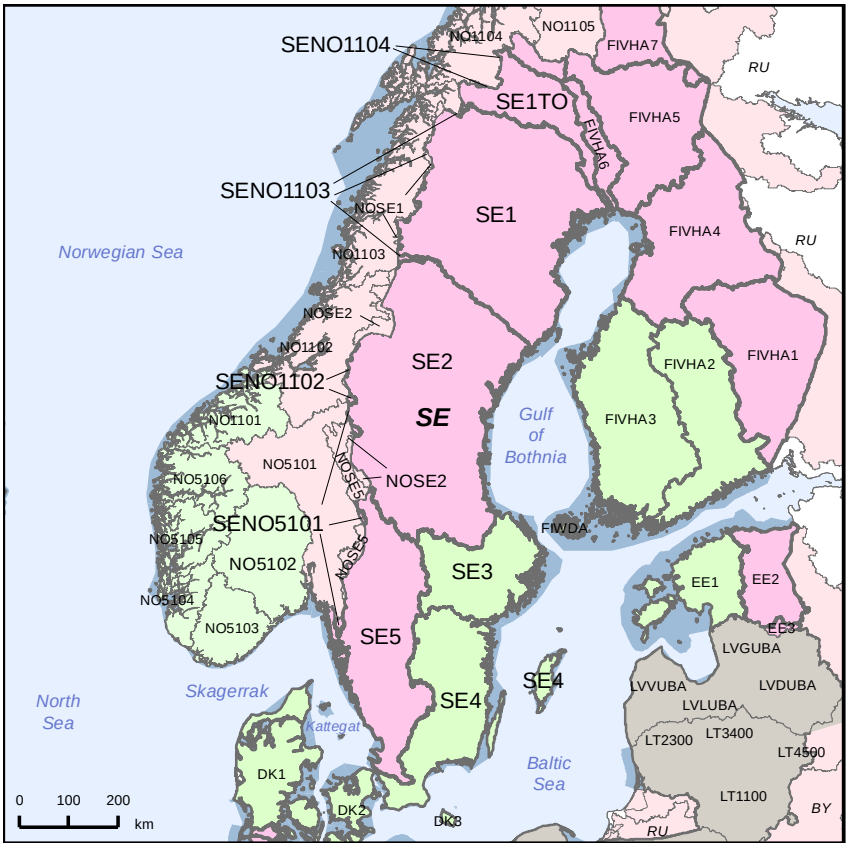
The Water Framework Directive (WFD) (2000/60/EC) requires in its Article 18 that each Member State reports its River Basin Management Plan(s) (RBMPs) to the European Commission. The second RBMPs were due to be adopted by the Member States in December 2015 and reported to the European Commission in March 2016.

This Member State Assessment report was drafted on the basis of information that was reported by Member States through the Water Information System for Europe (WISE) electronic reporting.

The Member State Reports reflect the situation as reported by each Member State to the European Commission in 2016 or 2017 and with reference to RBMP prepared earlier. The situation in the Member States may have changed since then.

General Information

Map of River Basin Districts



Source: WISE, Eurostat (country borders)

International River Basin Districts (within European Union)
International River Basin Districts (outside European Union)
National River Basin Districts (within European Union and Norway)
Countries (outside European Union)
Coastal Waters

Sweden has a population of 9.75 million (Eurostat 2015)[1]. The total area of Sweden is 453 140 km^2 ([2]).

The Bothnian Bay River Basin District (RBD) is shared with Finland and Norway mainly by the River Torne, which forms part of the border between Finland and Sweden. A very small part of this catchment is in Norway.

[1] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tps00001&tableSelection=1&footnotes=yes&labeling=labels&plugin=1

[2] Map and area from Commission second implementation report on WFD monitoring of 2009, Annex http://ec.europa.eu/environment/water/water-framework/implrep2007/index_en.htm

The border between Sweden and Norway is mostly formed by a mountain range. About 30 transboundary catchments are shared between the two countries, most of them having only a small part in the upstream country. These small parts of catchments have been given specific codes in addition to the main RBDs in Sweden (SE1, SE2 and SE5). In Skagerrak and Kattegat there is one major international river shared with Norway, the Göta river catchment, which includes the river Klarälven and Lake Vänern, the largest lake in the European Union (5 655 km²).

The information on the areas of the national RBDs including sharing countries is provided in Table A. Sweden's share of the international RBDs is shown in Table B.

Table A Overview of Sweden's RBDs[3]

RBD	Name	Size[4] (km²) (Area including coastal waters shown in brackets)	Countries sharing RBD
SE1**	Bothnian Bay (Bottenviken)	120900 (128100)	FI, NO
SE1TO	Bothnian Bay (International district Torne river) (managed as part of SE1)	25420 (25500)	FI, NO
SE2**	Bothnian Sea (Bottenhavet)	140200 (145200)	NO
SE3**	North Baltic Sea (Norra Östersjön)	36980 (44200)	-
SE4**	South Baltic Sea (Södra Östersjön)	54920 (64980)	-
SE5**	Skagerrak and Kattegat (Västerhavet)	68580 (71690)	NO
SE1102	Bothnian Sea (International RBD Trondelagsfylkene) (managed as part of SE2)	450	NO
SE1103	Bothnian Bay (International RBD Nordland) (managed as part of SE1)	1319	NO
SE1104	Bothnian Bay (International RBD Troms) (managed as part of SE1)	192	NO
SE5101	Skagerrak and Kattegat (International RBD Glomma) (managed as part of SE2 and SE5)	992	NO

Source: River Basin Management Plans reported to WISE ***Note:*** *** Main RBDs shown. All the small international parts of these RBDs are reported in separate envelopes (http://cdr.eionet.europa.eu/se/eu/wfd2016/), but the RBMPs are the same as those for the main RBDs, and are adopted and reported at the same dates.*

[3] Sweden subsequently informed the Commission that these 10 RBDs, are only for reporting purposes. The five river basins that are shared with Norway and Finland have been defined as five separate RBDs in the WISE reporting schemes; however, this does not mean that those river basins are individual RBDs that are managed separately. The management of those basins is instead included in the RBMPs for the main RBDs that they belong to.

[4] Source: http://www.vattenmyndigheterna.se/Sv/om-vattenmyndigheterna/fakta-om-distrikten/Pages/default.aspx?keyword=Vattendistrikt+areal

Table B Transboundary RBDs by category and % share in Sweden

Name international river basin	Sweden national RBDs	Countries sharing RBD	Co-ordination Category	
			2	
			km^2	%
Ångermanälven	SE2	NO	30349	95.0
Dalälven	SE2	NO	27843	95.0
Fagerbakkvassdraget	Nordland/SE1	NO	20	2.0
Glomma	Glomma/SE5/SE2	NO	430	1.0
Haldenvassdraget/Enningsdal	SE1	NO	578	23.0
Hellemovassdraget	Nordland/SE1	NO	16	1.0
Indalsälven	SE2	NO	24763	92.0
Klarälven/Trysil - Göta alv/Vänern Göta/ (including the Sub-basins Norsälven/Byälven/ Upperudälven)	SE5	NO	42982	84.0
Kobbelva	Nordland/SE1	NO	10	1.0
Luleälven	SE1	NO	24506	97.0
Malselvvassdraget/Malangen	Troms/SE1	NO	209	3.0
Nidelva	Troendelag/SE2	NO	293	8.0
Piteälven	SE1	NO	11186	99.0
Ranavassdraget	Nordland/SE1	NO	270	6.0
Rossaga	Nordland/SE1	NO	193	7.0
Saltelva	Nordland/SE1	NO	119	6.0
Signaldalselva	Troms/SE1	NO	46	3.0
Skjomavassdraget	Nordland/SE1	NO	160	10.0
Stjordalsvassdraget	Troendelag/SE2	NO	46	2.0
Torneälven/Tornionjoki	SE1	FI/NO	25393	63.1
Umeälven	SE1	NO	26561	99.0
Vefsna	Nordland/SE1	NO	548	12.0
Verdalsvassdraget	Troendelag/SE2	NO	102	6.0

Source: WISE electronic reporting

Category 1: International agreement, permanent co-operation body and international RBMP in place.
Category 2: International agreement and permanent co-operation body in place.
Category 3: International agreement in place.
Category 4: No co-operation formalised.

Status of second river basin management plan reporting

A total of five RBMPs for Sweden (Bothnian Bay, Bothnian Sea, North Baltic, South Baltic, Skagerrak and Kattegat and Glomma) were published on 21 December 2016. Documents are available from the European Environment Agency (EEA) EIONET Central Data Repository https://cdr.eionet.europa.eu/

Key strengths, improvements and weaknesses of the second River Basin Management Plan(s)

The main strengths and shortcomings of the second RBMP of Sweden are as follows:

- **Governance and public consultation**

  - Sweden has coordinated the preparation of RBMPs with Finland and Norway, including via the preparation of "roof reports" on common challenges and actions, and these were provided for consultation in all countries involved.

  - A broad range of stakeholders were actively involved in the preparation and drafting of Sweden's RBMPs via advisory groups.

  - Sweden did not adopt and publish the RBMPs in accordance with the timetable in the Water Framework Directive.

- **Characterisation of the RBD**

  - Some small water bodies situated in Protected Areas have been delineated as separate water bodies, so their objectives will be in line with those of other water bodies in Protected Areas.

  - In each of the RBDs there are several river, lake and coastal water bodies that are reported not to have corresponding intercalibration types. The RBMPs reported that the Swedish classification system has been successfully intercalibrated for all the biological quality elements for national types that have been linked to common intercalibration types.

  - Type specific reference conditions have been established for relevant biological quality elements, physicochemical quality elements and hydromorphological quality elements for all coastal water bodies, but not for rivers or lakes. This may lead to some weaknesses in the classification of status/potential according to these quality elements.

  - Further characterisation work has been undertaken since the first RBMP with the inclusion of the assessment of linkages with surface water bodies and terrestrial ecosystems.

- For surface water bodies, significance of pressures is reported as being linked to the potential failure of objectives and are defined in terms of thresholds. The significance of pressures is reported to be linked to the potential failure of objectives for groundwaters. Sweden has made major attempts to improve the assessment of significance in their analyses of pressures since the first RBMPs, developing a set of new methods for each of the major pressure/impact categories: nutrient enrichment, acidification, contamination by hazardous substances and morphological pressures. Models are used to estimate the source apportionment and link threshold values to the boundary for the sensitive biological quality elements; however, the significance of pressures has not been defined in terms of thresholds for pressures on groundwater and for defining abstraction, artificial recharge, and other pressures; only expert judgement was used.

- All RBDs reported inventories of emissions, discharges, and losses, containing each only between six to eight Priority Substances. For some substances in the inventories (including some substances deemed relevant at RBD level), Tier 1 of the methodology was implemented; for the others a combination of Tier 1 (point source information) and Tier 2 (riverine load) was used, while the Guidance Document recommends applying at least Tier 1 + 2 for all substances relevant at RBD level. The data quality was not reported.

- **Monitoring, assessment and classification of ecological status**

- The proportion of water bodies included in surveillance monitoring increased for all relevant water categories in the second RBMPs. The same happened with operational monitoring in coastal and river water bodies, while there was a small decrease for lake water bodies.

- There has been an overall increase in the numbers of surveillance monitoring sites in coastal waters (+27 %), lakes (+19 %) and rivers (+26 %) since the first RBMPs.

- The number of operational monitoring sites in rivers increased by 3 % since the first RBMPs, but there was a decrease in coastal waters (-9 %) and lakes (-26 %).

- Monitoring of biological quality elements still shows several gaps, namely for angiosperms and macroalgae in coastal waters, phytobenthos, benthic invertebrates, macrophytes and fish in lakes. These were monitored only in some RBDs or not at all.

- Morphological conditions were not monitored in any water category or RBD, and there are also gaps concerning tidal regime and hydrological regime.

- Similarly, there are also significant gaps in the monitoring of general physicochemical quality elements.

- None of the coastal waters, lakes, and river water bodies included in surveillance monitoring was monitored for all required biological or hydromorphological or physicochemical quality elements.

- Of the 10 biological quality elements used for surveillance monitoring in surface waters, only phytoplankton was sampled at least at the minimum recommended frequency at all sites in coastal waters. For operational monitoring, none of the 10 biological quality elements used were sampled at least at the minimum recommended frequency at all sampling sites.

- When it comes to River Basin Specific Pollutants, 34 were reported to be monitored, four in biota (unspecified), seven in fish, six in biota other than fish, nine in settled sediment, and 33 in water. Biota, settled sediment, and water were monitored in all three relevant water categories. None of the River Basin Specific Pollutants were sampled at least at the minimum recommended frequency at all sites.

- Assessment methods for biological quality element methods were developed since the first RBMPs for angiosperms in coastal waters, but methods for the assessment of phytobenthos in lakes and macroalgae in coastal waters are still missing. A method for macrophytes in rivers was recently developed, but was not reported.

- Assessment methods for hydromorphological quality elements are reported for each water category, but are not linked to the sensitive biological quality elements.

- For physicochemical quality elements, only the assessment methods for nutrients in all water categories are reported to be related to the sensitive biological quality elements.

- Environmental Quality Standards have been set for 26 River Basin Specific Pollutants in water and in all water categories. For one substance (polychlorinated biphenyl) Environmental Quality Standards in biota and fish were also derived. All Standards have been derived in accordance with Technical Guidance n. 27. The analytical methods are in line with Articles 4(1) or 4(2) of the Quality Assurance / Quality Control Directive (2009/90/EC), except those for the two estradiols.

- Expert judgment is the most often used means of classification of ecological status/potential of the quality elements in rivers, lakes, and coastal waters in Sweden.

- The use of hydromorphological quality elements and River Basin Specific Pollutants in the overall classification of ecological status ware largely based on expert judgment, even when this was not the case in the classification of the individual parameters.

- There are still only a small minority of water bodies classified for most of the biological quality elements in all water categories.

- In general, more lakes and river water bodies were classified using physicochemical quality elements than using biological quality elements.

- The number of water bodies with unknown ecological status/potential was reduced from 128 in the first RBMPs to only one in the second. The proportion of coastal waters in good or better status increased, while the proportion of rivers and lakes reported to be in good or better ecological status/potential decreased significantly. These changes are mostly reported as being due to better data, knowledge and more complete assessment methods, and not to real deterioration of status.

- Confidence in the classification of ecological status/potential assessment has improved, especially for rivers and lakes, due to more monitoring and better assessment of biological quality elements.

- **Monitoring, assessment and classification of chemical status in surface water bodies**

- All water categories including territorial waters are monitored for Priority Substances for the assessment of chemical status.

- In all water categories, the proportion of monitoring sites used for chemical status is low in particular compared to the proportion of monitoring sites used for ecological status (5 % and 3 % of surface water bodies are included in surveillance and operational monitoring respectively for chemical status); however, this could be explained by the fact that the reported pressures with respect to chemical status are limited to ‘diffuse – atmospheric deposition’ which is affecting almost all surface water bodies. Chemical status has been assigned through a combination of monitoring and expert judgement with medium to low confidence for the majority of water bodies.

- Sweden monitors all (6 to 12) of the Priority Substances included in the inventories in five RBDs with the exception of one substance (DEHP) in the Bothnian Bay RBD. There are a large number of water bodies with no, or limited monitoring of Priority Substances. Where monitoring occurs, the monitoring frequencies are consistent with the recommended minimum guideline

- Mercury, hexachlorobenzene and hexachlorobutadiene are monitored in biota and/or sediment for status assessment with frequencies that meet the recommended minimum guideline in some, but not all monitoring sites

- According to WISE, arrangements are in place for the long-term trend analysis, but monitoring of sediment and biota reported to WISE is said to be for status assessment only. Sweden subsequently clarified that the required substances are monitored for trend analysis; however, this might not have been reported properly in the RBMPs.

- Sweden reports that all surface water bodies are failing to achieve good chemical status. All 41 Priority Substances are used in the assessment of chemical status across all 10 RBDs.; however, not all of these substances are monitored in each of the RBDs. The majority of surface water bodies were classified via expert judgement, all of which again were found to fail to achieve good status with grouping and monitoring underpinning classification for 0.3 and 4.3 % of surface water bodies respectively. The assessment of chemical status is driven by the failure of the environmental quality standard for mercury in biota and for brominated diphenylethers where these are monitored, and the extrapolation of these results through expert judgement to unmonitored water bodies.

- Sweden has used the environmental quality standards from the revised Environmental Quality Standards Directive (EQS Directive) (2013/39/EU) as the basis for the assessment of chemical status for 33 Priority Substances in the second RBMP. For the remaining eight Priority Substances, Sweden reported that alternative and/or additional standards have been applied.

- **Monitoring, assessment and classification of quantitative status of groundwater bodies**

- Only 2 % of the groundwater bodies are covered by monitoring for quantitative status.

- While all groundwater bodies have a clear status, the confidence in the status assessment is unknown for 87 % of the groundwater bodies.

- **Monitoring, assessment and classification of chemical status of groundwater bodies**

  - Surveillance and operational monitoring have improved significantly.

  - Sweden subsequently clarified that not reporting all WFD core parameters that are subject to monitoring is likely to be a reporting error.

- **Designation of Heavily Modified and Artificial Water Bodies and definition of Good Ecological Potential**

  - Two new guidelines for the designation of heavily modified water bodies have been developed since the first RBMPs (one general guideline and one guideline specific to hydropower). The methodology for designation addresses the criteria for the identification of substantial changes in character, the assessment of significant adverse effects on the use and explanations of how WFD Article 4(3)(b) has been applied (better environmental option). The reason for the designation of most heavily modified water bodies in Sweden is still hydropower production (in particular large-scale hydropower over 10 megawatts). The lack of designations due to other uses is related to the lack of national guidance on how water bodies affected by other water uses should be assessed from a heavily modified water bodies-perspective. More detailed guidance on designation related to other activities (other than hydropower) is still pending.

  - Work to define good ecological potential is still ongoing. Good ecological potential definition in terms of biology is foreseen in theory in the relevant guidelines, but it has not been carried out yet in practice. Mitigation measures for good ecological potential are not yet defined for specific heavily modified water bodies, but the RBMPs indicate future work to define these still in 2018. The water authorities (in all districts) started a project in 2016 in order to develop river basin-based plans of measures which will be used to identify the measures that are reasonable for achieving good ecological potential for heavily modified and artificial water bodies related to hydropower by the end of 2018.

- **Environmental objectives and exemptions**

  - Environmental objectives for ecological and chemical status of surface water bodies and quantitative and chemical status of groundwater bodies have been reported in all RBDs.

- Drivers, pressures and impacts leading to exemptions are reported and exemptions have been applied at water body level.

- Sweden has developed new national guidance on exemptions in preparation of the second RBMPs. The justifications for Article 4(4) and 4(5) exemptions have been revised in the second cycle following implementation of the national guidance. The use of this justification of disproportionate costs is hampered by the lack of cost information in some cases.

- **Programme of Measures**

- The most important progress made seems to be the definition of a significant number of national measures in relation to specific pressures (although not all pressures appear to have been addressed), the planning of more measures and/or the extension of measures in the second and third cycles, for example to control nutrients and in particular phosphorus loads. The level of implementation of the first cycle of Programme of Measures (PoM) in Sweden was reported as "some measures completed" for all five main RBDs.

- A clear financial commitment is reported as having been secured for the implementation of PoM in all five RBDs.

- New legislation or regulations to implement the Programmes of Measures in the first RBMP was reported necessary and already adopted in all five RBDs.

- Many of the reported significant pressures are not covered by operational KTMs.

- National basic measures (52) and national supplementary measures (45) have been mapped against 14 of the 25 pre-defined KTMs. All measures apply in all RBDs. Some basic measures have been mapped against KTMs for which their operational measures have not been reported.

- No measure was reported as linked to individual Priority Substance or River Basin Specific Pollutant, although measures have been reported to tackle chemical pollution both in surface waters and in groundwaters[5].

[5] Sweden clarified that although the information is not reported in WISE, it is obvious from the RBMPs, Programmes of Measures and the underlying documents for all RBDs that a large number of measures are directed at addressing Priority Substances and River Basin Specific Pollutants.

- Indicators have been developed for a number of significant pressures. Where they have been developed, they are well defined and indicate a high level of ambition.
- Indicators have not been developed for all the significant pressures identified.
- Full integration of the RBMPs and Flood Risk Management Plans is reported and WFD Article 9(4) has been applied (as reported in WISE, although Sweden subsequently clarified that there was not full integration, but close co-operation).
- Although full integration is reported (see above), other aspects which would therefore be expected (e.g. joint consultation, win-win measures) are reported as not having taken place/been included in the second RBMPs.

- **Measures related to abstractions and water scarcity**

  - Water abstraction pressure has not been reported as relevant for Sweden, where minor numbers of groundwater bodies are failing good quantitative status and minor numbers of surface water bodies with significant abstraction pressures.
  - The Water Exploitation Index is not calculated; though water quantity data have been reported to support the European State of the Environment Report in relation to Water Quantity.
  - Article 11(3)(e) controls over agricultural water abstraction and impoundment (e.g. permits and water pricing policies) have not been improved since the first cycle.

- **Measures related to pollution from agriculture**

  - There is a clear link between agricultural pressures and agricultural measures.
  - A gap assessment was carried out for the reductions needed in loads of nitrogen and phosphorus and for the reduction in the number of applications of pesticides to achieve objectives.
  - Safeguard zones have been established for abstractions. Significant changes are announced in the RBMPs but are not detailed further.
  - Supplementary measures for reducing pollution from agriculture are reported as well as measures to reduce sedimentation from soil erosion and surface runoff.

- Limited information was available in the RBMPs on whether mandatory or voluntary measures are being used.

- Progress is anticipated as the area to be covered by the measures tackling nutrient pollution is expected to increase significantly between 2015 and 2021.

- **Measures related to pollution from sectors other than agriculture**

- As noted in relation to Topic 9, no substance-specific measures was reported to WISE although measures were reported to tackle chemical pollution.

- The effectiveness of measures to combat phosphorus pollution in coastal catchments is described in the RBMPs, but cannot be judged because of a lack of information on the reduction need, and in other catchments it is not clear how the calculated need will be met.

- **Measures related to hydromorphology**

- In the first RBMPs, no concrete measures were identified to achieve improvements in hydromorphology. The proposed measures were mainly aiming at an improved basis for decisions upon specific measures to be taken in the next planning cycle. In the second RBMPs, operational KTMs to tackle significant hydromorphological pressures are reported in the five main RBDs but only in relation to dams/barriers/locks. No operational KTM are reported for significant physical alterations, hydrological alterations and hydromorphological alterations. In addition, significant hydromorphological pressures are assigned to specific sectors only to some extent.

- From the information available, there will be considerable progress in closing the gap by 2021 in terms of continuity barriers. Nevertheless, after 2021, there will still be a considerable number of water bodies where ecological flows need to be established to achieve the objectives, especially in the Bothnian Sea, South Baltic Sea and Skagerrak and Kattegat (Glomma) RBDs.

- Ecological flows have been derived partially, i.e. for some relevant water bodies, but the work is still on-going. The ecological flows that have been derived so far have been implemented only in some relevant water bodies. The issue of ecological flows is generally not described in detail. The measures linked to ecological flows are all

administrative (guiding of other authorities, planning, identification of needs etc.) and no information is given on specific and physical efforts planned.

- Win-win measures in terms of achieving the objectives of the WFD and Floods Directive, drought management and use of Natural Water Retention Measures are not reported as included in the PoM. Also, the design of new and existing structural measures, such as flood defenses, storage dams, and tidal barriers, are reported not to have been adapted to take into account WFD objectives.

- **Economic analysis and water pricing policies**

  - It is not explained how pricing policies provide 'adequate incentives'.
  - No detailed information on the application of the Polluter Pays Principle was reported.
  - Cost recovery rates are provided only for the municipal water and wastewater system (combined). Environmental and resource costs have not been included

- **Considerations specific to Protected Areas (identification, monitoring, objectives and measures)**

- In terms of setting specific objectives for Protected Areas designated under the Habitats and Birds Directives associated with surface waters, Sweden reports that some specific objectives have been set, but work is still on-going to determine needs. No information is provided in WISE on whether these specific objectives have been met.

- Where Protected Areas have been designated in relation to shellfish production (in the SE5 RBD), additional specific objectives have also been defined, comprising microbiological standards that are different to those in the repealed Shellfish Directive 2006/113/EC; however, no information is provided in WISE on whether these specific objectives have been met.

- The lack of some Protected Area monitoring programmes and the low number of monitoring sites in some cases indicate insufficient monitoring of water bodies associated with Protected Areas.

- **Adaptation to drought and climate change**

  - Climate change was considered in various ways in all RBDs.

- It is stated that the Common Implementation Strategy guidance document on how to adapt to climate change was not used for the preparation of the RBMPs.

- KTM 24 – "Adaptation to climate change" has not been made operational to address significant pressures in any of the RBDs.

- Droughts have not been reported to be relevant for the country, except in the South Baltic Sea RBDs which are facing frequent local droughts and occasional large-scale water shortage, according to the information provided by Sweden. No drought management plans have been reported for Sweden.

Recommendations

- Sweden needs to ensure that the preparation of the next cycle of RBMPs is carried out in accordance with the WFD timetable to ensure the timely adoption of the third RBMPs.

- Clear information should be included in national RBMPs on international coordination efforts in order to increase transparency. Sweden should continue to focus on international cooperation, including coordinated assessments of the technical aspects of the WFD such as ensuring a harmonized approach for status assessment and a coordinated PoM in order to ensure the timely achievement of the WFD objectives.

- Further work is needed to define type-specific reference conditions for relevant biological, physicochemical and hydromorphological Quality Elements in rivers and lakes.

- Sweden should further strengthen the monitoring of surface waters by covering all relevant quality elements in all water categories.

- An increased level of monitoring should lead to a lower dependence on expert judgment for the classification of ecological status/potential.

- Sweden should ensure that Environmental Quality Standards are available and adequate for all relevant River Basin Specific Pollutants.

- Sweden should complete the development of assessment methods for all biological quality elements in all categories of water bodies. Assessment methods for hydromorphological and for physicochemical quality elements should be linked to the sensitive biological quality elements.

- Sweden should improve the monitoring for status assessment to reach sufficient confidence and spatial coverage for all the Priority Substances as well as the monitoring frequencies in biota/sediment in all monitoring sites according to the Directive.

- Sweden should report information on trend monitoring in surface waters, which should cover all the relevant substances specified in Directive 2008/105/EC in order to provide sufficient data for long-term trend analysis.

- The knowledge base on groundwater should significantly be improved in Sweden. Enhanced and robust groundwater monitoring should be established based on WFD requirements. WFD based methodologies should be used to assess groundwater status correctly.

- Sweden should continue the efforts and complete the methodologies for the designation of heavily modified water bodies for all relevant water uses, including clear criteria for the assessment of significant adverse effects of mitigation measures on use or the wider environment and the lack of significantly better environmental options. Ecological potential still needs to be defined for each individual heavily modified and artificial water body based on a comprehensive set of mitigation measures.

- Progress in the justification of exemptions by further substantiating the related assessments with additional data and information and by reducing the remaining degree of uncertainties should be pursued. The number of applied exemptions is still significant. Sweden should take all necessary measures to bring down the number of exemptions as much as possible for the next cycle in order to ensure a timely achievement of the WFD objectives.

- Sweden should make sure that significant pressures are covered by operational KTMs.

- Measures to address all relevant Priority Substances, River Basin Specific Pollutants and groundwater pollutants should be identified and linked to the individual substances.

- Indicators for all identified significant pressures should be developed.

- In the third RBMPs, it should be stated clearly for all RBDs, to what extent, in terms of area covered and pollution risk mitigated, basic measures (minimum requirements to be complied with) or supplementary measures (designed to be implemented in addition to basic measures) will contribute to achieving the WFD objectives. Sources of funding should be identified (e.g. CAP Pillar 1, RDP), as appropriate, to facilitate successful implementation of these measures in all RBDs.

- Sweden needs to continue its efforts to quantify the phosphorus reduction need in coastal catchments and to find additional measures against phosphorus pollution in general.

- Sweden should ensure the implementation and appropriate reporting of measures to tackle all hydromorphological pressures, including restoration of the hydrological and hydromorphological conditions of water bodies.

- The methodology for establishing ecological flows need to be finalised, and its full implementation should be ensured in all RBDs.

- Sweden should continue to consider river restoration and prioritise the use of green infrastructure and/or natural water retention measures that provide a range of environmental (improvements in water quality, increase water infiltration, and thus aquifer recharge, flood protection, habitat conservation etc.), social and economic benefits which can be in many cases more cost-effective than grey infrastructure.

- Sweden should apply cost recovery for water use activities having a significant impact on water bodies or justify any exemptions using Article 9(4). It should present in a transparent manner how financial, environmental and resource costs have been calculated and how the adequate contribution of the different users is ensured. It should also present transparently the water-pricing policy and provide a transparent overview of estimated investments and investment needs.

- Sweden should continue to work on setting specific additional objectives for all Protected Areas under relevant Directives and ensure their link to the WFD implementation.

- Based on the prevalence of local drought in the Bothnian Sea and North Baltic Sea RBDs, as one of the effects of climate change, Sweden should consider preparing drought management plans where appropriate.

Topic 1 Governance and public participation

1.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

1.1.1 Administrative arrangements – River Basin Districts

Sweden has designated 10 RBDs. Of the 10 RBDs, four are small catchments shared with Norway and one is a larger catchment shared with Finland. These five RBDs are managed under three larger RBDs, Bothnian Bay, Bothnian Sea, and Skagerrak and Kattegat.

1.1.2 Administrative arrangements – competent authorities

Sweden reports Competent Authorities at national and sub-national level.

Sweden has five Water Authorities for: the Bothnian Sea Water District, Bothnian Bay Water District, North Baltic Water District, South Baltic Water District, and Skagerrak and Kattegat Water District. The main roles for the five Water Authorities are: monitoring of groundwater and surface water[6], economic analysis, preparation of RBMPs and PoM, public participation and co-ordination of implementation. These Authorities have supporting roles for the assessment of status of groundwater and surface water, pressure and impact analysis, and reporting to the Commission.

The 21 County Administrative Boards main roles include the assessment of status of groundwater and surface water, the enforcement of regulations, pressure and impact analysis, and public participation issuing regulations for the respective water districts. Sweden reported to WISE that they have a supporting role[7] for the monitoring of groundwater and surface water and Sweden informed that the Boards also manage several monitoring programmes.

Three national bodies have several roles:

- The Swedish Geological Survey's main role focuses on regulating/issuing regulations implementation of measures and coordination of measures; it has a support role for monitoring of groundwater and reporting to the Commission and Sweden has informed that it also has a role in the preparation of national guidance.

[6] Sweden subsequently noted that, while the five Water Authorities hold the role for monitoring, actual ownership of monitoring is distributed among many actors, including for example SWAM (Swedish Agency for Marine and Water Management).

[7] Sweden informed that the Boards also manage several monitoring programmes.

- The Swedish Agency for Marine and Water Management's main role focuses on the regulating/issuing regulations, coordinate the five water authorities, implementation of measures, coordination of measures, and reporting to the Commission; it has a secondary role for monitoring of surface water. Sweden also informed that the agency also has a role in the preparation of national guidance.

- The Swedish Environmental Protection Agency's main roles are to put focus on the enforcement of regulations and the implementation of measures. The Agency has the primary responsibility for environmental monitoring and funding of monitoring.

In addition to these three bodies, other national organisations have a primary responsibility for the implementation of measures:

- Swedish Board of Agriculture;
- Swedish Forest Agency;
- Swedish Energy Agency;
- Swedish Chemical Agency;
- Medical Products Agency.
- Swedish Coast Guard;
- Mining Inspectorate, under the Swedish Geological Survey;
- Legal, Financial and Administrative Services Agency;
- National Board of Housing, Building and Planning;
- Surgeon General (Defence Inspector for Health and the Environment);

In addition, County Administration Boards and municipalities (290 in total) also have a main role in the implementation of measures.

1.1.3 River Basin Management plans – structure and Strategic Environmental Assessment

Sweden did not report sub-plans for its RBMPs to WISE, but has informed that sub plans for some RBDs have been reported in appendices to the RBMPs. Sweden informed that the RBMPs identify sub-plans. For example, the Skagerrak and Kattegat RBMP includes a

summary of sub-plans, and for the North Baltic RBMP, 50 detailed sub-basin plans have been produced and made available to the public.

All of Sweden's RBMPs underwent Strategic Environmental Assessments.

1.1.4 Public participation and active involvement of stakeholders

In all of Sweden's RBDs, the public and interested parties were informed about the public consultation by the following means: direct mailing, Internet, invitations to stakeholders, media (papers, TV and radio), meetings, and printed material. Documents for consultation were available by: direct mailing (both email and post), download, and paper copies available in municipal buildings and distributed at exhibitions. Documents were available for the requisite six months.

The following stakeholder groups in each RBD were actively involved in the development of Sweden's RBMPs: national authorities, agriculture/farmers, energy/hydropower, fisheries, aquaculture, industry, local/regional authorities, NGOs/nature protection and water supply and sanitation. The mechanisms for active involvement were: the establishment of advisory groups and involvement in drafting.

In all of Sweden's RBDs, the impact of the public consultation and active involvement was: addition of new information, adjustment to specific measures, changes to the selection of measures and commitment to action in the next RBMP.

1.1.5 Integration with other European Union legislation: Floods Directive and Marine Strategy Framework Directive

Sweden reported to WISE that, in each of its RBDs, the RBMP and Floods Directive[8] Flood Risk Management Plan were integrated into a single plan. Sweden has afterwards informed that separate RBMPs and FRMPs had been prepared and that each RBMP discuss coordination with the Floods Directive and relevant FRMPs; moreover, some County Administrative Boards considered measures and objectives under both the WFD and FD, and certain measures were included in both RBMPs and FRMPs.

Sweden did not report that there was joint consultation of the RBMPs and FRMPs[9].

[8] Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

[9] Sweden subsequently noted that the consultation periods overlapped, and several consultation meetings addressed both the WFD and Floods Directive.

Sweden reported that, in each of its RBDs, there was joint consultation with the Marine Strategy Framework Directive[10]. Further information on integration with respect to the PoM in available in Chapter 9 of this report.

1.1.6 International Coordination

Sweden shares eight of its 10 RBDs with neighbouring countries. Two RBDs – Bothnian Bay (Bottenviken) and Bothnian Bay (Torne) – are shared with both Finland and Norway. For these two RBDs, an international agreement and a permanent co-operation body are in place (designated as category 2 cooperation).

Sweden shares six other RBDs – Bothnian Sea, Skagerrak and Kattegat, Bothnian Sea (Trondelagsfylkene), Bothnian Bay (Nordland), Bothnian Bay (Troms), and Skagerrak and Kattegat (Glomma) – with Norway. It is reported that international agreements on water management without permanent co-operation mechanisms are in place in these six RBDs (designated as category 3 cooperation). The assessment of the first RBMPs reported that Sweden had close cooperation on water management with Norway and that a cooperation body was in place (designated as category 2 cooperation)[11]. Sweden has continued to have close co-operation with Norway and Finland and it appears that Sweden's cooperation with neighbouring countries has strengthened which indicates that there has been a reporting error in WISE

The RBMPs for the shared RBDs between Norway and Sweden are established according to the following principles: each national RBMP has two parts: one comprising the parts of the district in its own country, and a second part covering the international sections of the district (developed by the other country's authorities). The second part is an attachment to the national part of the RBMP. The entire document is provided for consultation in both countries.

For further information, see the reports on international coordination on the Water Framework Directive.

1.2 Main changes in implementation and compliance since the first cycle

There was no evidence of significant changes in the information reported to WISE.

[10] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

[11] Sweden subsequently noted that there might have been a reporting error.

1.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *It is recommended that the more detailed sub-basin plans are reported as formal parts of the RBMPs and formally reported to the Commission and made available to the public, as they include important supplementary information.*

  Assessment: Sweden did not report sub-plans to WISE, in the second cycle, but has informed that sub plans for some RBDs have been reported in appendices to the RBMPs and others made available on websites.

  Consequently, Sweden has partly fulfilled this recommendation.

- Recommendation: *Sweden needs to ensure full co-operation with neighbouring countries, including the correct designation of trans-boundary RBDs and co-operation on measures to ensure achievement of the environmental objectives.*

  Assessment: Sweden has continued to have close co-operation with Norway and Finland. This includes reporting on the identification of transboundary surface water bodies, but not for transboundary groundwater bodies[12]. The delineation is coordinated with joint methods partly in place. It is not clear if this extends to the correct designation of RBDs; five transboundary RBDs are designated, and managed as part of larger RBDs in Sweden, but reported separately. Although Sweden and Norway have established common RBMPs, there is insufficient information on cooperation on measures to assess this aspect of the recommendation. It appears; however, that Sweden's cooperation with neighbouring countries has strengthened and that the recommendation is to a great extent fulfilled.

  .

[12] Sweden subsequently informed that transboundary groundwater bodies have been identified, but not allocated as joint identifiers between Norway and Sweden, as it has been done for transboundary surface water bodies.

Topic 2 Characterisation of the River Basin District

2.1 Assessment of implementation and compliance with WFD requirements in the second cycle

2.1.1 Delineation of water bodies and designation of heavily modified and artificial water bodies

There was an overall decrease in the number of river water bodies (-3 %) (Table 2.1) from the first to the second cycle. There has been an increase in the number of lake water bodies of 3 %, with the highest increase in the North Baltic Sea RBD, 24 %. The RBMPs explained that in the first cycle the conditions of some water bodies were too heterogeneous, so re-delineation was carried out to improve homogeneity within each water body in terms of type, status and pressures. Some water bodies have been removed as they did not fulfil the criteria for water body delineation.

The numbers of coastal water bodies increased by 8 % with the highest increases in the Bothnian Sea RBD (33 %) and North Baltic Sea RBD (13 %). The RBMPs explained that some transitional water bodies were redefined as coastal water bodies, because it was not possible to distinguish them from the nearby coastal waters. For coastal waters, the geographical conditions have also been used for delineation, distinguishing open coastal waters from bays and sounds and harbour areas.

The criteria for delineating lakes and rivers remained the same in the second cycle with water bodies greater than 1km^2 being delineated as separate water bodies and river reaches greater than 15 km length (or catchments greater than 10 km^2) as separate water bodies. In the second RBMPs, delineation has also included some smaller water bodies in Protected Areas, water bodies of special ecological value or water bodies impacting an existing water body. Some small water bodies situated in Protected Areas have been delineated as separate water bodies, so their objectives will be in line with that of other water bodies in Protected Areas. For all the other small water bodies outside of Protected Areas there is no information in the RBMPs on how they are delineated and managed[13].

Table 2.2 shows the differences in size distribution of surface water bodies in Sweden between the second and first RBMPs. It is notable that both the minimum size of rivers and the maximum size have decreased overall.

[13] Sweden subsequently explained that all water within a river basin, irrespective of size, is indirectly covered by water management based on other Swedish environmental legislation.

In the second cycle, 97 % of identified surface water bodies were natural with 3 % being designated as heavily modified and less than 1 % artificial. Overall there was very little change in the numbers of heavily modified and artificial water bodies between the first and second RBMPs, less than 1 % difference (Figure 2.1). The water use and physical alteration have been reported for each water body type.

The numbers of groundwater bodies increased by 10 % as shown in Table 2.3 and it was explained in the RBMPs that this was due to updated mapping. For groundwater, some water bodies have been split, others merged, and others have been changed in terms of their geographic distribution. New groundwater bodies used for drinking water supply have been delineated. In the future, more groundwater bodies are proposed to be delineated if they are connected to groundwater-dependent surface water bodies or ecosystems.

There were 19 territorial water bodies reported in the second RBMP, but none were reported in the first RBMP.

Table 2.4 summarises the information provided by Sweden on how water bodies have evolved between the first and second RBMP. The water body type with the most changes was river water bodies, with 217 water bodies created, 223 split and 552 deleted.

Table 2.1 Number and area/length of delineated surface water bodies in Sweden for the second and first RBMPs

Year	RBD	Rivers		Lakes		Transitional		Coastal	
		Number of water bodies	Total length of water body (km)	Number of water bodies	Total area (km^2) of water bodies	Number of water bodies	Total area (km^2) of water bodies	Number of water bodies	Total area (km^2) of water bodies
2016	SE1	4 089	21 732	1 687	6 631	0	0	110	7 162
2016	SE1TO	664	4 668	273	858	0	0	3	80
2016	SE2	6 864	26 594	3 643	8 435	0	0	85	5 038
2016	SE3	624	4 972	423	2 909	0	0	167	7 220
2016	SE4	1 033	9 433	495	4 177	0	0	178	10 076
2016	SE5	1 672	12 409	807	8 866	0	0	110	4 109
2016	SE1102	47	121	18	25	0	0	0	0
2016	SE1103	64	160	52	74	0	0	0	0
2016	SE1104	3	13	1	1	0	0	0	0
2016	SE5101	32	180	23	49	0	0	0	0
2016	Total	15 092	80 282	7 422	32 025	0	0	653	33 685
2010	SE1	4 221	21 405	1 627	6 851	0	0	100	7 178
2010	SE1TO	655	4 538	268	892	0	0	3	81
2010	SE2	7 295	27 038	3 635	8 445	0	0	64	5 042
2010	SE3	623	4 942	340	2 887	19	120	148	7 104
2010	SE4	968	8 931	478	4 169	0	0	177	10 075
2010	SE5	1 650	12 048	790	5 776	2	61	110	5 143
2010	SENO1102	48	154	18	30	0	0	0	0
2010	SENO1103	69	223	52	87	0	0	0	0
2010	SENO1104	3	13	1	4	0	0	0	0
2010	SENO5101	31	175	23	50	0	0	0	0
2010	Total	15 563	79 466	7 232	29 192	21	180	602	34623

Source: WISE electronic reporting

Table 2.2 Size distribution of surface water bodies in Sweden in the second and first cycle.

Year	RBD	River length (km)			Lake area (km^2)			Transitional (km^2)			Coastal (km^2)		
		Min	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average
2016	SE1	0.02	160.14	5.31	0.01	262.39	3.93				0.15	2329.07	65.11
2016	SE1TO	0.03	239.37	7.03	0.02	329.85	3.14				6.81	39.62	26.8
2016	SE2	0.03	93.75	3.87	0	456.27	2.32				0.5	710.56	59.27
2016	SE3	0.03	41.32	7.97	0.04	377.36	6.88				0.16	643.66	43.23
2016	SE4	0.03	51.89	9.13	0.07	1850.48	8.44				0.4	885.84	56.61
2016	SE5	0.05	49.11	7.42	0.03	3087.68	10.99				0.15	349.04	37.36
2016	SE1102	0.25	12.26	2.58	0.11	17.87	1.4						
2016	SE1103	0.18	10.15	2.5	0.01	28.05	1.43						
2016	SE1104	0.73	8.61	4.28	1.28	1.28	1.28						
2016	SE5101	0.25	17.17	5.63	0.07	10.16	2.15						
2010	SE1	0	160.15	5.07	0.01	262.44	4.21				0.81	2334.18	71.78
2010	SE1TO	0.02	233.15	6.93	0.04	330	3.33				6.84	39.75	26.89
2010	SE2	0.02	94.12	3.71	0	456.33	2.32				0.5	1049.69	78.79
2010	SE3	0	41.31	7.93	0.1	528.57	8.49	0.77	33.53	6.31	0.16	644.11	48
2010	SE4	0	51.89	9.23	0.07	1850.77	8.72				0.4	885.96	56.92
2010	SE5	0.02	49.15	7.3	0	2013.77	7.31	22.96	37.64	30.3	0.15	898	46.75
2010	SENO1102	0.13	21.16	3.2	0.1	17.88	1.65						
2010	SENO1103	0.18	13.6	3.22	0.03	28.05	1.68						
2010	SENO1104	0.69	8.61	4.26	4.12	4.12	4.12						
2010	SENO5101	0.25	17.18	5.66	0.06	10.17	2.17						

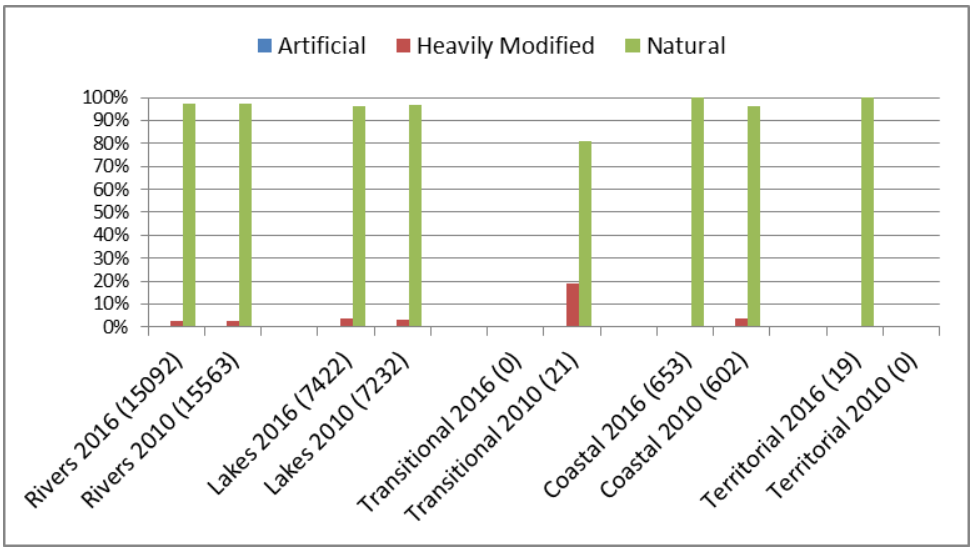
Source: WISE electronic reporting

Table 2.3 Number and area of delineated groundwater bodies in Sweden for the second and first cycle

Year	RBD	Number	Area (km^2)		
			Minimum	Maximum	Average
2016	SE1	622	0.01	271.25	6.57
2016	SE1TO	74	0.08	306.05	22.58
2016	SE2	832	0	5152.46	12.88
2016	SE3	574	0	447.7	2.97
2016	SE4	667	0.01	1820.60	22.97
2016	SE5	539	0	888.1	12.87
2016	SE1102				
2016	SE1103	1	1.1	1.1	1.1
2016	SE1104				
2016	SE5101	2	0.2	0.94	0.57
2016	*Total*	*3311*			
2010	SE1	594	0.01	271.62	6.73
2010	SE1TO	61	0.08	306.43	26.84
2010	SE2	779	0	5,155.95	13.76
2010	SE3	529	0	447.72	3.09
2010	SE4	580	0.01	1837.01	26.32
2010	SE5	477	0	888.45	13.9
2010	SENO1102				
2010	SENO1103	1	1.1	1.1	1.1
2010	SENO1104				
2010	SENO5101	2	0.2	0.94	0.57
2010	*Total*	*3023*			

Source: WISE electronic reporting

Figure 2.1 ***Proportion of surface water bodies in Sweden designated as artificial, heavily modified and natural for the second and first RBMPs. Note that the numbers in parenthesis are the numbers of water bodies in each water category***



Source: WISE electronic reporting

Table 2.4 ***Type of change in delineation of groundwater and surface water bodies in Sweden between the second and first cycles. Note that transitional waters are not delineated in the second cycle.***

Type of water body change for second cycle (wiseEvolutionType)	Groundwater	Rivers	Lakes	Coastal	Territorial
Aggregation	3	209	5	1	
Change	107	698	140		
changeBothAggregationAndSplitting		20		1	
changeCode		111	51	5	
changeExtendedArea		13	11		
changeReducedArea		1	5	1	
Creation	286	217	190		19
Deletion	21	552	33		
noChange	2895	13600	6964	596	
Splitting	20	223	56	49	
Total water bodies before deletion	3332	15644	7455	653	19
Delineated for second cycle (after deletion from first cycle)	3311	15092	7422	653	19

Source: WISE electronic reporting. Data for transitional water bodies was not reported.

2.1.2 Identification of transboundary water bodies

Transboundary river and lake water bodies have been identified in all the following RBDs: Bothnian Bay, Bothnian Sea, Skagerrak and Kattegat, Bothnian Sea (Trondelagsfylkene), Bothnian Bay (Nordland), Bothnian Bay (Troms), and Skagerrak and Kattegat (Glomma). In addition, transboundary lake water bodies have been identified in Bothnian Bay (Torne) and coastal water bodies in the Skagerrak and Kattegat RBD. No transboundary groundwater bodies have been reported to WISE[14].

Coordination on delineation of transboundary water bodies has been carried out. The joint methods are partly in place, including no longer clipping a transboundary water body in two different national parts, but rather delineating it as a whole, based on type, pressures and status, regardless of the national border passing through it. There are; however, differences in the delineation of lakes, between Norway, Finland and Sweden, with Norway and Finland using 0.5 km^2 as the limit for delineating a lake water body, while Sweden sometimes uses 1 km^2 as the limit, thus not delineating part of the lakes between 0.5 to 1 km^2, which are quite a lot of lakes. The water body-ID for transboundary water bodies between Sweden and Norway follows the Swedish ID system, but uses 'SENO' in front of the number; however, for the third RBMPs, this will change most likely to using the national water body ID system of the country into which the water flows.

2.1.3 Typology of surface water bodies

The Swedish typology uses ecoregion as a basis. The distinction between the Northern and Southern ecoregions are based on differences in freshwater flora and fauna according to the glaciation history in Sweden. The reference conditions for biological quality elements in Swedish water bodies are estimated for each water body, using various modelling techniques, but not for each type, using different ranges of abiotic typology factors than those used in the main typology system. Therefore, it is unclear whether, or to what extent, the typology is biologically relevant for all the national types.

There are in total 77 lake water types, 52 river water types, and 27 coastal water types (but no longer any transitional water bodies, see under delineation above) (Table 2.5). In general, the number types decreased between the first and second RBMPs, especially for river water bodies.

[14] Sweden has subsequently clarified that two transboundary groundwater bodies have been reported in spatial data in WISE.

Member States were asked to report 'Not applicable' if there is no corresponding intercalibration type for national types. Many national types (heavily modified, artificial, and natural) have been intercalibrate; however, in each of the RBDs there are several river, lake, and coastal water bodies that are reported not to have corresponding intercalibration types, approximately 80 % of river water bodies, 19 % of coastal water bodies, and 16 % of lake water bodies. The RBMPs reported that the Swedish classification system has been successfully intercalibrated for all the biological quality elements for national types that have been linked to common intercalibration types.

Table 2.5 Number of surface water body types at RBD level in Sweden for the first and second cycles

RBD	Rivers		Lakes		Coastal		Territorial	
	2010	2016	2010	2016	2010	2016	2010	2016
SE1	11	11	18	19	4	4	0	1
SE1TO	8	8	13	13	2	2	0	0
SE2	28	28	37	36	4	4	0	1
SE3	15	15	21	24	6	7	1	1
SE4	22	22	31	32	11	11	0	1
SE5	30	29	34	34	6	7	1	1
SE1102	5	5	4	4	0	0	0	0
SE1103	4	4	6	6	0	0	0	0
SE1104	1	1	1	1	0	0	0	0
SE5101	6	7	7	7	0	0	0	0
TOTAL	53	52	76	77	25	27	2	1

Source: WISE electronic reporting. Note that the total is not the sum of the types in each RBD as some types are shared by RBDs.

2.1.4 Establishment of reference conditions for surface water bodies

Type specific reference conditions have been established for relevant biological quality elements, physicochemical quality elements, and hydromorphological quality elements for all coastal water bodies, but not for rivers or lakes, as shown in Table 2.6. This may lead to some weaknesses in the classification of status/potential for rivers and lakes.

Sweden did not coordinate the identification of type-specific reference conditions with other Member States; however, for the second RBMPs, the reference conditions for transboundary water bodies follows the classification system used in the country into which the water flows. In Sweden, reference conditions are estimated with models for each water body, while in

Norway and Finland, the reference conditions are type-specific. The reference conditions for the different biological quality elements are nevertheless intercalibrated for national types corresponding to the common intercalibration types, so to some extent the reference conditions are comparable. Further information on references conditions is provided in Chapter 3 of this report.

Table 2.6 Percentage of surface water body types in Sweden with reference conditions established for all, some and none of the biological, hydromorphological, and physicochemical quality elements. Numbers in parenthesis are the number of types in each category

Water category	Water types	Biological quality elements	Hydromorphological quality elements	Physicochemical quality elements
Lakes (77)	All			
	Some			
	None	100 %	100 %	100 %
Rivers (52)	All			
	Some			
	None	100 %	100 %	100 %
Coastal (27)	All	100 %	100 %	100 %
	Some			
	None			

Source: WISE electronic reporting

Note: Sweden has object-specific reference values in general, which do not appear in Table 6.

2.1.5 Characteristics of groundwater bodies

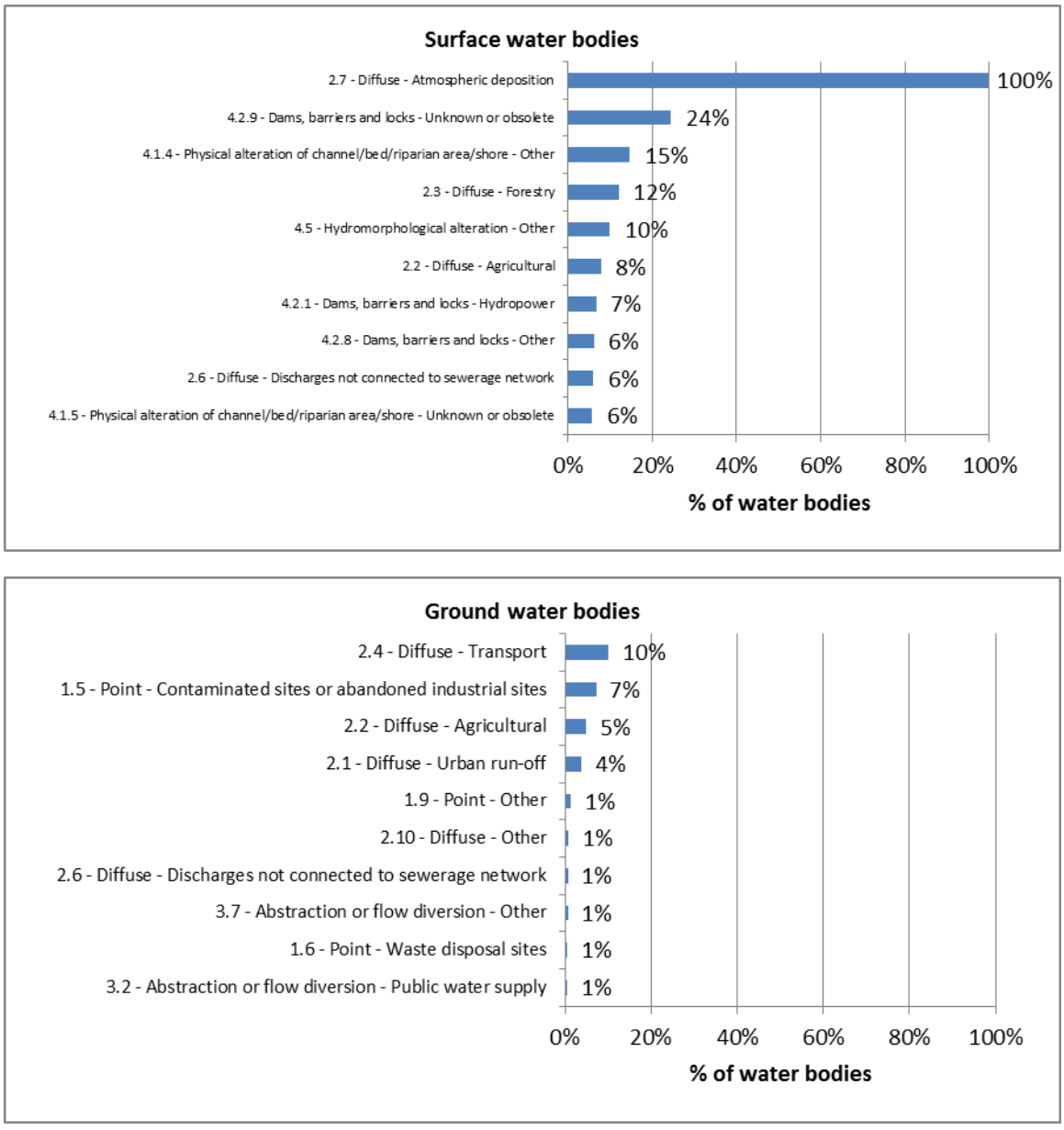
The geological formation of the aquifer types in which groundwater bodies reside, along with the details of whether groundwater bodies are layered, have been reported. Further characterisation work has been reported since the first RBMP with the inclusion of the assessment of linkages with surface water bodies and terrestrial ecosystems for all RBDs. In the future, more groundwater bodies are proposed to be delineated if they are connected to groundwater-dependent surface water bodies or ecosystems.

2.1.6 Significant pressures and impacts on water bodies

In the second RBMP, atmospheric deposition was reported to affect the largest proportion (100 % of surface water bodies), followed by dams, barriers, and locks (24 %) (Figure 2.2) In the first cycle, Sweden only reported pressures at an aggregated level. Overall it appears there was a large increase in the number of occasions where “No significant pressures” were reported

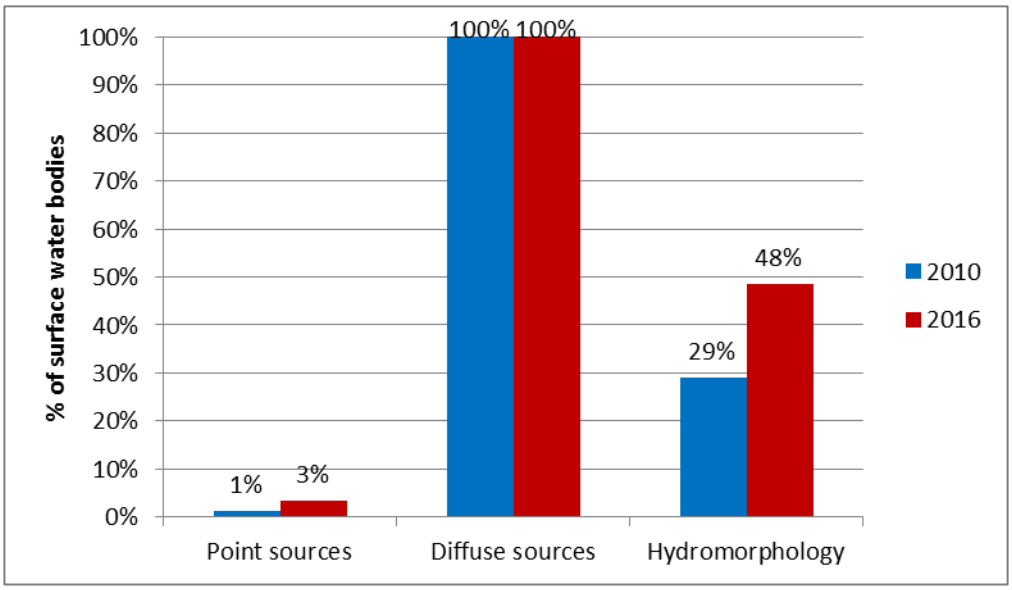
between the first and second RBMPs, with an increase in the reporting of point and hydromorphological pressures (Figure 2.3). For groundwater bodies "No significant pressures" was reported most frequently (82 % of groundwater bodies).

Figure 2.2 The most significant pressures on surface water bodies and groundwater bodies in Sweden for the second RBMP



Source: WISE electronic reporting

Figure 2.3 Comparison of pressures on surface water bodies in Sweden in the first and second cycle. Pressures presented at the aggregated level. Note there were 23186 identified surface water bodies for the second cycle and 23418 for the first cycle



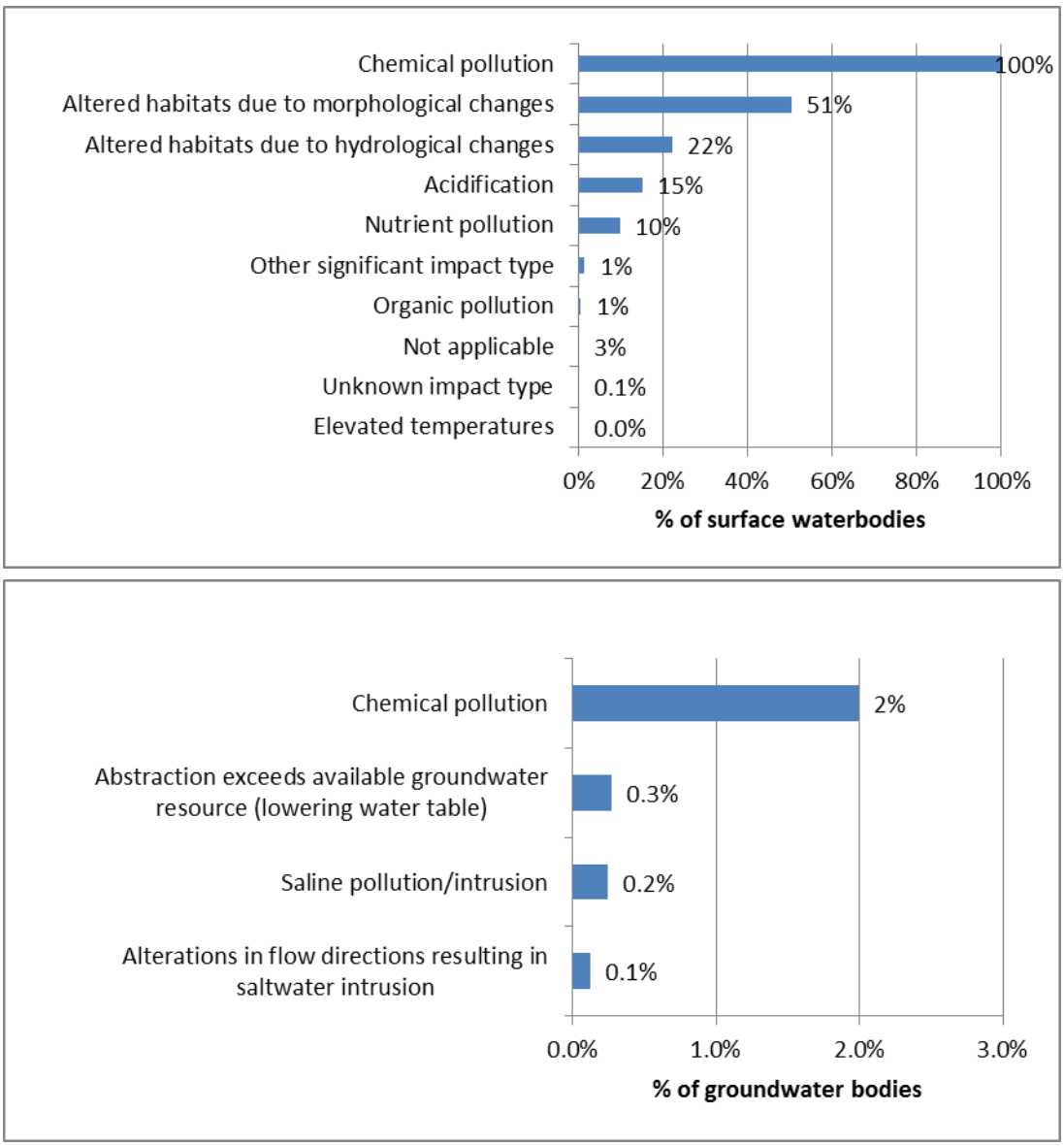
Source: WISE electronic reporting

The reasons for the increase in 'no significant pressures' being reported for surface waters and the high proportion reported for groundwater could relate to the changes in the methodology for defining pressures as discussed in the next section.

For the second RBMP, it was reported that the following significant pressures were not assessed for surface waters: "Exploitation or removal of animals or plants", "Litter or fly tipping", "Groundwater – Recharges", and "Groundwater - Alteration of water level or volume". For groundwater it was reported that 25 significant pressures were not assessed, these were surface water specific pressures such as dams and hydrological changes.

In the second RBMP, the most significant impact on surface water bodies was chemical pollution (100 % of surface water bodies), followed by altered habitats due to morphological changes (41 %) (Figure 2.4). Sweden did not report on impacts in the first cycle.

Figure 2.4 Significant impacts on surface water and groundwater bodies in Sweden for the second cycle. Percentages of numbers of water bodies



Source: WISE electronic reporting

For surface waters, numerical tools and expert judgement were used for defining significant pressures from point and diffuse sources, abstraction, and water flow pressures. For surface water bodies, significance of pressures is reported as being linked to the potential failure of objectives and is defined in terms of thresholds.

New and more reliable classification of biological quality elements were established after a national classification project WATERS (ending in 2013). This allowed a more confident

assessment of pressures than what was feasible for the first RBMPs. Sweden has made major attempts to improve the assessment of significance in their analyses of pressures, developing a set of new methods for each of the major pressure/impact categories: nutrient enrichment, acidification, contamination by hazardous substances (both River Basin Specific Pollutants and Priority Substances), and morphological pressures. They also identified qualitative criteria for assessing significant pressure from invasive species. For some pressures, threshold values are given to assess whether a pressure is significant or not.

Significant pressures were defined for all water bodies in less than good status, as well as water bodies at good status, where there was a risk of deterioration. For pressures in rivers, lakes, and coastal waters, the tools used to assess significant pressures are monitoring data, GIS analyses, models estimating the absolute and relative magnitude of the pressure, and threshold values linking the pressure to the boundary for the sensitive biological quality elements, as well as the qualitative criteria for invasive species. The approach used to link the significance for pressures to status was described as follows:

- For nutrients and contaminants, point sources and diffuse sources are identified in all water bodies in less than good status, and models were used to estimate the source apportionment, depending on land use, including agriculture, forestry, wetlands, industries, polluted sites, roads, railroads, atmospheric deposition.

- For contaminants, water, sediments and biota for groups of Priority Substances were considered and for relevant River Basin Specific Pollutants.

- For acidification, threshold values were defined based on the boundary for acidification sensitive biological quality elements and physicochemical quality elements. Reference conditions were estimated with the MAGIC model. Water bodies with pH > 6 (or 6.5 depending on reference pH) were considered not to be acidified. For water bodies with no data, results are extrapolated from comparable water bodies (grouping).

- For morphological pressures, guidance was developed in a separate project called HyMo and is summarized in a report called Vattenmyndigheterna 2013b, VMHyMo-Länsstyrelsen Västmanlands län, dnr. 537-2599-15 Rapport: Påverkanstryck på morfologiska förhållanden (not accessible online).

- For invasive species, the criteria for identifying whether there is a significant pressure based on whether the invasive species is outcompeting native species, it can be

poisonous, spread disease, hybridise with native species, or is a predator on native species and/or affect food webs.

For groundwaters, numerical tools and expert judgement were used for defining significant pressures from point and diffuse sources. For abstraction and artificial recharge and other pressures expert judgement was used. The significance of pressures is reported to be linked to the potential failure of objectives but the significance of pressures has not been defined in terms of thresholds.

2.1.7 Groundwater bodies at risk of not meeting good status

In five of the eight RBDs (with groundwater bodies delineated) between 1.5 and 37 % of groundwater bodies were reported to be at risk of failing to meet good chemical status. The pollutants putting groundwater bodies at risk of failing good chemical status have been reported for all RBDs. Further information is provided in Chapter 6 of this report.

In four of the eight RBDs between 1.5 % and 6 % of groundwater bodies were reported to be at risk of failing to meet good quantitative status. Further information is provided in Chapter 5 of this report.

2.1.8 Quantification of gap to be filled for pressures causing failure of status objectives

There are some inconsistencies in the pressures for which measures are planned and the significant pressures reported at the water body level. For example, in the Bothnian Bay RBD, Point - Non Industrial Emissions Directive plants has been reported at the surface water body level but this pressure has not been reported as being tackled in the PoM. Similarly in the Bothnian Sea RBD, Diffuse – Urban runoff has been reported at the groundwater body level but this pressure has not been reported as being tackled in the PoM[15]. Further information on the PoM is provided in Chapter 9 of this report.

The Priority Substances causing the failure of good chemical status and the measures to tackle these substances to achieve good status by 2027 have not been reported but this is optional.

[15] Sweden subsequently clarified that there are a few reasons for the inconsistencies: (1) the classification of significant pressures was against an earlier list of pressure types; (2) the method in Sweden has focused on remedying the impacts rather than the pressures; and (3) the measures in the Swedish programs of measures in general addresses other authorities should take into account in their daily work in a way that the direct measures needed to reach the environmental objectives will be performed. The reported summary of measures in the reporting, is what the authorities are expected to achieve during the next cycle and it is apparent that there is some inconsistencies or lack of coherence. The way the need for pressure reduction and measures are determined has undergone revision, as well as the way it is registered in the Water Information System Sweden which will give a much clearer view of the connection between pressure and measure and all other aspects of water management.

Further information on Priority Substances causing the failure of good chemical status is provided in Chapter 4 and on measures in Chapter 12 of this report.

2.1.9 Inventories of emissions, discharges and losses of chemical substances

Article 5 of the Environmental Quality Standard Directive (2008/105/EC)[16] requires Member States to establish an inventory of emissions, discharges and losses of all Priority Substances and the eight other pollutants listed in Part A of Annex I of the Environmental Quality Standard Directive for each RBD, or part thereof, lying within their territory. This inventory should allow Member States to further target measures to tackle pollution from priority substances. It should also inform the review of the monitoring networks, and allow the assessment of progress made in reducing (resp. suppressing) emissions, discharges and losses for priority substances (resp. priority hazardous substances).

Sweden reported whether or not each of the Priority Substances was included in an inventory. Only the Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs reported on the number of substances within the inventory, which ranged from only six to eight Priority Substances (i.e. five RBDs did not report any inventory for any of the Priority Substances[17]). Insufficient monitoring was the reason given in the RBMP for not including more.

The two step approach from the Common Implementation Strategy Guidance Document n°28[18] has been followed for all substances considered in the inventories. For some substances in the inventories (including some substances deemed relevant at RBD level), Tier 1 of the methodology was implemented; for the others a combination of Tier 1 (point source information) and Tier 2 (riverine load) was used, while the Guidance Document recommends to apply at least Tier 1 + 2 for substances relevant at RBD level. The data quality was not reported.

[16] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02008L0105-20130913

[17] These are small RBDs which are included in the five main ones.

[18] CIS Guidance N° 28 - Preparation of Priority Substances Emissions Inventory http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

2.2 Main changes in implementation and compliance since the first cycle

There was an overall decrease in the number of river water bodies (-3 %). There has been an increase in the number of lake water bodies of 3 %, with the highest increase in the North Baltic Sea RBD of 24 %. The numbers of coastal water bodies increased by 8 % with the highest increases in the Bothnian Sea RBD (33 %) and North Baltic Sea RBD (13 %). Some transitional water bodies were redefined as coastal water bodies because it was not possible to distinguish them from the nearby coastal waters. The numbers of groundwater bodies increased by 10 %. There were 19 territorial water bodies reported in the second RBMP but none were reported in the first cycle.

In the second RBMP, atmospheric deposition was reported to affect the largest proportion of surface water bodies, followed by dams, barriers and locks. In the first cycle, Sweden only reported pressures at an aggregated level. Overall it appears there was a large increase in the number of occasions where "No significant pressures" were reported between the first and second RBMPs. For groundwater bodies, "no significant pressures" was reported most frequently. The reasons for the increase in 'no significant pressures' being reported for surface waters and the high proportion reported for groundwater likely relates to the changes in methodology of the identification of pressures.

2.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *Sweden needs to lower its minimum size threshold for lakes to ensure all relevant water bodies are included.*

  Assessment: In the first RBMP, the minimum threshold for lake water bodies that was used in all RBDs was 1km^2 and there was national guidance for smaller lakes but the details were lacking. In the second RBMP the minimum threshold for lake water bodies that was used in all RBDs was reported to be 1km^2. For the Bothnian Bay (Troms) RBD 4km^2 was the mimimum lake size used in the first RBMP and 1km^2 in the second RBMP. It was reported in the RBMPs that some small water bodies situated in Protected Areas have been delineated as separate water bodies, so their objectives will

be in line with that of other water bodies in Protected Areas. Therefore this recommendation has been partially fulfilled for the second RBMP[19].

- Recommendation: *Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

  Assessment: This recommendation applies to a number of topics. In terms of characterisation of significant pressures, for surface waters, numerical tools and expert judgement were used for defining significant pressures from point and diffuse sources, abstraction and water flow pressures. For surface water bodies, significance of pressures is reported as being linked to the potential failure of objectives and therefore would be linked to water status. For groundwaters, numerical tools and expert judgement were used for defining significant pressures from point and diffuse sources. For abstraction and artificial recharge and other pressures, expert judgement was used. The significance of pressures is also reported to be linked to the potential failure of objectives. Sweden has made major attempts to improve the assessment of significance in their analyses of pressures since the first RBMPs, developing a set of new methods for each of the major pressure/impact categories: nutrient enrichment, acidification, contamination by hazardous substances and morphological pressures. They also identified qualitative criteria for assessing significant pressure from invasive species. For some pressures, threshold values are given to assess whether a pressure is significant or not. Therefore this part of the recommendation has been fulfilled.

  In terms of intercalibration, Swedish authorities have clarified that the intercalibration had not been completed by the time of adoption of the first RBMPs, but that the process was due to be completed in 2011. However, in each of the RBDs, there are several river, lake and coastal water bodies that are reported not to have corresponding intercalibration types in the second RBMP, approximately 80 % of river water bodies, 19 % of coastal water bodies and 16 % of lake water bodies. The RBMPs reported that the Swedish classification system has been successfully intercalibrated for all the biological quality elements for national types that have been linked to common intercalibration types. Therefore this part of the recommendation has been fulfilled.

[19] Sweden subsequently clarified that irrespective of whether a water body meets the minimum size criteria, all water within a river basin is indirectly covered by water management based on other Swedish environmental legislation

- Recommendation: *Sweden needs to complete the initial characterisation, to enable the establishment of WFD compliant monitoring networks. It is important to complete this first stage of the WFD implementation process to ensure cost effective implementation of subsequent steps.*

  Assessment: There has been an increase in the number of lake water bodies, coastal water bodies and groundwater bodies between the first and second RBMPs, with a slight decrease in river water bodies. There is also evidence of further characterisation of groundwaters. The RBMPs explained that the transitional water bodies were redefined as coastal water bodies because it was not possible to distinguish them from the nearby coastal waters. The number of water types is assessed against the previous recommendation. It therefore appears that characterisation has been updated and this recommendation has been fulfilled.

- Recommendation: *There is no clear link between status assessment and the need for pressure reduction (nutrients, chemical pollutants and hydromorphology) and measures. Many of the measures are "administrative" (new investigations, monitoring etc)*

  Assessment: This recommendation relate to more than one topic. In terms of significant pressures, in the second RBMP, atmospheric deposition was reported to affect the largest proportion of surface water bodies, followed by dams, barriers and locks. In the first cycle, Sweden only reported pressures at an aggregated level. Overall it appears there was a large increase in the number of occasions where “No significant pressures” were reported between the first and second RBMPs. For groundwater bodies “No significant pressures” was reported most frequently. These changes are likely a result of the changes to the methodology of the assessment of pressures. Sweden has made major attempts to improve the assessment of significance in their analyses of pressures since the first RBMPs, developing a set of new methods that are linked to status objectives. Based on the available information it appears that these recommendations have been fulfilled.

Topic 3 Monitoring, assessment and classification of ecological status in surface water bodies

3.1 Assessment of implementation and compliance with the WFD requirements in the second RBMPs and main changes in implementation and compliance since the first RBMPs

3.1.1 Monitoring of ecological status/potential

Monitoring programmes

Information on monitoring programmes was reported from eight RBDs in Sweden. Programmes were designed in terms of surface water or groundwater and for each in terms of purpose – surveillance and operational, plus quantitative for groundwater. For most RBDs and water categories, there were programmes for surveillance and operational monitoring. In one RBD (Bothnian Bay (Nordland)), only lakes were included in a monitoring programme even though rivers were also reported for this RBD.

Monitoring sites and monitored water bodies used for surveillance and operational monitoring

A major difference between the first and second RBMPs is that no transitional water bodies were identified for the second RBMPs, while 21 transitional water bodies were identified for the first and had been monitored. There is also another major difference in the information reported for the first RBMPs. The Commission Staff Working Document on the first RBMPs[20] includes values for the number of monitoring sites. Sweden resubmitted some of its information to WISE in November 2012, including for surface water monitoring sites. The resubmitted values are significantly different from those in the Commission Staff Working Document: for example 40 river surveillance sites in the Bothnian Bay RBD were shown in the Commission Staff Working Document and 560 in the resubmitted information to WISE. The comparisons here are made with the resubmitted data on the first RBMPs.

Table 3.1 compares the number of monitoring sites used for surveillance and operational purposes between the first and second RBMPs, and Table 3.2 gives the number of sites used for different purposes for the second RBMPs.

[20] http://ec.europa.eu/environment/water/water-framework/pdf/third_report/CWD-2012-379_EN-Vol3_SE.pdf

Table 3.1 ***Number of sites used for surveillance and operational monitoring in Sweden for the second and first RBMPs. NB - For reasons of comparability with data reported in the first RBMPs, the data for the second RBMPs does not take into account whether sites are used for ecological and/or chemical monitoring.***

	Rivers		**Lakes**		**Transitional**		**Coastal**	
	Surv.	**Op**	**Surv.**	**Op**	**Surv.**	**Op**	**Surv.**	**Op**
second RBMP								
SE_1	956	542	450	57			155	57
SE_2	746	531	410	171			137	95
SE_3	634	328	748	329			252	213
SE_4	1208	704	725	301			291	175
SE_5	1860	1869	941	644			309	174
SE_5101	33	38	17	14				
SE_1103	0	0	2	0				
SE_1TO	75	18	86	8			2	1
Total by type of site	*5512*	*4030*	*3379*	*1524*	*0*	*0*	*1144*	*714*
Total number of monitoring sites used for operational and surveillance monitoring	*6210*		*3597*		*0*		*1157*	
first RBMP								
SE_1	560	445	373	98			69	56
SE_2	960	655	602	312			145	61
SE_3	393	353	419	359	11	11	174	175
SE_4	921	787	642	485			360	334
SE_5	1454	1624	716	768	6	6	154	157
SE_5101	15	20	10	15				
Total by type of site	*4303*	*3884*	*2762*	*2037*	*17*	*17*	*902*	*783*
Total number of monitoring sites	*8187*		*4799*		*34*		*1685*	

Sources: WISE electronic reporting

Table 3.2 Number of monitoring sites in relevant water categories used for different purposes in Sweden[21]

Monitoring Purpose	Rivers	Lakes	Coastal	Territorial
BWD - Recreational or bathing water - WFD Annex IV.1.iii		86		
CHE - Chemical status	510	846	309	9
DWD - Drinking water - WFD Annex IV.1.i	18	47		
ECO - Ecological status	5960	3270	905	7
NID - Nutrient sensitive area under the Nitrates Directive[22] - WFD Annex IV.1.iv	113	461	119	5
OPE - Operational monitoring	4030	1524	715	7
SEA - International network of a sea convention	25			
SOE - EIONET State of Environment monitoring	83	73		
SUR - Surveillance monitoring	5512	3379	1146	16
Total sites irrespective of purpose	**6210**	**3597**	**1157**	**16**

Source: WISE electronic reporting

For all three water categories (six RBDs), more sites were used for surveillance than for operational monitoring for the second RBMPs. Overall in the six RBDs (with data for both the first and second RBMPs), 5437 sites were used for surveillance monitoring compared to 4012 for operational monitoring.

Comparing the six RBDs with data for both the first and second RBMPs shows that there has been an overall increase in the numbers of surveillance sites in coastal waters (+27 %), lakes (+19 %) and rivers (+26 %) from the first to the second RBMPs. There were differences between the RBDs, with significant decreases in numbers in all three water categories in the Bothnian Sea RBD. In contrast, there was a decrease in the number of operational sites overall in the six RBDs in coastal waters (-9 %) and lakes (-26 %). For coastal waters, the decrease was only in one of the six RBDs; whereas all six RBDs showed a decrease in the numbers of lake operational monitoring sites. Overall, there was a 3 % increase in the number of operational river sites, with three RBDs showing an increase and three a decrease.

For the first RBMPs, Sweden reported information on monitoring for six RBDs, while for the second RBMPs information on monitoring was reported on eight of the 10 RBDs. Based on the

[21] The numbers given in this table concern the monitoring sites used for the WFD, as operational or surveillance sites and other purposes these monitoring sites are used for. They do not include monitoring sites used for those other purposes but not for the WFD.

[22] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

comparison of the same six RBDs for both the first and second RBMPs, it seems that the proportion of water bodies included in surveillance monitoring has increased: 64 % of coastal water bodies had surveillance monitoring for the second RBMPs and 45 % for the first. These proportions are 29 % and 27 % for lakes, 20 % and 15 % for rivers. There was a similar increase in the proportion of coastal and river water bodies included in operational monitoring but a small decrease in the proportion of lakes.

Monitored quality elements

Table 3.3 illustrates the quality elements used for the monitoring of surface waters for the second RBMPs: no differentiation is made between purposes of monitoring.

For the second RBMPs there were still gaps in the biological quality elements reported to be monitored. Angiosperms are not monitored in any of the RBDs with coastal waters, and in one of them (Bothnian Bay), macroalgae are also not monitored[23]. The monitoring of lakes does not include phytobenthos in any RBD, benthic invertebrates are not included in three of the seven RBDs with lakes, macrophytes in four and fish in two. Macrophytes were not reported to be monitored in all seven RBDs with rivers and benthic invertebrates in one RBD. Benthic invertebrates were reported to be monitored in territorial waters, even if ecological status does not apply there.

Morphological conditions are not monitored in any water category or RBD in Sweden: this is a major gap. Hydrological regime is also not monitored in coastal waters and, for one RBD, in lakes, again a significant gap.

There are also gaps in the physicochemical quality elements monitored. Thermal conditions and salinity conditions are not reported to be monitored in any RBD or water category.[24] Acidification status is also not monitored in coastal waters, and the same applies to oxygenation conditions in lakes in three of the eight RBDs with lakes and in rivers in six of the seven RBDs with rivers. Transparency conditions are also not monitored in lakes in three of the eight RBDs with lakes.

[23] Sweden subsequently explained that macroalgae is not suitable for monitoring in the Bothnian Bay due to low salinity.

[24] Sweden subsequently informed that those quality elements are always monitored in combination with monitoring of nutrients, but were not reported because Sweden linked all monitoring to classification and there is no classification of salinity and thermal conditions.

Table 3.3 ***Quality elements monitored for the second RBMPs in Sweden (excluding River Basin Specific Pollutants). NB - Quality elements may be used for surveillance and/or operational monitoring. Some Member States reported "other aquatic flora" rather than the component sub-quality elements, macrophytes, phytobenthos, angiosperms and macroalgae.***

	Biological quality elements									Hydromorphological quality elements		
	Phytoplankton	Macrophytes	Phytobenthos	Benthic invertebrates	Fish	Angiosperms	Macroalgae	Other aquatic flora	Other species	Hydrological or tidal regime	Continuity conditions	Morphological conditions
Lakes	Yes	Yes	No	Yes	Yes			No		Yes		No
Rivers		No	Yes	Yes	Yes			No		Yes	No	No
Coastal	Yes			Yes		No	Yes	No		No		No

	General physicochemical quality elements								
	Transparency conditions	Thermal conditions	Oxygenation conditions	Salinity conditions	Acidification status	Nitrogen conditions[25]	Phosphorus Conditions[26]	Silicate	Other determinand for nutrient conditions
Lakes	Yes	No	Yes	No	Yes	No	Yes	No	No
Rivers		No	Yes	No	Yes	No	Yes	No	No
Coastal	Yes	No	Yes	No	No	Yes	No	No	No

Source: WISE electronic reporting

Compared to the situation for the first RBMPs, macrophytes are still missing in rivers, phytobenthos in lakes and angiosperms in coastal waters: there has been no change or progress. For the second RBMPs, nitrogen is now monitored in coastal waters and in rivers and lakes, where phosphorous is monitored, indicating that there has been some progress in terms of

[25] Sweden subsequently noted that only the monitoring used in classification has been reported. Nitrogen is generally not used in classification in rivers and lakes since phosphorous is the most limiting nutrient. Nitrogen is however monitored in all waters where phosphorous monitoring is reported.

[26] Sweden subsequently stated that phosphorus is measured at all coastal sites where nitrogen is measured. Furthermore, it is also used in the classifications of coastal waters and should therefore have been reported to WISE.

monitoring physicochemical quality elements in coastal waters. Compared to the first RBMPs, hydrological regime is now monitored in rivers and lakes but not in coastal waters, which again indicates some progress. Morphological conditions are still not monitored in any water bodies, so there is no progress with this group of quality elements.

Annex V of the WFD provides guidance on the frequency of monitoring of the different quality elements. Surveillance monitoring should be carried out for each monitoring site for a period of one year during the six-year period covered by a RBMP. For phytoplankton, this should be done twice during the monitoring year and for the other biological quality elements once during the year. Operational monitoring should take place at intervals not exceeding once every six months for phytoplankton and once every three years during the six-year cycle for the other biological quality elements. Greater intervals may be justified on the basis of technical knowledge and expert judgement.

None of the 10 biological quality elements used for surveillance monitoring in rivers, lakes and coastal waters was sampled at least at the minimum WFD recommended frequency at all sites. The largest proportion of sites that met or exceeded this minimum recommended frequency was for phytoplankton in coastal waters (95 % of sites included in surveillance monitoring), benthic invertebrates in lakes (90 %) and benthic invertebrates in rivers (87 %).

Two of the 10 biological quality elements used for operational monitoring of rivers, lakes and coastal waters were sampled at least at the minimum frequency at all of the sampling sites used for operational monitoring: macroalgae and benthic invertebrates in coastal waters. Fish in lakes were only sampled at the minimum frequency at 11 % of sites and phytobenthos in rivers at 64 % of sites.

Monitored River Basin Specific Pollutants

When it comes to River Basin Specific Pollutants, 29 different ones were reported to be monitored overall in Sweden; nine were reported to be monitored in biota (five in fish, four in other biota), seven in settled sediment and 28 in water. Biota, settled sediment and water were monitored in all three water categories (coastal waters, lakes and rivers). Table 3.4 shows the number of sites used to monitor River Basin Specific Pollutants for the first and second RBMPs.

Table 3.4 Number of sites used to monitor River Basin Specific Pollutants for the second RBMPs and non-priority specific pollutants and/or other national pollutants for the first RBMPs in Sweden. NB - The data from both cycles may not be fully comparable as different definitions were used and also not all Member States reported information at the site level, meaning that there were no equivalent data for the first RBMPs

RBMP		Rivers	Lakes	Coastal
second	Sites used to monitor River Basin Specific Pollutants	362	402	145
first	Sites used to monitor non-priority specific pollutants and/or other national pollutants	-	-	-

Sources: WISE electronic reporting

River Basin Specific Pollutants are monitored in a few water bodies (Table 10). However, the monitoring of River Basin Specific Pollutants done for the second RBMPs represents a significant improvement compared to the first RBMPs, when these pollutants were not reported to be monitored in any RBD (Table 10).

In terms of the number of sites used to monitor River Basin Specific Pollutants in Sweden as a whole, zinc was monitored at the most sites (750), followed by copper (670), chromium (510) and arsenic (358).

According to section 1.3.4 of Annex V of the WFD the minimum recommended sampling frequency for the surveillance monitoring of River Basin Specific Pollutants is four times in one year of the six-year RBMP cycle. None of the River Basin Specific Pollutants monitored in water in Sweden was monitored at this or a higher frequency at all the sites where they were monitored. For 12 pollutants none of the sites was monitored at least at the recommended frequency, while for three pollutants over 50 % of sites were sampled at the minimum frequency.

In Sweden as a whole approximately twice as many sites were used for the surveillance monitoring of River Basin Specific Pollutants in water than for operational purposes. The degree to which the minimum recommended frequency of monitoring of River Basin Specific Pollutants for operational monitoring was met was greater than for surveillance monitoring. For three River Basin Specific Pollutants included in operational monitoring all sites were monitored at least at the minimum frequency of once every three months, for 11 substances between 50 and 100 % of sites were sampled at least at the minimum frequency, while for 10 substances none of the sites was.

Annex V, section 1.3.4 of the WFD does not explicitly define the matrices to which the minimum required frequency of monitoring of River Basin Specific Pollutants ("Other Pollutants") applies. Required monitoring frequencies are specified for Priority Substances in biota and sediment in Article 3(2)(c) of EQS Directive 2008/105/EC: once per year for operational and surveillance monitoring purposes. For consistency this required frequency of once per year has been applied to the monitoring of River Basin Specific Pollutants in biota/sediment.

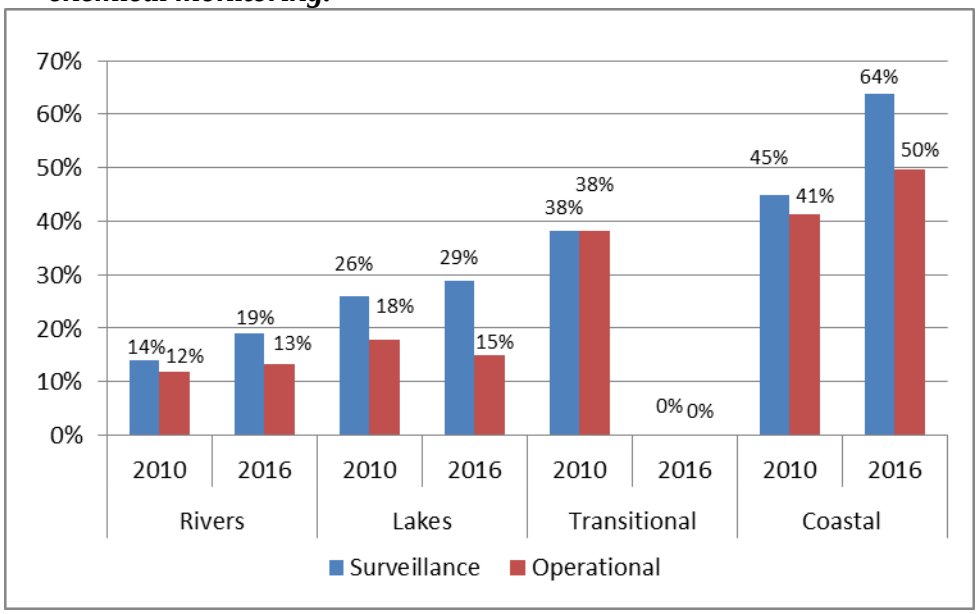
Nine different River Basin Specific Pollutants are reported to be monitored in settled sediment in Sweden. For only one pollutant are all the sites monitored at the minimum frequency during the RBMP cycle. Seven different River Basin Specific Pollutants were monitored in biota (unspecified), fish or other biota. For around 50 % of pollutant/matrix combinations, all sites were monitored at least once every year.

The monitoring of River Basin Specific Pollutants is reported to be used for status assessment for all substances and matrices. The analytical methods are in line with Article 4(1) of Quality Assurance / Quality Control Directive (2009/90/EC) for 21 substances, or Article 4(2) for the remaining identified substances except the two estradiols (CAS 50-28-2-17 and 57-63-6-17).

Surveillance monitoring of surface water bodies

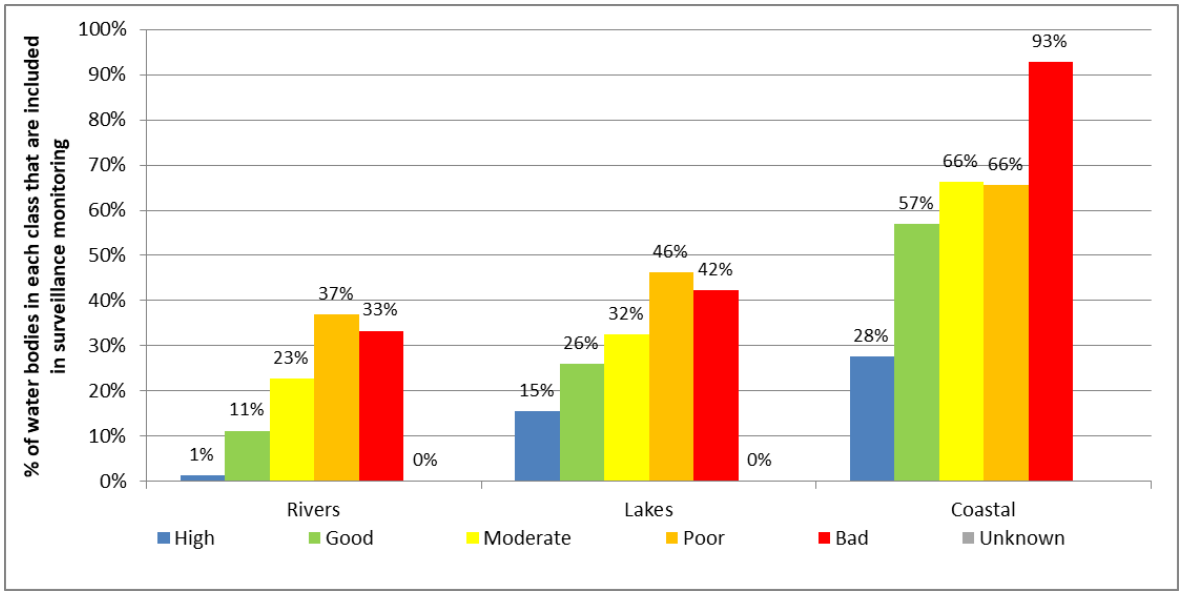
Figure 3.1 shows the proportion of water bodies subject to surveillance and operational monitoring. Figure 3.2 shows the proportion of water bodies subject to surveillance monitoring for each status/potential class.

Figure 3.1 ***Percentage of water bodies included in surveillance and operational monitoring in Sweden for the first and second RBMPs. NB - No differentiation is made between water bodies included in ecological and/or chemical monitoring.***



Source: WISE electronic reporting

Figure 3.2 ***Proportion of water bodies in each ecological status/potential class that are included in surveillance monitoring in Sweden.***



Source: WISE electronic reporting. A differentiated presentation between ecological status and potential and including all types of quality element can be viewed here - https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_QualityElement_Status_Compare/SWB_QualityElement_Group?iframeSizedToWindow=true&:embed=y&:display_count=no&:showAppBanner=false&:showVizHome=no

None of the coastal waters, lakes and river water bodies included in surveillance monitoring are monitored for all required biological or hydromorphological or physicochemical quality elements, which shows a potential lack of compliance with the WFD.

Operational monitoring of surface water bodies

The biological quality element most often used for operational monitoring of coastal waters is phytoplankton (in 68 % of the water bodies included in operational monitoring): benthic invertebrates were used in 36 % and macroalgae in 12 %. Three physicochemical quality elements were used in operational monitoring with nitrogen conditions being used in the largest proportion (76 %). Hydromorphological quality elements were not used at all.

Four biological quality elements were used for the operational monitoring of lakes, with phytoplankton being most often used (35 % of lakes included in operational monitoring). Four physicochemical quality elements were also used in operational monitoring with determinands indicative of acidification status being used in most lakes (71 %). Three percent of lakes in operational monitoring were also monitored for hydrological regime: morphological conditions were not monitored at all.

Fish was the most frequently used biological quality element in the operational monitoring of rivers (41 % of water bodies in operational monitoring): phytobenthos and benthic invertebrates were also used. Acidification status was monitored in the largest proportion of rivers included in operational monitoring (62 %) followed by phosphorus conditions (38 %) and oxygenation conditions (0.4 %). Five percent of rivers in operational monitoring were also monitored for hydrological regime, while morphological conditions were not monitored at all.

Although ecological status does not apply there, territorial waters were also included in operational monitoring with benthic invertebrates, transparency, oxygenation and nitrogen conditions being used.

Overall, 39 % of lake water bodies, 33 % of river water bodies and 12 % of coastal water bodies included in operational monitoring were not monitored for any biological quality element.

In terms of operational monitoring, 56 % of coastal, 23 % of lakes and 18 % of river water bodies at less than good ecological status/potential were included: this implies that the status of other water bodies at less than good status/potential have been derived by other means i.e. from results of surveillance monitoring, by grouping or expert judgment.

Transboundary surface water body monitoring

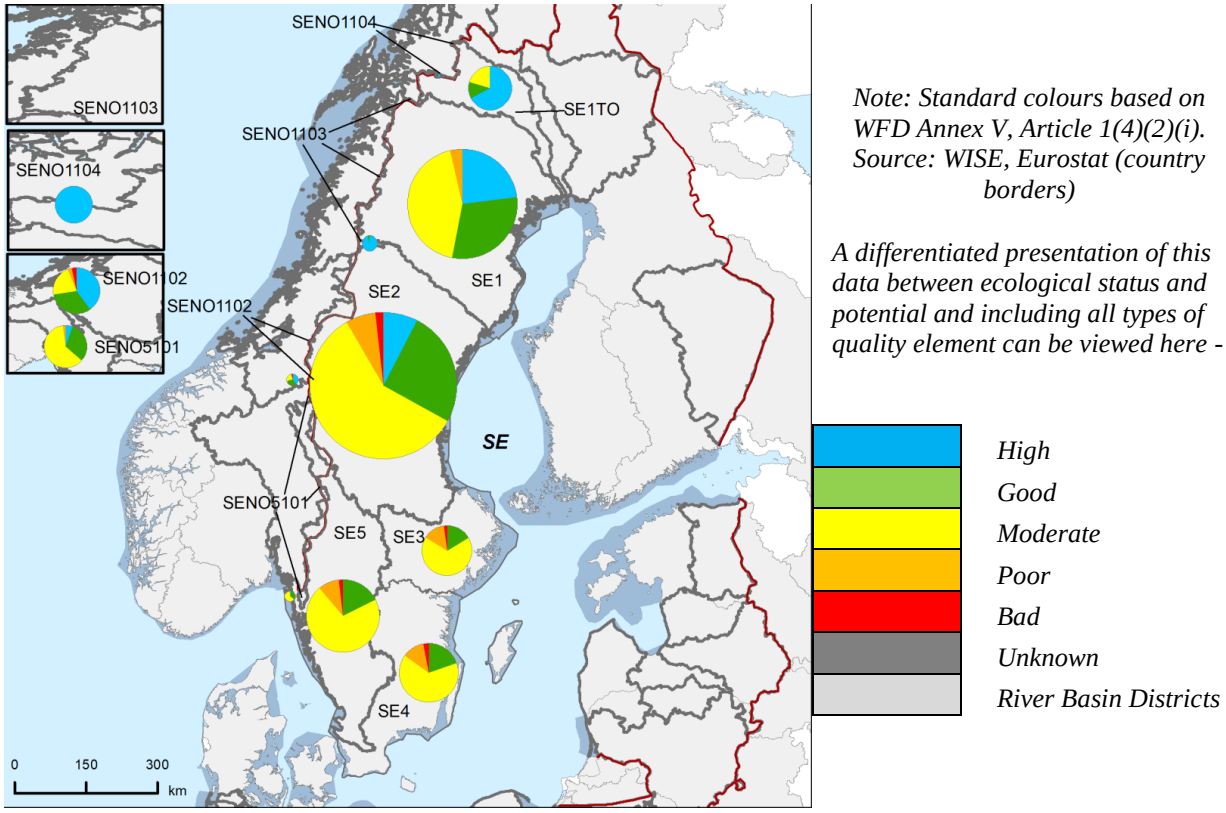
Sweden reported 25 monitoring sites from five RBDs that were part of an international network of a sea convention.

3.1.2 Assessment and classification of ecological status/potential of surface water bodies

Ecological status or potential of surface water bodies

The ecological status/potential of surface water bodies in Sweden for the second RBMPs is illustrated in Map 3.1. Transitional water bodies were delineated for the first RBMPs, but none were delineated for the second.

Map 3.1 Ecological status or potential of surface water bodies in Sweden based on the most recently assessed status/potential of the surface water bodies

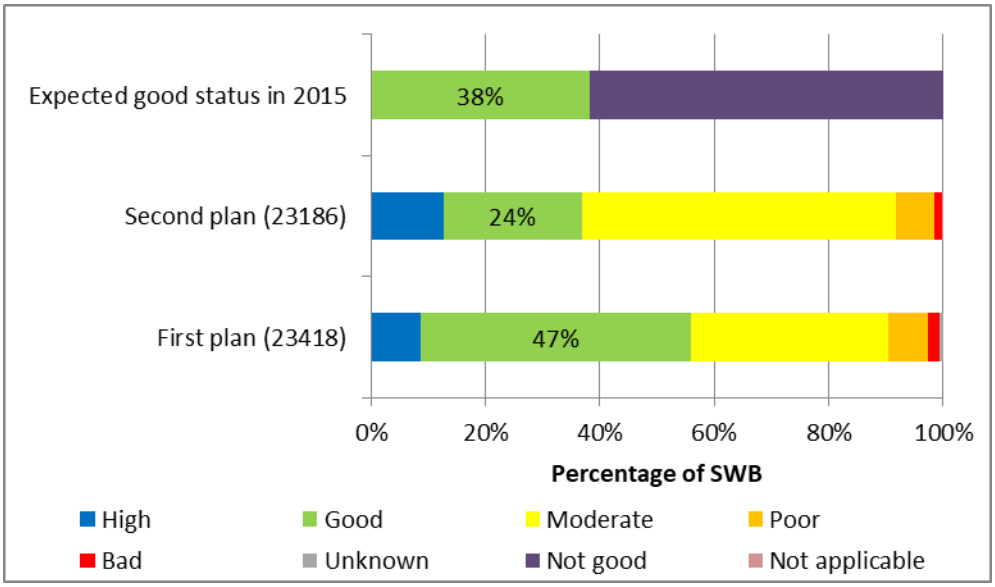


https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_QualityElement_Status_Compare/SWB_QualityElement_Group?iframeSizedToWindow=true&:embed=y&:display_count=no&:showAppBanner=false&:showVizHome=no

Overall there was no improvement of ecological status/potential since the first RBMPs. The majority of water bodies are in less than good ecological status/potential and the ecological status/potential has apparently deteriorated in many rivers and lakes. This apparent deterioration is largely due to changes in classification methods and to the inclusion of River Basin Specific Pollutants in the classification.

Figure 3.3 compares the ecological status of surface water bodies in Sweden for the first RBMPs with that for the second and that expected by 2015.

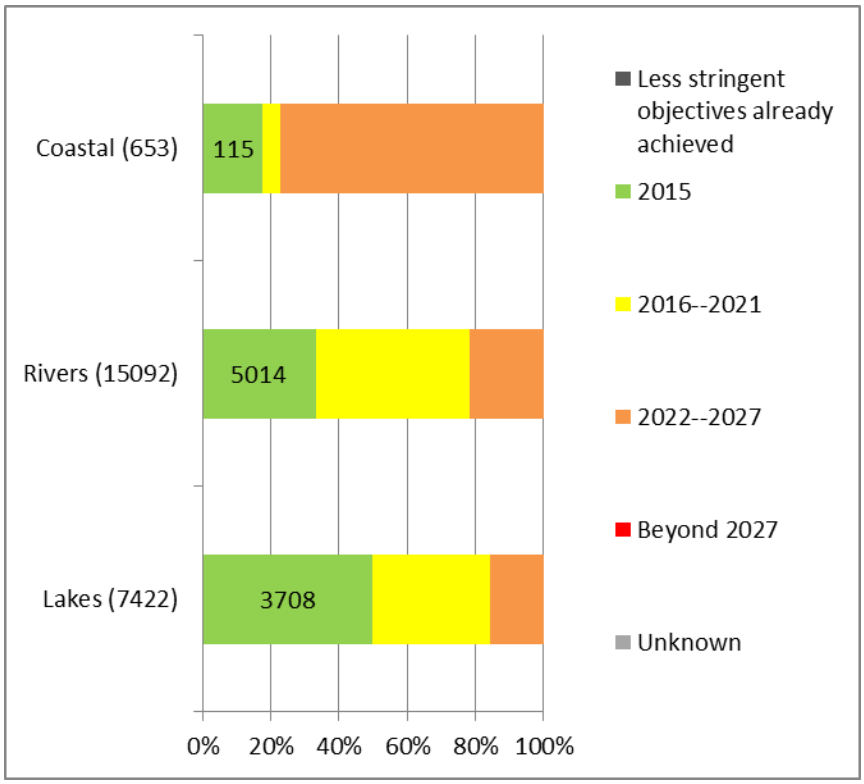
Figure 3.3 ***Ecological status or potential of surface water bodies in Sweden for the second RBMPs, for the first RBMPs and expected in 2015. The number in parenthesis is the number of surface water bodies for each cycle. NB - The period of the assessment of status for the second RBMPs was 1990 to 2014. The year of the assessment of status for the first RBMPs is not known***



Source: WISE electronic reporting

Member States were asked to report the expected date for the achievement of good ecological status/potential. The information for Sweden is shown in Figure 3.4.

Figure 3.4 ***Expected date of achievement of good ecological status/potential of surface water bodies in Sweden. The number in parenthesis is the number of water bodies in each category.***



Source: WISE electronic reporting

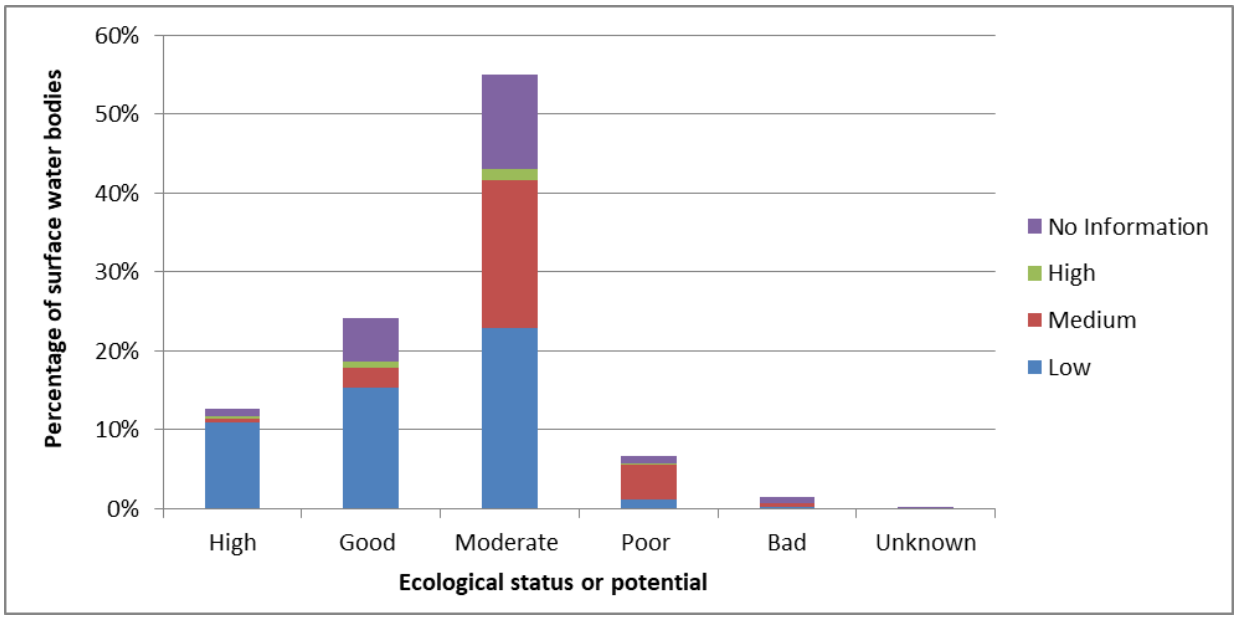
Overall, ecological status/potential is less than good for the majority of water bodies: 51 % of lakes, 68 % of rivers and 82 % of coastal waters (EEA visualisation tool for the State-of-Water report).

The proportion of rivers and lakes in good or better ecological status/potential decreased significantly from the first to the second RBMPs: by 24 % for rivers and by 11 % for lakes. These are accompanied with similar increases in the proportion of water bodies at less than good status/potential. These changes are mostly reported as not consistent, but due to better data, knowledge and more complete assessment methods. In contrast, there was a small increase in the proportion of coastal waters at good or better status and also an increase in less than good status/potential; this is linked to the increase in the number of delineated coastal water bodies and to the fact that the number of water bodies with unknown ecological status/potential was reduced from 128 in the first RBMPs to one in the second.

Confidence in ecological status assessment

Figure 3.5 shows the confidence in the classification of ecological status/potential.

Figure 3.5 Confidence in the classification of ecological status or potential of surface water bodies in Sweden based on the most recently assessed status/potential



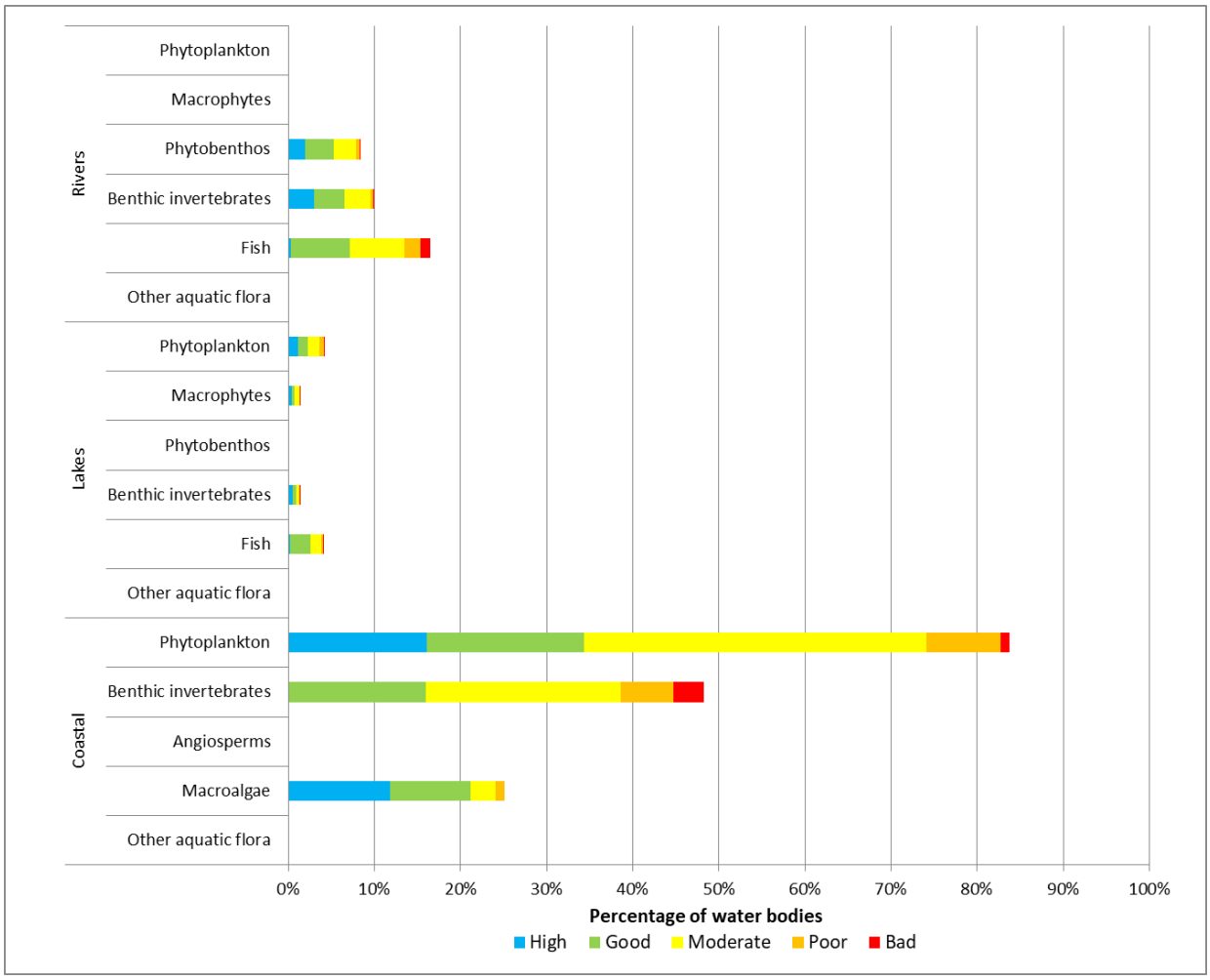
Source: WISE electronic reporting

Confidence in the classification of ecological status/potential assessment has improved since the first RBMPs, especially for rivers and lakes, due to more monitoring and better assessment of biological quality elements.

Classification of ecological status at the quality element level

Figure 3.6 shows the percentage of water bodies in terms of the biological quality elements used for classification.

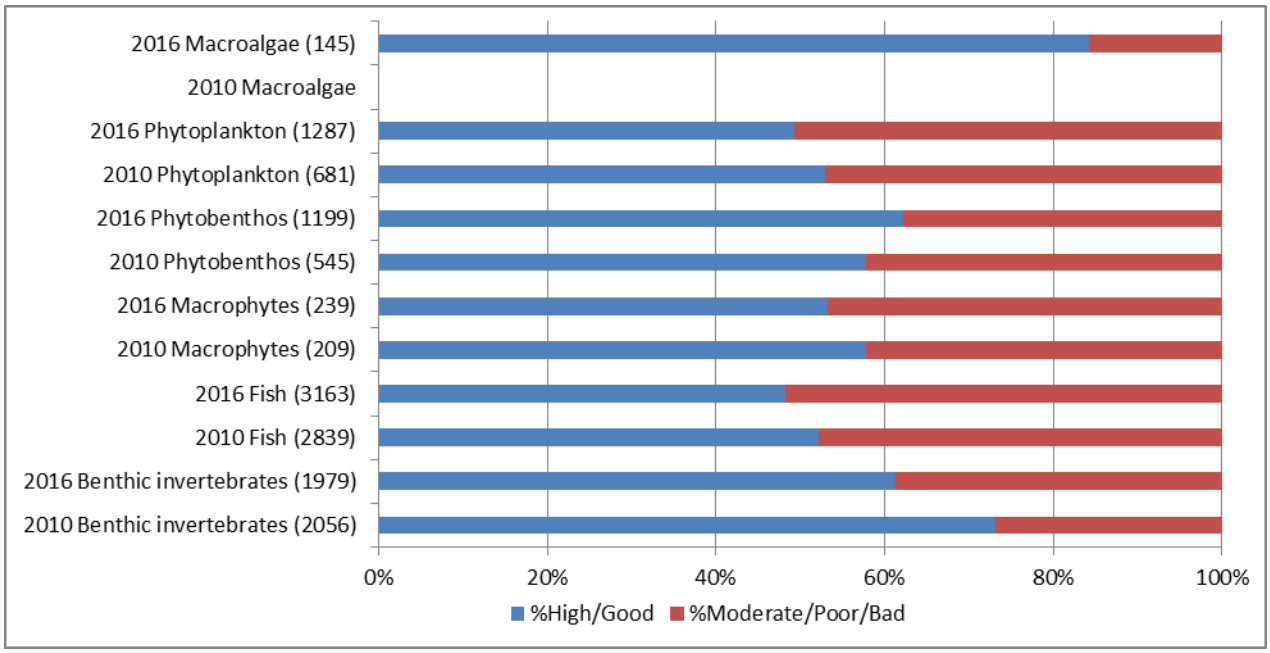
Figure 3.6 Ecological status/potential of the biological quality elements used in the classification of surface water bodies in Sweden. NB - Water bodies with unknown status/potential, and those that are monitored but not classified or not applicable, are not presented.



Source: WISE electronic reporting. A differentiated presentation of this data between ecological status and potential and including all types of quality element can be viewed here - https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_QualityElement_Status_Compare/SWB_QualityElement_Group?iframeSizedToWindow=true&:embed=y&:display_count=no&:showAppBanner=false&:showVizHome=no

Figure 3.7 compares the classification of biological quality elements in terms of ecological status/potential for the first and second RBMPs. It should be noted that this comparison should be treated with caution as there are differences between the numbers of surface water bodies classified for individual elements from the first to the second RBMPs.

Figure 3.7 Comparison of ecological status/potential in Sweden according to classified biological quality elements in surface waters between the first and second RBMPs. The number in brackets is the number of surface water bodies classified for each biological quality element.



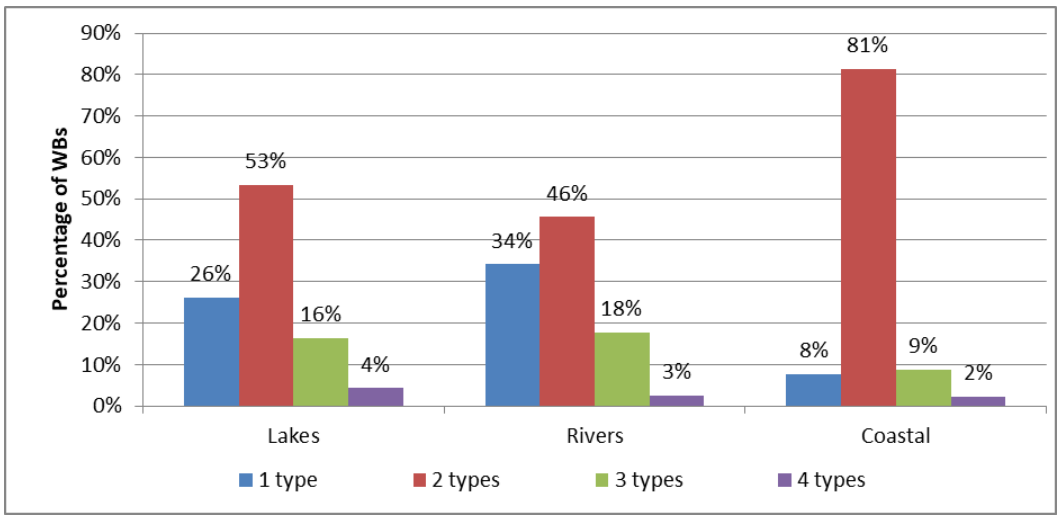
Source: WISE electronic reporting

Figure 3.8 illustrates the basis of the classification of ecological status/potential of rivers and lakes in Sweden for the second RBMPs.

The change in status/potential at the quality element level is reported as unknown for most water bodies and most quality elements, and for the rest, most quality elements have no change, while in some water bodies the status has improved and in others it has deteriorated.

Quality element status/potential has been classified for at least one biological quality element in many water bodies, including macrophytes and fish in lakes and phytobenthos and fish in in some river water bodies, as well as macroalgae in a few river water bodies. These biological quality elements were mostly missing in the first RBMPs. Monitoring is the basis for classification for a large proportion of the water bodies classified for these biological quality elements.

Figure 3.8 ***The classification of the ecological status or potential of surface waters in Sweden using 1, 2, 3 or 4 types of quality element. NB - The four types are: biological; hydromorphological, general physicochemical and River Basin Specific Pollutants.***



Source: WISE electronic reporting

Assessment methods for the biological quality elements

There are now assessment methods developed for angiosperms in coastal waters, while macrophytes in rivers, phytobenthos in lakes and macroalgae in coastal waters, which were missing for the first RBMPs, are still missing. However, the reason why a method for macrophytes in rivers was not reported by Sweden is probably the very recent completion and intercalibration of the method in the Northern Geographic Intercalibration Group of the Common Implementation Strategy Working Group on Ecological Status.

Although reference conditions are estimated for each water body using models, it is not clear how the good-moderate boundary has been set.

Intercalibration of biological quality element methods

It is not clear which class boundaries are used for assessment for several national lake types, as some national types overlap with several different intercalibration types, e.g. lake type "S4DLNN" overlaps with both low alkalinity Northern Geographic Intercalibration Group types and high alkalinity Central Baltic Geographic Intercalibration Group types. These

Geographic Intercalibration Group types have very different intercalibrated class boundaries for good status for phytoplankton and macrophytes.

Assessment methods for the hydromorphological quality elements

Assessment methods for the supporting hydromorphological quality elements are reported for each water category but are not linked to the sensitive biological quality elements.

Hydromorphological quality elements are assessed in all water bodies based on expert judgement, which uses models (e.g. S-HYPE) and other information sources, including historical maps and current Geographical Information System analyses, as well as the national register of dams and regional information on barriers based on electro-fishing, biotope mapping and field surveys of road structures. Hydromorphological assessment methods have been developed for coastal waters but are not used for assessment status in these water categories because of high uncertainty and limited data availability.

Classification methods for physicochemical quality elements

Methods for assessing acidification status and nutrient conditions are reported for rivers but this is not the case for the other relevant physicochemical quality elements. There is a more complete coverage of assessment methods for the relevant quality elements in lakes, with assessment methods for transparency and oxygenation conditions being reported as well as for acidification and nutrients. Methods for assessing transparency, oxygenation conditions and nutrient conditions are reported for coastal waters. Only the methods for nutrients in all water categories are reported to be related to the sensitive biological quality elements.

The sensitivity of the biological quality element methods to different impacts have been reported, but only one method (for fish in rivers) is sensitive to hydromorphological impacts.

Type-specific standards are reported for nutrients for all types of water bodies in all water categories, for acidification parameters in rivers and lakes, for transparency and oxygen in lakes, transitional and coastal waters.

The physicochemical quality element standards are set by object-specific modelling claimed to support sensitive biological quality elements. However, only the nutrients are reported to support the sensitive biological quality elements.[27]

[27] Information available through other projects indicates that the link to biological quality elements is weak also for nutrients. The reference conditions are modelled and the good-moderate boundary is set by multiplying the reference value by two, regardless of the biological quality element response. For pH, the good-moderate

Selection of River Basin Specific Pollutants and use of Environmental Quality Standards

Environmental Quality Standards have been set for 26 River Basin Specific Pollutants in water in all water categories, and for one substance (polychlorinated biphenyl) in fish and other biota. The RBSPs have been identified by the national WFD authorities including substances that are emitted in significant quantities in Sweden, causing risk of exceeding their environmental quality standards and/or negatively affect the ecological status. For the second RBMPs, new methods have been developed on how to identify significant emissions, including a newly developed pressure model, as well as a Geographical Information System, and there is more monitoring data. All pollution sources that contribute to a combined significant pressure for the RBSPs in each sub-unit of the RBDs are identified from data found in national and local registers of emissions from industries, urban wastewater treatment plants, land-use (including agriculture and forestry), roads, urban run-off and atmospheric deposition.

Environmental Quality Standards are reported for all the identified River Basin Specific Pollutants as having been derived using the Technical Guidance Document No 27[28].

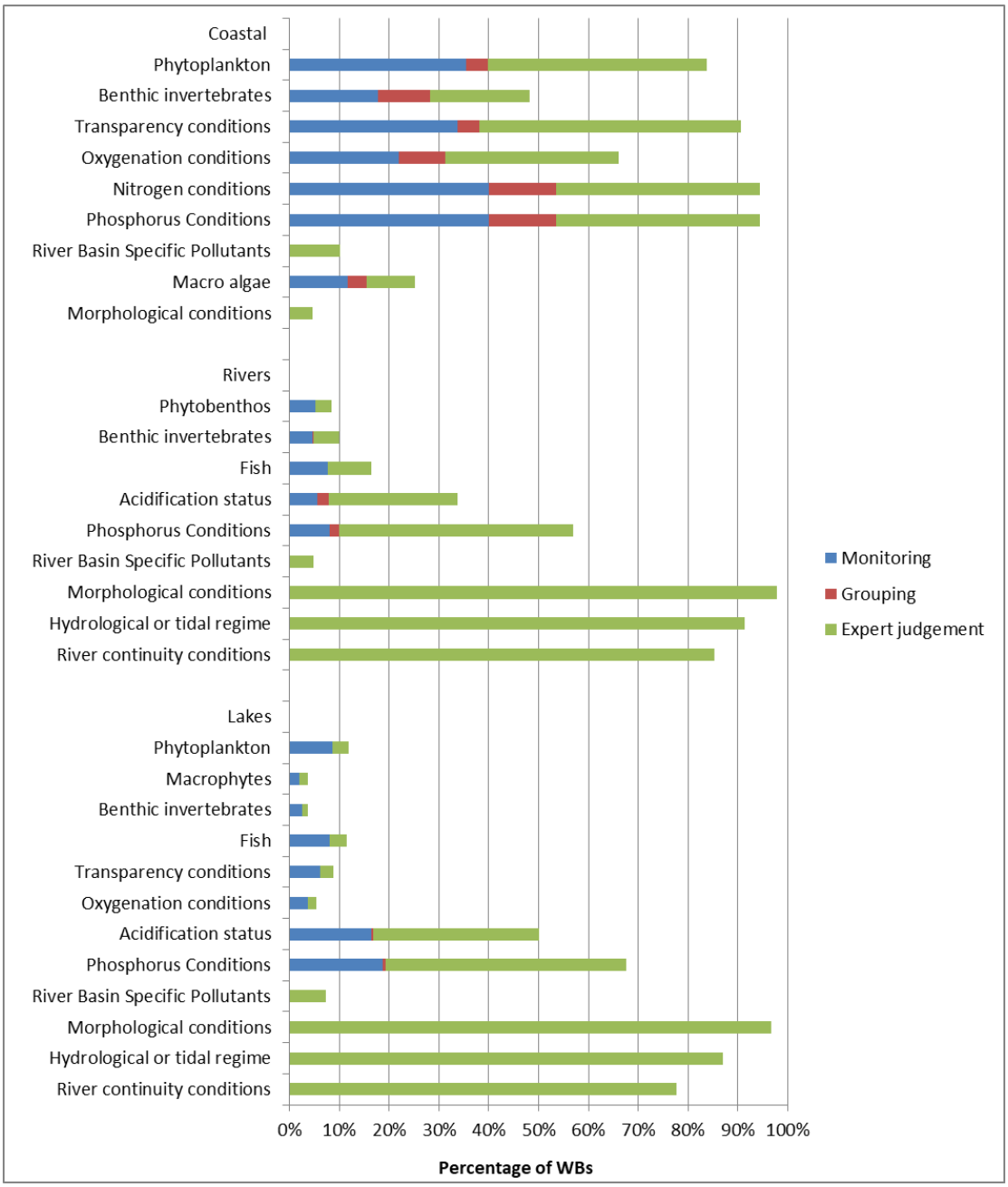
Use of monitoring results for classification

The classification of the individual quality elements is illustrated in Figure 3.9.

boundary is set by adding 0.4 pH units to the modelled object-specific reference value, regardless of the sensitive biological quality element responses. Research work is on-going through a newly started Nordic collaborative project to improve the methods and ensure better links to the sensitive biological quality elements in all water categories.

[28] https://circabc.europa.eu/sd/a/0cc3581b-5f65-4b6f-91c6-433a1e947838/TGD-EQS %20CIS-WFD %2027 %20EC %202011.pdf

Figure 3.9 Basis of the classification of ecological status/potential in Sweden.



Source: WISE electronic reporting

Expert judgment is the most significant means of classification of ecological status/potential of the quality elements in rivers, lakes and coastal waters in Sweden. For 91 %, 84 % and 50 % of water bodies which were classified in terms of individual quality elements in rivers, lakes and coastal waters, respectively, the basis for classification was expert judgement.

Hydromorphological quality elements and River Basin Specific Pollutants were reported in WISE as being solely classified by expert judgement, even though hydrological regime was reported to be monitored in rivers and lakes[29]. In rivers and lakes, it is the hydromorphological quality elements that have overwhelmingly been used in the classification of ecological status/potential. A total of 14774 river water bodies were classified using morphological conditions compared to 2847 using fish. In lakes, 7175 water bodies were classified using morphological conditions, and the highest number classified by a biological quality element was based on fish (858). This seems to indicate that the overall classification of ecological status/potential of surface water bodies in Sweden is largely based on expert judgment.

There is still only a small minority of water bodies classified for most of the biological quality elements in all water categories, e.g. for benthic fauna in rivers, which is one of the most commonly used biological quality elements, the proportion of water bodies classified is only 10 %.

Phytoplankton, macroalgae and benthic invertebrates were used in the classification of coastal waters with approximately the same number classified by expert judgment and monitoring results and a smaller proportion by grouping. Phytoplankton, macrophytes, benthic invertebrates and fish were used to classify lakes with monitoring results being predominately used in the classification, with a smaller proportion being classified by expert judgment and very few water bodies by grouping. Phytobenthos, benthic invertebrates and fish were used in the classification of rivers: approximately the same proportion was classified by monitoring results and expert judgement with a much smaller proportion using grouping.

In general more lakes and river water bodies were classified using physicochemical quality elements than using biological quality elements, and more water bodies were classified using hydromorphological quality elements than physicochemical quality elements.

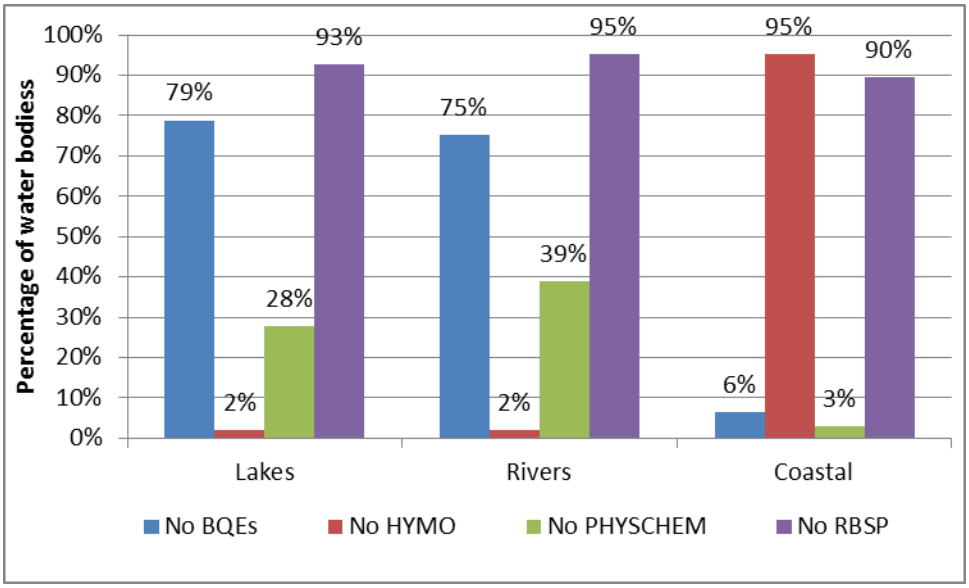
Expert judgment, monitoring results and grouping are also used in classifying physicochemical quality elements in coastal waters.

[29] Sweden subsequently informed that hydromorphological quality elements were classified using official water quality criteria based on GIS and runoff data, However, expert judgement was sometimes applied when overall ecological status was classified solely based on hydromorphological quality elements (in accordance with official Swedish water quality criteria). For the RBSPs, Sweden explained that for the individual pollutants, more than 50 % of the classifications were based on monitoring.

Overall classification of ecological status

Figure 3.10 shows the percentage of river and lake water bodies where no classification type was used.

Figure 3.10 The percentage of surface water bodies in Sweden where no biological quality element or no hydromorphological (HYMO) or no general physicochemical (PHYSCHEM) or no River Basin Specific Pollutant (RBSP) has been used in the classification of ecological status or potential.



Source: WISE electronic reporting

The one-out-all-out principle was reported as having been used in all RBDs, the details on combination rules applied for the biological quality elements versus the supporting quality elements are explained in the RBMPs, including the use of the hydromorphological quality elements to downgrade from good to moderate ecological status.

3.2 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *A large majority of water bodies are classified without monitoring data, giving low confidence in the classification. Very few water bodies are monitored with biological quality elements. Sweden needs to improve its classification system for ecological status, since it has several gaps".*

Assessment: The confidence in classification of ecological status has improved for rivers and lakes from around 20 % of all classified water bodies in medium or high confidence in the first RBMPs to around half in the second RBMPs.

A classification method for angiosperms in coastal waters has been developed. Quality element status has been classified for at least one biological quality element in many water bodies, including macrophytes and fish in lakes and phytobenthos and fish in rivers in some water bodies, as well as macroalgae in a few water bodies. These biological quality elements were mostly missing in the first RBMPs. Monitoring is the basis for classification for a large proportion of the water bodies classified for these biological quality elements.

All the three hydromorphological quality elements are now classified in a large majority of water bodies in rivers and lakes.

River Basin Specific Pollutants have been included in monitoring for the second RBMPs and have been used in ecological status/potential classification. In this respect there has been some progress.

Compared to the situation for the first RBMPs, macrophytes are still missing in rivers, phytobenthos in lakes and angiosperms in coastal waters, so there has been no progress on these elements. For the second RBMPs, nitrogen is now monitored in coastal waters, rivers and lakes, indicating some progress in terms of monitoring physicochemical quality elements. Compared to the first RBMPs, hydrological regime is now monitored in rivers and lakes but not in coastal waters, which also indicates some progress. Morphological conditions are still not monitored in any water bodies, indicating no progress with this group of quality elements.

In the six RBDs with comparable information for both the first and second RBMPs, there was an increase from 11 % of surface water bodies being monitored for at least one biological quality element for the first RBMPs to 16 % for the second.

In conclusion, this recommendation is partially fulfilled.

- Recommendation: *The described monitoring programme is not designed to be WFD compliant, but is a continuation of previous monitoring programmes (e.g. operational monitoring for groundwater bodies is missing and no or very few sites are monitored for botanical biological quality elements and hydromorphological quality elements in*

both surveillance and operational mode). The RBMPs need for instance to be more transparent regarding which Priority Substances are monitored. The justifications for not monitoring certain quality elements are not adequate. Improvement of the monitoring programme to make it fully WFD compliant is on-going and is planned to be ready by 2012.

Assessment: Compared to the situation for the first RBMPs, macrophytes are still missing in rivers, phytobenthos in lakes and angiosperms in coastal waters, so there has been no progress on these elements. For the second RBMPs, nitrogen is now monitored in coastal waters, rivers and lakes, indicating some progress in terms of monitoring physicochemical quality elements. Compared to the first RBMPs, hydrological regime is now monitored in rivers and lakes but not in coastal waters, which also indicates some progress. Morphological conditions are still not monitored in any water bodies, indicating no progress with this group of quality elements.

In conclusion, this recommendation is partially fulfilled.

- Recommendation: *The identification of River Basin Specific Pollutants needs to be completed in all RBDs, and made more transparent, with clear information on how pollutants were selected, how and where they were monitored, how Environmental Quality Standard was established, where there are exceedances and how such exceedances have been taken into account in the assessment of ecological status. It is important that there is an ambitious approach to combatting chemical pollution and that adequate measures are put in place.*

  Assessment: Information was found in the RBMPs about how River Basin Specific Pollutants have been identified. Environmental Quality Standards are reported for 26 River Basin Specific Pollutants in water, and one (non-dioxin-like PCBs) in fish and other biota. These standards are the same for all RBDs, and are found in national guidelines referred to in the RBMPs. The Common Implementation Strategy technical guidance has been used to set the Environmental Quality Standards. The analytical methods are in line with Article 4(1) of the Quality Assurance / Quality Control Directive (2009/90/EC) for 21 substances or Article 4(2) for the remaining identified substances, except for the two estradiols (CAS 50-28-2 and 57-63-6)[30]. All water categories are monitored and exceedances were reported. However, the status for the RBSPs is reported as unknown in the large majority of water bodies. Sweden

[30] Even if 17alpha-ethinylestradiol (CAS_57-63-6) was not monitored, information on the Environmental Quality Standard for this substance was reported.

implements the one-out, all-out principle, downgrading to moderate status if one or more of the River Basin Specific Pollutants exceeds their EQS values.

On this basis, the recommendation is fulfilled.

Topic 4 Monitoring, assessment and classification of chemical status in surface water bodies

4.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

4.1.1 Monitoring of chemical status in surface waters

Monitoring sites and monitored water bodies used for monitoring of chemical status

Member States implement surveillance and operational monitoring programmes in accordance with the requirements of the WFD and of the EQS Directive, for the assessment of ecological status/potential and chemical status.

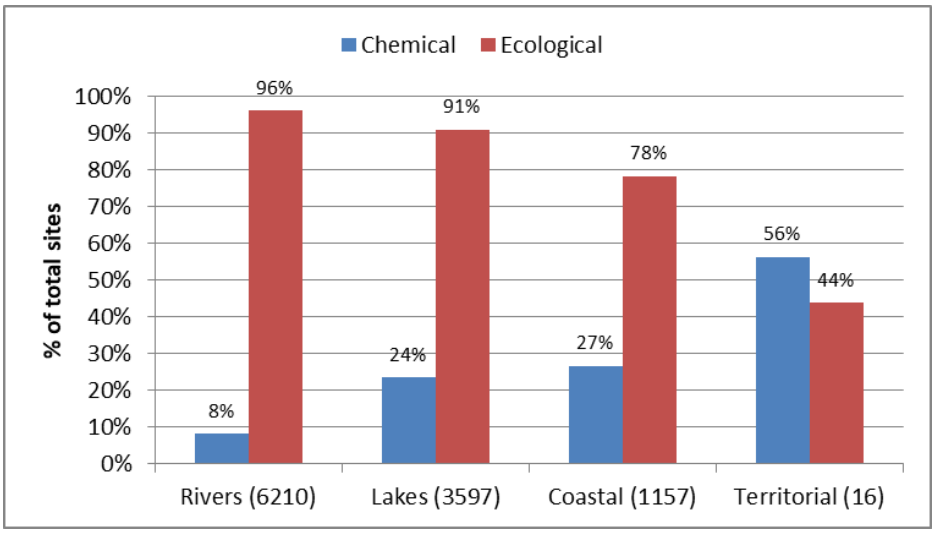
Surveillance monitoring programmes should allow Member States to supplement and validate the impact assessment procedure, to efficiently and effectively review the design of their monitoring programmes, and to assess the long-term changes in natural conditions and those resulting from widespread anthropogenic activity. For operational purposes, monitoring is required to establish the status of waterbodies identified as being at risk of failing to meet their environmental objectives, and to assess any changes in the status of such waterbodies resulting from the PoM.

Section 3.1.1 of this report summarises the characteristics of the surveillance and operational monitoring programmes in Sweden for the second RBMP.

Figure 41 summarises the proportion of sites used for the monitoring of chemical status in lakes and rivers for the second RBMP. In this figure, no distinction is made between sites used for surveillance and/or operational purposes. More detailed information can be found on the website of the European Environment Agency[31].

[31] https://www.eea.europa.eu/publications/state-of-water

Figure 4.1 ***Proportion of sites used for monitoring of chemical status and, for comparison, ecological status, in Sweden. The number in parenthesis next to the category is the total number of monitoring sites irrespective of their purpose.***



Source: WISE electronic reporting

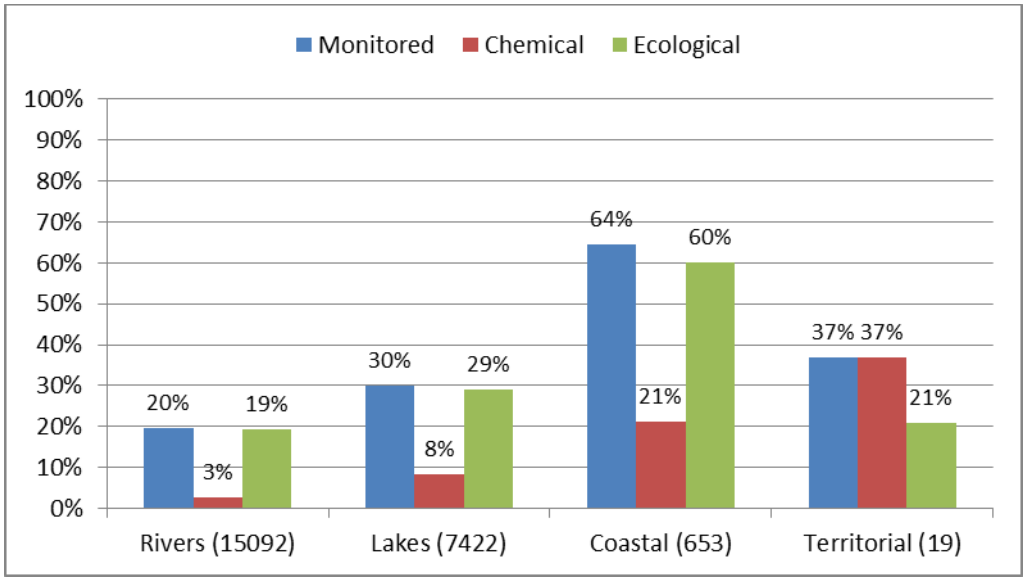
A total of 96 % of sites are used for monitoring the ecological status of rivers and 91 % for lakes but only 8 % and 24 % respectively are used for the monitoring of chemical status. In coastal and territorial waters 78 % and 44 % of sites are used for ecological status with 27 % and 56 % respectively for chemical status. In all water categories, the proportion of monitoring sites used for chemical status is low, in particular compared to the proportion of monitoring sites used for ecological status.

In the first RBMPs, transitional waters were designated and territorial waters were not. Sweden stated that the chemical status of territorial waters and coastal water bodies were evaluated jointly, and the status was attributed to the coastal water bodies. In the second RBMPs, transitional waters were no longer delineated and territorial waters were monitored and their status assessed (see section 2.1.1 of this report for further details).

Figure 4.2 summarises the proportion of water bodies monitored for chemical status in surface waters for the second RBMP. In this figure, no distinction is made between sites used for surveillance and/or operational purposes. Also given is the proportion of water bodies monitored for any purpose and, for comparative purpose, those for ecological status.

In all water categories, almost all of the surface water bodies monitored are monitored for ecological status. The proportion monitored for chemical status is significantly lower (3 %, 8 % and 21 % of water bodies in rivers, lakes and coastal waters respectively).

Figure 4.2 ***Proportion of total water bodies in each category which are monitored, monitored for chemical status and, monitored for ecological status, in Sweden. The number in parenthesis next to the category is the total number of water bodies in that category.***



Source: WISE electronic reporting

For the second RBMP, for surface waters in the selected RBDs (Bothnian Bay, Bothnian Bay (Torne), Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs), there appears to be a higher proportion of sites monitored for Priority Substances under surveillance monitoring (15 % of total sites monitored) than operational monitoring (7 % of total sites monitored). In these RBDs a third or less of the water bodies failing to achieve good chemical status (5 % of the waterbodies failing to achieve good status) are monitored for Priority Substances as part of the operational monitoring programme.

In comparing the number of sites and water bodies monitored between the first and the second RBMPs, for operational monitoring there is a 445 decrease in monitoring sites and a 110 increase in water bodies. For surveillance monitoring, the number of sites has increased by 2069 and the number of water bodies has increased by 1106 since the first RBMP. Information from one RBD is missing: Bothnian Sea (Trondelagsfylkene). Note that these numbers include surface water bodies reported as being monitored for chemicals and may include those

monitored for River Basin Specific Pollutants in addition to those monitored for Priority Substances.

Long-term trend monitoring and monitoring of Priority substances in water, sediment and biota for status assessment

Monitoring for status assessment

Requirements

Article 8(1) of the WFD requires Member States to establish monitoring programmes in order to provide inter alia a coherent and comprehensive overview of water status within each RBD. The amount of monitoring undertaken in terms of priority substances, frequency and numbers of sites should be sufficient to obtain a reliable and robust assessment of status. According to the EQS Directive (version in force in 2009), mercury, hexachlorobenzene and hexachlorobutadiene have to be monitored in biota for status assessment, unless Member States derived a standard for another matrix, which is at least as protective as the biota standard.

Spatial coverage

With regard to the monitoring of the 41 Priority Substances in water, for six selected RBDs (Bothnian Bay, Bothnian Bay (Torne), Bothnian Sea, North Baltic Sea, South Baltic Sea, Skagerrak and Kattegat) more than 66 % of coastal water bodies are not monitored for any Priority Substances while for the Bothnian Sea RBD 9 % are monitored for more than 10 Priority Substances. For rivers in these RBDs, 90 % to 99 % of water bodies are not monitored for any Priority Substances; for lakes in these RBDs, 67 % to 99 % of water bodies are not monitored for Priority Substances. More precisely, for the Bothnian Sea (Trondelagsfylkene), Bothnian Bay (Nordland), Bothnian Bay (Troms) and Skagerrak and Kattegat (Glomma) RBDs, none of the lake and river water bodies are monitored for any Priority Substance. For the Bothnian Bay, Bothnian Bay (Torne) and Bothnian Sea RBDs, over 97 % or more territorial waters are not monitored for Priority Substances.

Mercury, hexachlorobutadiene and hexachlorobenzene are monitored in biota and sediment for status assessment. Mercury is monitored in biota and/or sediment at up to 25 sites in coastal waters, up to 32 sites in lakes; up to 16 sites in rivers and up to five sites in territorial waters in most RBDs. Hexachlorobutadiene is monitored at seven sites in coastal waters (sediment only), up to seven sites in lakes, up to three sites in rivers but not in territorial waters in some RBDs. Hexachlorobenzene is monitored at up to seven coastal and lake water sites, up to three river water sites and up to five sites in territorial waters in some RBDs.

Frequencies

The WFD indicates that, for the surveillance and operational monitoring of Priority Substances in water, the frequency of monitoring should be at least monthly for one year during the RBMP cycle and at least monthly every year, respectively. Monitoring in biota for status assessment should take place at least once every year according to the EQS Directive. In all cases greater intervals can be applied by Member States if justified on the basis of technical knowledge and expert judgement.

Monitoring frequencies are reported for up to 37 groups of Priority Substances in water at the site level with frequencies ranging from 1 to 12 times per year and from at least once per cycle to once every 10 years. Of these groups, 28 Priority Substances are monitored at the site level with a frequency of 12 times per year and these are monitored each year in the cycle; this is consistent with the minimum guideline frequencies for surveillance and operational monitoring.

The monitoring frequencies in biota and/or sediments meet the recommended minimum frequencies in some but not in all monitoring sites.

Monitoring of long-term trend assessment

Requirements

Article 3(3) of the EQS Directive (version in force in 2009) requires Member States to monitor 14 priority substances[32] that tend to accumulate in sediment and/or biota, for the purpose of long-term trend assessment. Monitoring should take place at least once every three years, unless technical knowledge and expert judgment justify another interval.

Spatial coverage

Sweden reported in WISE that arrangements are in place for the long-term trend analysis of concentrations of those Priority Substances that tend to accumulate in sediment and/or biota in all RBDs.

Sweden has monitored 13 of the required 14 Priority Substances in sediment and/or biota based on information reported for RBDs: Bothnian Bay, Bothnian Bay (Torne), Bothnian Sea,

[32]Anthracene, brominated diphenylether, cadmium, C10-13 chloroalkanes, DEHP, fluoranthene, hexachlorobenzene, hexabutadiene, hexachlorocyclohexane, lead, mercury, pentachlorobenzene, PAH, Tributyltin.

North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat (the only RBDs for which information is provided). The full suite of 13 substances is only monitored in sediment in the North Baltic Sea RBD with 3 to 12 Priority Substances monitored in the other RBDs. The full suite of 13 substances is only monitored in biota in the Skagerrak and Kattegat RBD with the remainder monitoring seven to eight substances. Chloroalkanes C10-13 are not monitored in any RBD.

However, for both sediment and biota, information reported to WISE indicated that out of the six RBDs, all substances were monitored for status assessment rather than trend analysis or both. This apparently contradictory reporting indicates that the arrangements for long-term trend analysis are unclear. Sweden subsequently clarified that the data in sediment and biota are used fro trend analysis as well, but this may not have been properly reported to WISE.

Frequencies

Sweden did not report monitoring frequencies for sediment or biota monitoring in relation to trend analysis.

Monitoring of Priority Substances that are discharged in each RBD

Annex V of the WFD states, in Section 1.3.1 (Design of surveillance monitoring), that "Surveillance monitoring shall be carried out for each monitoring site for a period of one year during the period covered by a RBMP for [*inter alia*]: priority list pollutants which are discharged into the river basin or sub-basin." Section 1.3.2 (Design of operational monitoring) of the directive states that "In order to assess the magnitude of the pressure to which bodies of surface water are subject Member States shall monitor for those quality elements which are indicative of the pressures to which the body or bodies are subject. In order to assess the impact of these pressures, Member States shall monitor as relevant [*inter alia*]: all priority substances discharged, and other pollutants discharged in significant quantities."

Member States are therefore required to monitor all Priority Substances which are discharged into the river basin or sub-basin.

Only the Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs reported on the number of substances in the inventory, which ranged from only 6 to 12 Priority Substances.

Information reported to WISE indicates that all Priority Substances in inventories are discharged and monitored in the Bothnian Sea, North Baltic Sea, South Baltic Sea and

Skagerrak and Kattegat RBDs. However, the Bothnian Bay RBD has a single substance that is discharged but is not monitored: di(2-ethylhexyl)phthalate (DEHP). The RBMPs indicate that all substances in inventories are monitored. No information however on inventories, what is discharged or what is monitored is reported for the other RBDs.

Performance of Analytical methods used

In Sweden, for 38 Priority Substances the analytical methods used meet the minimum performance criteria laid down in Article 4(1) of Directive 2009/90/EC[33] for the strictest standard applied. For the remaining three priority substances reported, the analytical methods complied with the requirements laid down in Article 4(2) of Directive 2009/90/EC for the strictest standard applied.

The method of dealing with measurements of Priority Substances that are lower than the limit of quantification is as specified in Article 5 of Directive 2009/90/EC.

4.1.2 Chemical Status of surface water bodies

Member States are required to report the year on which the assessment of chemical status is based. This may be the year that the surface water body was monitored. In case of grouping this may be the year in which monitoring took place in the surface water bodies within a group that are used to extrapolate results to non-monitored surface water bodies within the same group. For Sweden, the assessment of chemical status was undertaken between 1975[34] and 2013.

The chemical status of surface water bodies in Sweden for the second RBMP is illustrated in Map 4.1. This is based on the most recent assessment of status.

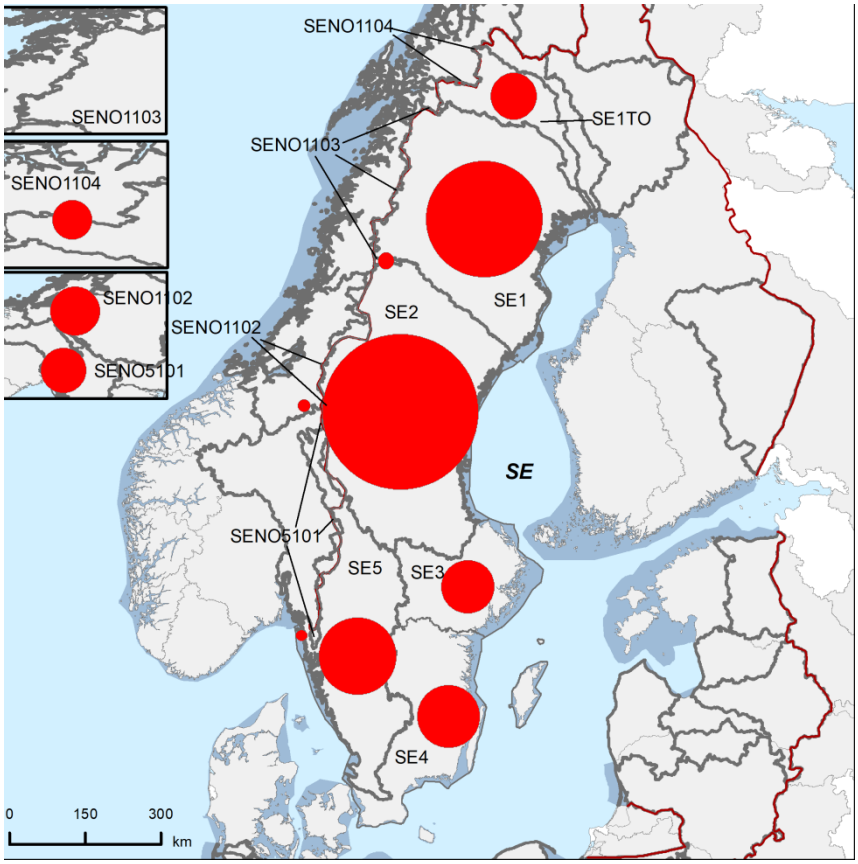
The chemical status of lakes and rivers in Sweden for the first and second RBMP is given in Table 4.1.

[33] Directive 2009/90/EC of 31 July 2009 laying down, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water status http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1524565750309&uri=CELEX:32009L0090

[34] Sweden subsequently informed that 1975 is a reporting error.

Map 4.1 ***Chemical status of surface water bodies in Sweden based on the most recent assessed status of the surface water bodies***

Note: Standard colours based on WFD Annex V, Article 1(4)(3)



Source: WISE, Eurostat (country borders)

Good
Failing to achieve to good
Unknown
River Basin Districts
Countries outside the EU

Table 4.1 ***Chemical status of surface water bodies in Sweden for the second and first RBMP. NB - 1) the number in parenthesis next to the water category is the number of water bodies; 2) Sweden reported chemical status in the second RBMP based on the standards laid down in EQS Directive 2013/39/EC (version in force on 13 August 2013). Sweden reported chemical status in the first RBMP based on the standards laid down in EQS Directive 2008/105/EC (version in force on 13 January 2009).***

Category	Good		Failing to achieve good		Unknown	
	Number	%	Number	%	Number	%
Second RBMP						
Lakes (7422)			7422	100 %		
Rivers (15072)			15091	99.90 %	1 (0)	0.01 %
Coastal (653)			653	100 %		
Territorial (19)			19	100 %		
Total (23186)			23185	100 %	1 (0)	0 %
First RBMP						
Lakes (7232)	3	0.04 %	7229	99.96 %		
Rivers (15563)			15563	100 %		
Coastal (602)			602	100 %		
Territorial (21)			21	100 %		
Total (23418)	3	0 %	23415	100 %		

Source: WISE electronic reporting

Sweden subsequently clarified that all surface water bodies failed to achieve good status.

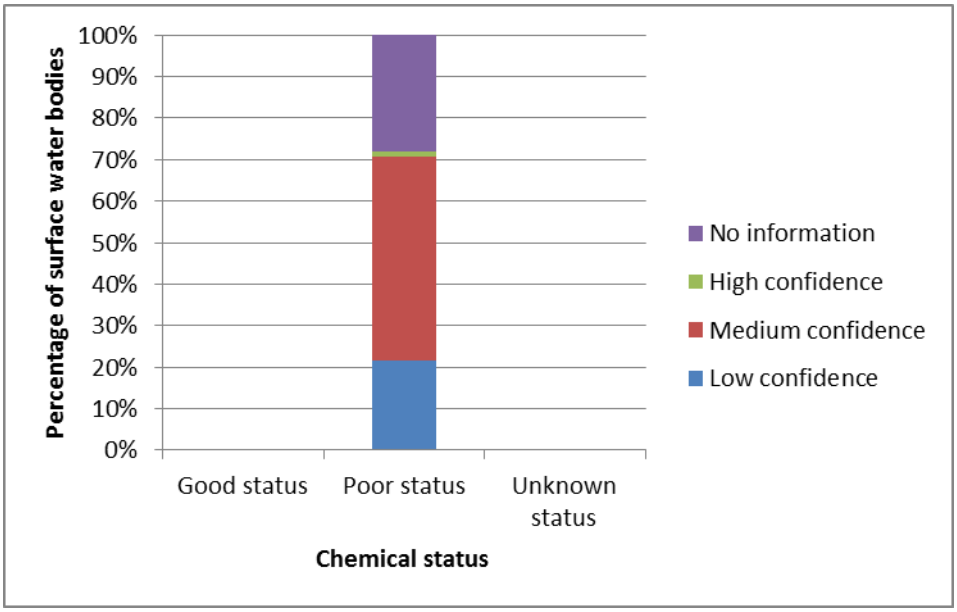
Overall between the two cycles, despite a small decrease in the number of surface water bodies delineated in Sweden as a whole from 23 418 to 23 186, the proportion of water bodies failing to achieve good chemical status has remained constant at nearly 100 % with three lake water bodies classified in good status in the first RBMP now failing to achieve good status and one river water body unknown status in the second RBMP. The chemical assessments were carried out in the period 2008-2013 for Bothnian Bay, Bothnian Bay (Troms), Bothnian Bay (Nordland), Bothnian Sea (Trondelagsfylkene), Skagerrak and Kattegat (Glomma) and Bothnian Bay (Torne), 2005-2013 for Bothnian Sea, 1975[7] -2013 for North Baltic Sea, 2000-2013 for South Baltic Sea and 1975[7]-2014 for Skagerrak and Kattegat.

With regards to the basis of the classification of chemical status, the majority of coastal water bodies are classified but not monitored for more than two thirds of all RBDs (Bothnian Bay,

Bothnian Bay (Torne), Bothnian Sea, North Baltic Sea, South Baltic Sea, Skagerrak and Kattegat) with the rest of these RBDs classified and monitored. All of the lake water bodies in the Bothnian Bay, Bothnian Sea, North Baltic Sea and South Baltic Sea RBDs are classified but not monitored, likewise for greater than two thirds of the other six RBDs while the remaining proportions are classified and monitored. More than 90 % of all river water bodies across the 10 RBDs were classified but not monitored with the remaining proportions monitored and classified except for one river water body in the North Baltic Sea RBD. All of the surface water bodies in the Bothnian Bay, Bothnian Sea, North Baltic Sea and South Baltic Sea RBDs were classified using expert judgement and found to be failing to achieve good status. The vast majority of surface water bodies for the other six RBDs were classified via expert judgement, all of which again were found to be failing to achieve good status with grouping and monitoring underpinning classification for 0.3 and 4.3 % of surface water bodies respectively. The RBMPs indicated that the exceedance of the mercury environmental quality standard in biota and that for brominated diphenylethers (where monitored) were extrapolated to all surface water bodies resulting in the observed assessment of chemical status. Where monitoring data was used, the RBMPs indicate that the one-out-all-out principle for used in the assessment of chemical status.

Figure 4.3 shows the confidence in the classification of chemical status for the second RBMPs. Overall 49 % of surface water bodies in Sweden were classified for chemical status with medium confidence, 22 % with low confidence and only 1 % with high confidence. The remainder (28 %) had no information.

Figure 4.3 Confidence in the classification of chemical status of surface water bodies in Sweden based on the most recently assessed status/potential



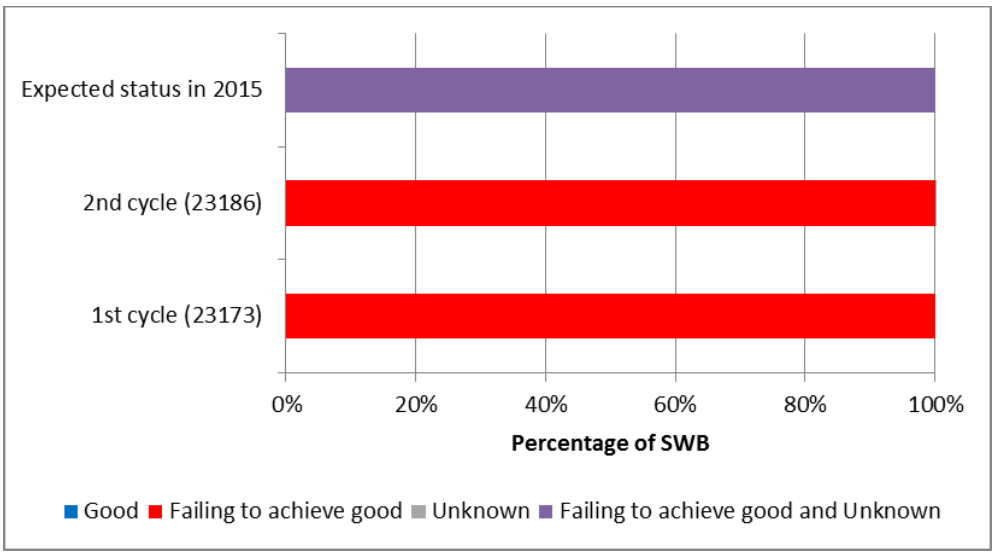
Source: WISE electronic reporting

The RBMPs referred to a national document describing a scale from A-D, where A= Good quality and D = Poor quality for confidence and precision of classifications. However, it is unclear how these classes translate into the low, medium and high confidence levels reported to WISE[35]. Confidence in the classification of chemical status for the first RBMPs was not reported.

Figure 4.4 compares the chemical status of surface water bodies in Sweden for the first RBMP with that for the second RBMP (based on the most recent assessment of status) and that expected by 2015. There was no change in the proportion of surface water bodies classified as failing to achieve good for the second RBMP compared to the first cycle with all failing and is consistent with expectations by the end of 2015.

[35] Sweden subsequently clarified that the methodology for classifications of confidence and precision is described in detail in RBMP Annex 1, p 16-20 for all RBDs.

Figure 4.4 ***Chemical status of surface water bodies in Sweden for the second RBMP, for the first RBMP and expected in 2015. The number in the parenthesis is the number of surface water bodies for both cycles. NB - The period of the assessment of status for the second RBMP was 1975[7] to 2013. The year of the assessment of status for first RBMP is not known***



Source: WISE electronic reporting

The assessment of chemical status for the second RBMP was expected to be based on the standards laid down in EQS Directive 2008/105/EC (version in force on 13 January 2009[36]). Sweden did implement the Directive in the first RBMPs and reported chemical status based on those standards. However, Sweden assessed chemical status in the second RBMP based on the standards laid down in EQS Directive 2013/139/EC (version in force on 13 August 2013) which sets more stringent environmental quality standards for seven substances[37].

Member States were requested to indicate if the new standard caused the status of the surface water body to appear to deteriorate. Sweden reported that 17 water bodies appeared to deteriorate due to the more stringent standard for lead and one water body for more stringent

[36] Following Directive 2013/39/EU, which amended the Environmental Quality Standards Directive, introduced a less stringent annual average Environmental Quality Standard for naphthalene in transitional and coastal waters. This less stringent environmental quality standard should be taken into account for the determination of surface water chemical status by the 2015 deadline laid down in Article 4 of the WFD.

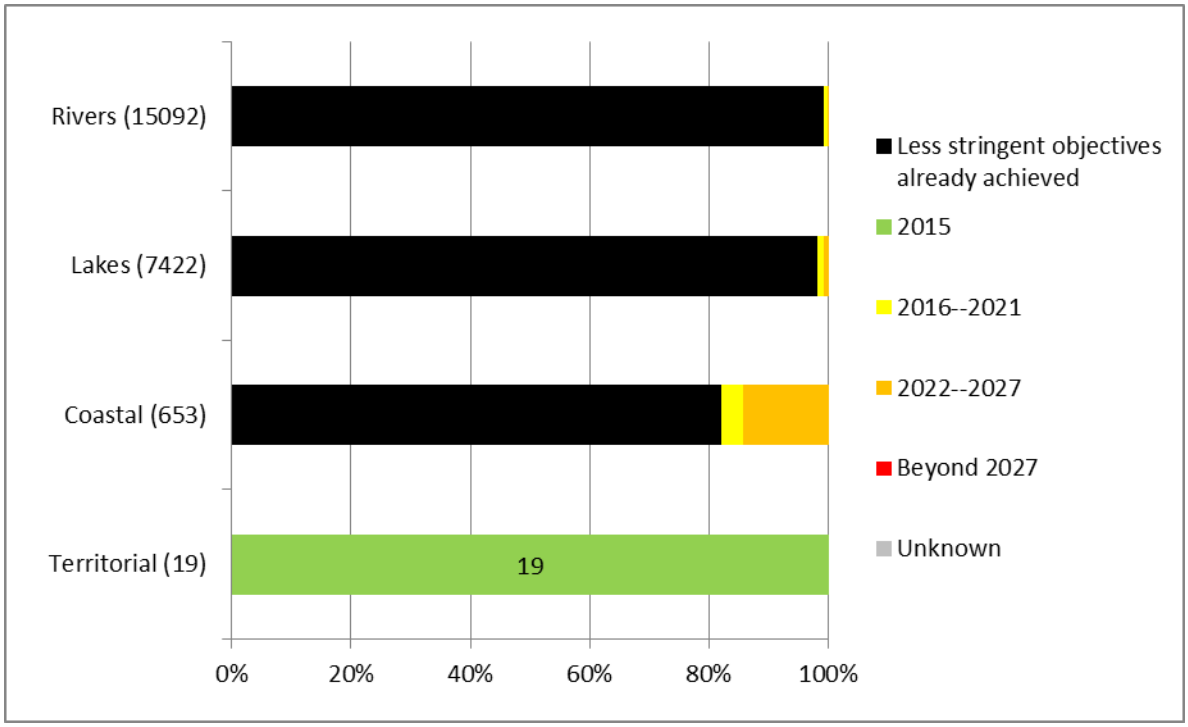
[37] Anthracene, Brominated diphenylether, Fluoranthene, Lead and its compounds, Naphthalene, Nickel and its compounds, Polyaromatic hydrocarbons (PAH)

standards for fluroanthene, nickel and brominated diphenylethers. More information on the chemical status in each RBD and water category can be found on the website of the European Environment Agency[38].

Good chemical status should be reached by 2021 in relation to the revised environmental quality standards, unless Member States apply exemptions under WFD Article 4(4) or less stringent objectives under WFD Article 4(5). Member States were asked to report the expected date for the achievement of good chemical status. The information for Sweden is shown in Figure 4.5. Good chemical status of surface water bodies is expected to be achieved by the end of the third planning cycle for all RBDs: 98 % of surface water bodies in Sweden have already either achieved good status or less stringent objectives (applied mainly for mercury and the brominated diphenylethers). The expected or actual improvement in the chemical status of surface water bodies at the end of the first cycle was reported to be less than described in the RBMP but only the Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs have reported this information.

[38] https://www.eea.europa.eu/publications/state-of-water

Figure 4.5 ***Expected date of achievement of good chemical status of surface water bodies in Sweden. The number in the parenthesis is the number of water bodies in each category***

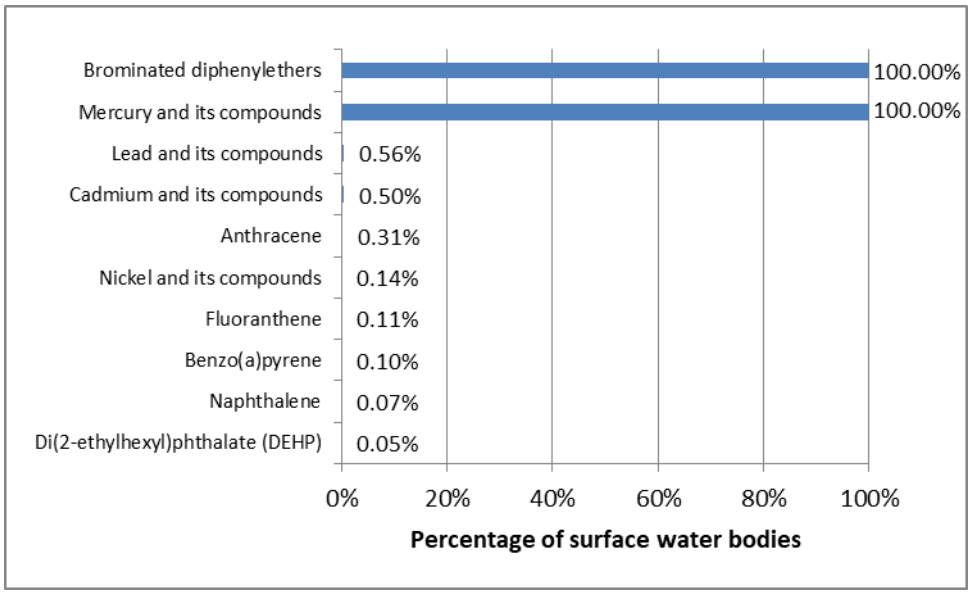


Source: WISE electronic reporting

Priority substances causing the failure of good chemical status

It was reported that 22 Priority Substances are causing failure to achieve good chemical status in surface water bodies in Sweden. The "top-ten" substances are shown in Figure 4.6. The substances causing the greatest proportion of water bodies to fail good chemical status were brominated diphenylethers (congener numbers 28, 47, 99, 100, 153 and 154) (100 %) and mercury and its compounds (100 %).

Figure 4.6 ***The top-ten Priority Substances causing failure to achieve good chemical status in surface water bodies in Sweden. NB - Sweden reported chemical status in the second RBMP based on the environmental quality standards in the amended EQS Directive.***



Source: WISE electronic reporting

Overall for surface water bodies in Sweden, the largest proportion of exceedances were for the annual average - environmental quality standards for brominated diphenylethers (congener numbers 28, 47, 99, 100, 153 and 154) (100 %) and mercury and its compounds (100 %).

Overall in Sweden there are 10 Priority Substances that were reported to have improve the water status from failing to achieve good to good chemical status since the first RBMP. For example, improvements to chemical status of waterbodies were as a result of cadmium (0.2 % of total surface water bodies), lead (0.05 %), nickel (0.02 %) and nonylphenol (0.15 %).

Ubiquitous persistent, bioaccumulative and toxic Priority Substances

According to article 8(a) of the EQS Directive[39], eight priority substances and groups of priority substances are behaving like ubiquitous, persistent, bioaccumulative and toxic substances[40]. These substances are generally expected to cause widespread exceedances, and their emissions can be challenging to tackle (e.g. due to long-range atmospheric transport and deposition). In order to show the progress made in tackling other priority substances, Member

[39] Amended by Directive 2013/39/EU

[40] Brominated diphenylether, Mercury and its compounds, Polyaromatic hydrocarbons (PAH), Tributyltin, PFOS, dioxins, hexabromocyclodecane and heptachlor

States have the possibility to present the information related to chemical status separately for these substances.

The assessment of chemical status for the surface waters in Sweden is driven primarily by the exceedance of the biota environmental quality standard for mercury and that for brominated diphenylethers[41] in water bodies where these are monitored and other water bodies to which this classification has been extrapolated. Mercury and brominated diphenylethers are ubiquitous persistent, bioaccumulative and toxic Priority Substances. Consequently, the influence of these substances on the failure of good chemical status in Sweden is significant. This is illustrated in the 2018 State of Water report of the European Environment Agency[42].

Priority substances used in the assessment of chemical status compared to those monitored

Sweden reports that all 41 Priority Substances are used in the assessment of chemical status across all 10 RBDs. However, not all of these substances are monitored in each of the RBDs: none of these substances was monitored in the Bothnian Sea (Trondelagsfylkene), Bothnian Bay (Nordland) and Bothnian Bay (Troms) RBDs, two of these substances were monitored in the Skagerrak and Kattegat (Glomma) RBD; nine of these substances was monitored in the Bothnian Bay (Torne) RBD; 16 of these substances was monitored in the Bothnian Bay RBD with the remaining RBDs monitoring the full suite of substances in at least one surface water body. The reported use of more Priority Substances in the classification of chemical status than are monitored in some RBDs is consistent with the reported widespread use of expert judgement and grouping in the assessment of chemical status.

Application of alternative environmental quality standards for water, biota and sediment

According to the EQS Directive, Member States may opt to apply environmental quality standards for another matrix than the one specified in the directive for a given substance. If they do so, they have to ensure the environmental quality standard they set in the other matrix (or matrices) offers at least the same level of protection as the standard established in the directive.

[41] Sweden has used the environmental quality standards in Directive 2013/39/EU for the assessment of chemical status in the second RBMP.

[42] https://www.eea.europa.eu/publications/state-of-water (p40-41 of the report). Also available in a more interactive format at :
https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_SWB_Chemical_Status_Maps/SWB_Failing_Good_Chemical_Status_RBD?iframeSizedToWindow=true&:embed=y&:showAppBanner=false&:display_count=no&:showVizHome=no

While WISE reporting indicated that for 25 of 41 Priority Substances the Environmental Quality Standards laid down in Part A of Annex I of the Directive 2008/105/EC[43] for assessment of the chemical status of bodies of surface water had been applied and used in the assessment of chemical status, Sweden later clarified that those from the later version of the Directive (20132/39/EU) had been applied for 33 Priority Substances.. For the remaining eight Priority Substances[44], Sweden reported that alternative and/or additional standards have been applied. Sweden subsequently clarified that the standards, with the exception of tributyltin, were based on the sediment and biota standards from the environmental quality standard. For tributyltin, Sweden has developed a national standard based on scientific publications and developed in line with Common Implementation Strategy guidance[45].

Use of mixing zones

Article 4 of the EQS Directive provides Member States with the option of designating mixing zones adjacent to points of discharge in surface waters. Concentrations of priority substances may exceed the relevant environmental quality standard within such mixing zones if they do not affect the compliance of the rest of the surface water body with those standards. Member States that designate mixing zones are required to include within their RBMPs a description of the approaches and methodologies applied to define such zones, and a description of the measures taken to reduce the extent of the mixing zones in the future.

Mixing zones have not been designated for any of the 10 RBDs in Sweden.

Background Concentrations and Bioavailability

The EQS Directive stipulates that Member States have the possibility, when assessing the monitoring results against the environmental quality standard, to take into account:

> (a) natural background concentrations for metals and their compounds, if they prevent compliance with the environmental quality standard, and;

[43] Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02008L0105-20130913

[44] Lead, cadmium, tributyltin, anthracene and fluoranthene in sediment and chloroalkanes C10-C13, DEHP and pentachlorobenzene in biota

[45] N° 27 - Deriving Environmental Quality Standards

(b) hardness, pH or other water quality parameters that affect the bioavailability of metals.

Natural background concentrations for metals and their compounds are taken into consideration where such concentrations prevent compliance with the relevant Environmental Quality Standard in all 10 RBDs of Sweden.

No information for any of the RBDs was reported on the application of water quality parameters that affect the bioavailability of metals when assessing monitoring results against relevant Environmental Quality Standards in any of the RBDs.

4.2 Main changes in implementation and compliance since the first cycle

In the first cycle, transitional waters were designated and territorial waters were not. In the second cycle, transitional waters were no longer delineated and territorial waters were. Territorial waters were monitored for chemical status included in the assessment of chemical status.

In comparing the number of sites and water bodies monitored for operational monitoring purposes between the first RBMP and second RBMP there is a 445 decrease in monitoring sites and a 110 increase in water bodies. Sweden subsequently clarified that only monitoring sites used for status assessment were included in the reporting for the second RBMP whereas all relevant monitoring sites were reported for the first RBMP regardless of whether they were used for status assessment. When it comes to surveillance monitoring, the number of sites has increased by 2 069 and the number of water bodies has increased by 1 106 since the first RBMP. Note that these numbers include surface water bodies reported as being monitored for chemicals and may include those monitored for River Basin Specific Pollutants in addition to those monitored for Priority Substances.

Sweden has monitored the majority of Priority Substances in the recommended matrices but not in all RBDs. A large proportion of surface water bodies are not monitored with assessments of chemical status extrapolated from monitored water bodies. Sweden has applied the Environmental Quality Standards listed in Annex I of the EQS Directive (version in force in 2013) for 33 Priority Substances but is using alternative standards for the remaining eight substances.

Overall between the two cycles, despite a small decrease in the number of surface water bodies delineated in Sweden as a whole from 23 418 to 23 186, the proportion of water bodies failing

to achieve good chemical status has remained constant at 99 % with three lake water bodies classified in good status in the first RBMP now failing to achieve good status in the second cycle.

Information on Priority Substances causing failure of good chemical status for the first RBMP was not systematically reported making comparison with the second cycle difficult. However, examination of the first RBMPs showed that mercury was causing the greatest failure in Sweden with 100 % of surface water bodies failing good chemical status affected.

4.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

- Assessment: With regards to chemical status, the assessment of status retains a high degree of uncertainty with overall 49 % of surface water bodies in Sweden classified with medium confidence, 22 % with low confidence and only 1 % with high confidence; the remainder (28 %) had no information reported. Confidence in the classification of chemical status for the first RBMPs was not reported. This recommendation has been partially fulfilled.

- Recommendation: *The described monitoring programme is not designed to be WFD compliant, but is a continuation of previous monitoring programmes (e.g. operational monitoring for groundwater bodies is missing and no or very few sites are monitored for botanical biological quality elements and hydromorphology quality elements in both surveillance and operational mode). The RBMPs need for instance to be more transparent regarding which Priority Substances are monitored. The justifications for not monitoring certain quality elements are not adequate. Improvement of the monitoring programme to make it fully WFD compliant is on-going and is planned to be ready by 2012.*

  Assessment: With respect to chemical status in surface waters, Sweden has monitored the majority of Priority Substances in the recommended matrices but not in all RBDs.

A large proportion of surface water bodies are not monitored with assessments of chemical status extrapolated from monitored water bodies. Sweden monitors all Priority Substances included in inventories and discharged with the exception of DEHP in the Bothnian Bay RBD. Monitoring is undertaken in all relevant matrices (see assessment of recommendation below). Sweden has applied the Environmental Quality Standards listed in Annex I of the EQS Directive (version in force in 2013) for 33 Priority Substances but is using alternative standards for the remaining eight substances. This recommendation is partially fulfilled.

- Recommendation: *The apparent omission of data on hexachlorobenzene and hexachlorobutadiene should be checked. The requirement for trend monitoring of several Priority Substances in sediment or biota as specified in EQS Directive Article 3(3) will need to be reflected in the next RBMPs.*

  Assessment: Hexachlorobenzene is monitored in sediment and biota but not in all RBDs and hexachlorobutadiene is monitored in sediment, biota and water. For status assessment, these Priority Substances are monitored at up to seven monitoring sites at frequencies consistent with the minimum guideline in the Directive. For the assessment of long-term trends, Sweden reports that arrangements are in place for the long-term trend analysis of concentrations of those Priority Substances listed in Part A of Annex I of the EQS Directive that tend to accumulate in sediment and/or biota However, for both sediment and biota, further information reported to WISE indicated that out of the six RBDs, 13 of the required 14 substances were monitored for status assessment rather than trend analysis or both. Sweden subsequently clarified that the relevant substances were monitored in sediment and /or biota for trend assessment, but this hasn't been properly reported to WISE. This recommendation is partially fulfilled.

Topic 5 **Monitoring, assessment and classification of quantitative status of groundwater bodies**

5.1 Assessment of implementation and compliance with WFD requirements in the second cycle

5.1.1 Monitoring of quantitative status in groundwater

The total number of groundwater bodies in Sweden is 3311 (Table 2.3). The vast majority, i.e. 3249 groundwater bodies are not subject to monitoring for quantitative status (Table 5.1). This means that 98 % of groundwater bodies are not monitored. Only between 0 % and 4 % of the groundwater bodies in the RBDs are subject to monitoring for quantitative status[46].

The number of groundwater bodies increased by 10 % from 3023 in the first RBMP to 3311 in the second cycle but the total groundwater body area remained almost the same. 3002 groundwater bodies remained unchanged since the first cycle.

The number of monitored groundwater bodies increased from 38 in the first cycle to 62 in the second cycle. The number of monitoring sites in groundwater bodies is shown in Table 5.2, and the proportion of groundwater bodies monitored for quantitative status is listed in Table 5.3. This shows an increase from 79 in the first cycle to 109 in the second cycle. The number of monitoring sites and their purpose is listed in Table 5.2.

1010 of 3311 groundwater bodies are identified as Drinking Water Protected Areas, allocated in all RBDs.

[46] Sweden subsequently clarified that other sources of information other than WFD monitoring have been used in the initial risk assessment of quantitative status. These include measurements/assessments on groundwater quantity made by the municipal water works (water works posing the main abstraction pressure in many groundwater bodies). These data are not part of the WFD monitoring program and have not been reported as such but constitute a valuable basis for risk assessment.

Table 5.1 Number of groundwater bodies in Sweden directly monitored and the purpose of monitoring

RBD	Total groundwater bodies directly monitored	Monitoring Purpose					
		CHE - Chemical status	DRI – Groundwater abstraction site for human consumption	DWD - Drinking water - WFD Annex IV.1.i	OPE - Operational monitoring	QUA - Quantitative status	SUR - Surveillance monitoring
SE1	73	69	0	60	5	6	69
SE1TO	19	19	0	16	0	1	19
SE2	120	116	1	87	17	9	116
SE3	125	120	0	107	33	8	120
SE4	223	217	0	176	81	27	217
SE5	180	179	0	157	64	11	179
SE5101	2	2	0	1	0	0	2

Source: WISE electronic reporting

Table 5.2 Number of groundwater monitoring sites in Sweden and their purpose

RBD	Total groundwater monitoring sites	Monitoring Purpose					
		CHE - Chemical status	DRI – Groundwater abstraction site for human consumption	DWD - Drinking water - WFD Annex IV.1.i	OPE – Operational monitoring	QUA – Quantitative status	SUR – Surveillance monitoring
SE1	104	93	0	82	9	11	93
SE1TO	25	19	0	16	0	6	19
SE2	152	136	1	97	17	16	136
SE3	189	177	0	162	44	13	177
SE4	383	362	0	293	190	39	362
SE5	313	295	0	265	115	24	295
SE5101	2	2	0	1	0	0	2

Source: WISE electronic reporting

Table 15.3 Proportion of groundwater bodies in Sweden monitored for quantitative status

RBD	No of groundwater bodies with quantitative monitoring	Total No. groundwater bodies	% of total groundwater bodies monitored for quantitative status
SE1	6	622	0.96 %
SE1TO	1	74	1.35 %
SE2	9	832	1.08 %
SE3	8	574	1.39 %
SE4	27	667	4.05 %
SE5	11	539	2.04 %
SE5101	0	2	0.00 %
SE1103	0	1	0.00 %

Source: WISE electronic reporting

5.1.2 Assessment and classification of quantitative status for groundwater

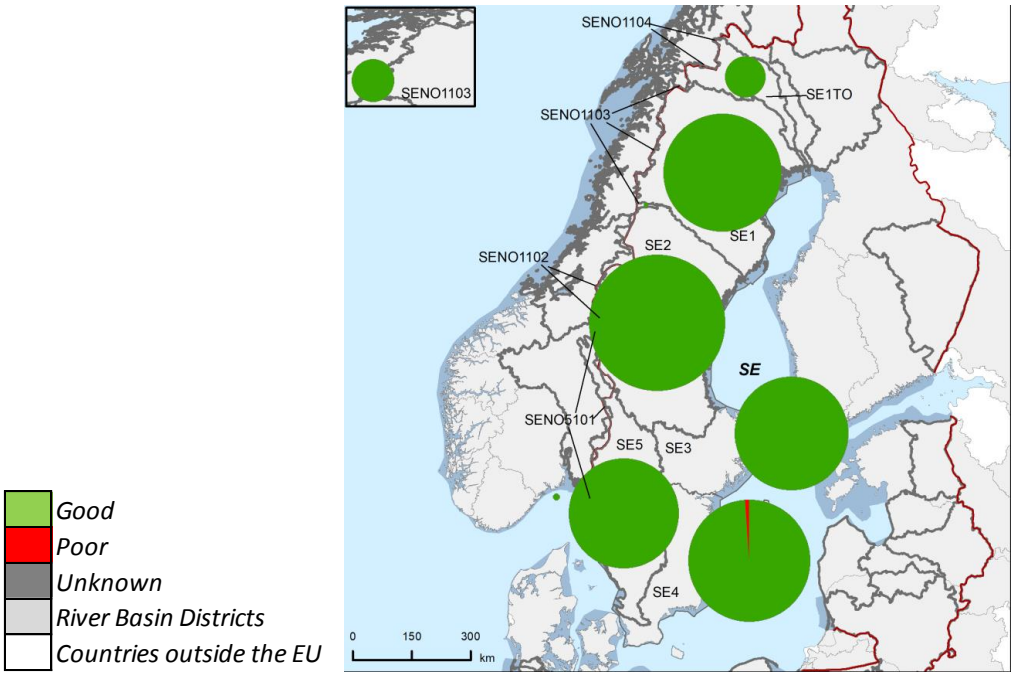
Map 5.3 displays the most recently assessed quantitative status of groundwater bodies based on status. It shows that 3302 of 3311 groundwater bodies (99.7 %) were of good quantitative status and nine (0.3 %) are failing good status (Figure 5.1). In terms of area, this means that about 5.6 % are failing good quantitative status. Figure 5.2 shows the confidence in status classification. For 87 % of the groundwater bodies, the level of confidence in the status results is unknown. All groundwater bodies have a clear status, in the second RBMP. This situation improved compared to the first RBMP, in which 391 groundwater bodies (10 % in terms of the total groundwater body area) were of unknown status.

The total number of groundwater bodies failing good quantitative status increased from five groundwater bodies in the first to nine in the second RBMP but in terms of groundwater body area, the situation almost remained the same with 5.4 % groundwater body area failing good quantitative status in the first and 5.6 % in the second RBMP.

For all eight RBDs, water balance was assessed by using reliable information on groundwater levels across the groundwater body.

The reasons for the failure of good quantitative status of groundwater bodies are shown in Figure 5.3. All nine groundwater bodies are failing good status due to failing the water balance test, which means that the long-term annual average rate of groundwater abstraction is exceeding the available groundwater resource. The expected date of achievement of good quantitative in Sweden is shown in Figure 5.4, with all groundwater bodies expected to achieve good status by 2021.

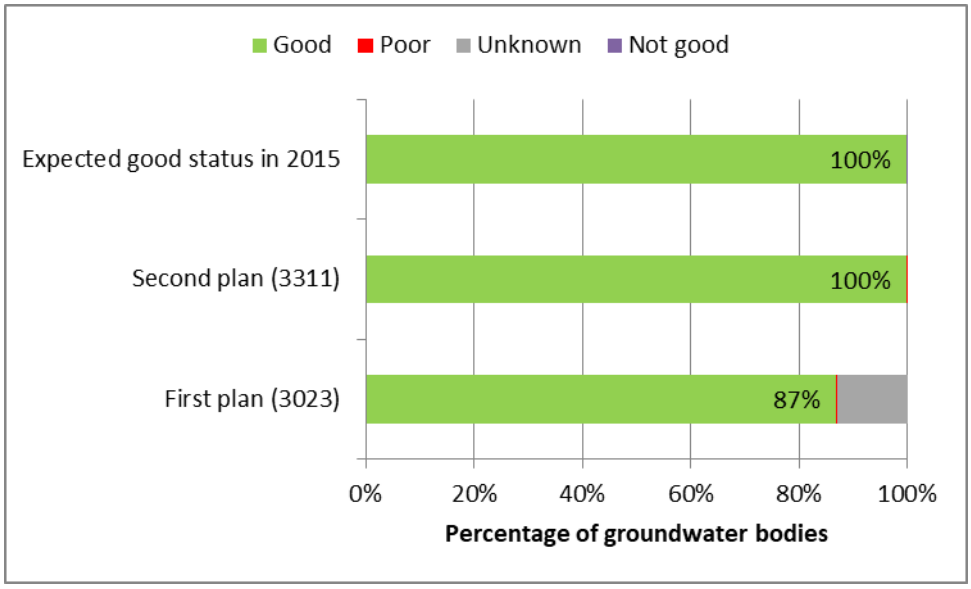
Map 5.3 ***Map of the most recently assessed quantitative status of groundwater bodies***



Note: Standard colours based on WFD Annex V, Article 2(2)(4).

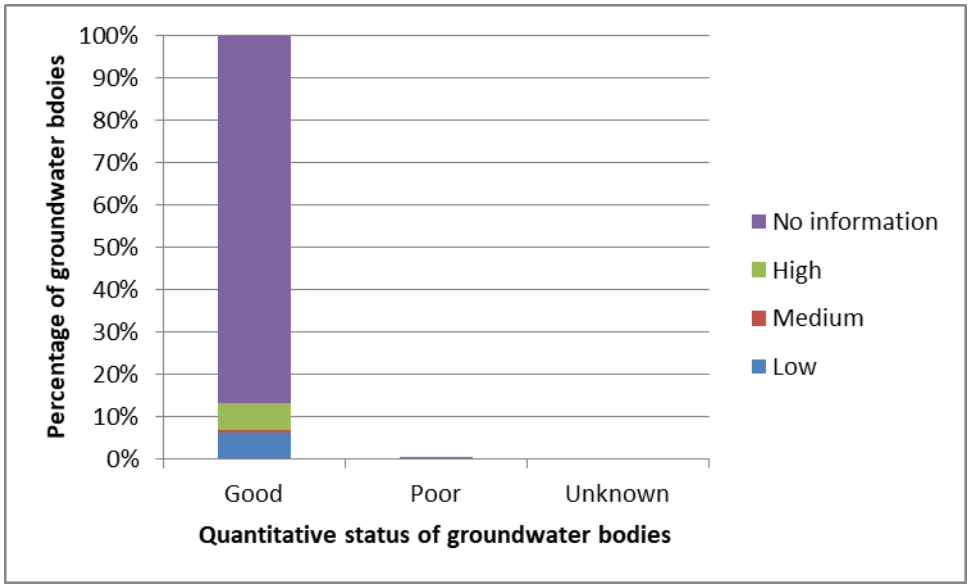
Source: WISE, Eurostat (country borders)

Figure 5.1 ***Quantitative status of groundwater bodies in Sweden for the second RBMP, for the first RBMP and expected in 2015. The number in parenthesis is the number of groundwater bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2009 to 2013. The year of the assessment of status for the first RBMP is not known***



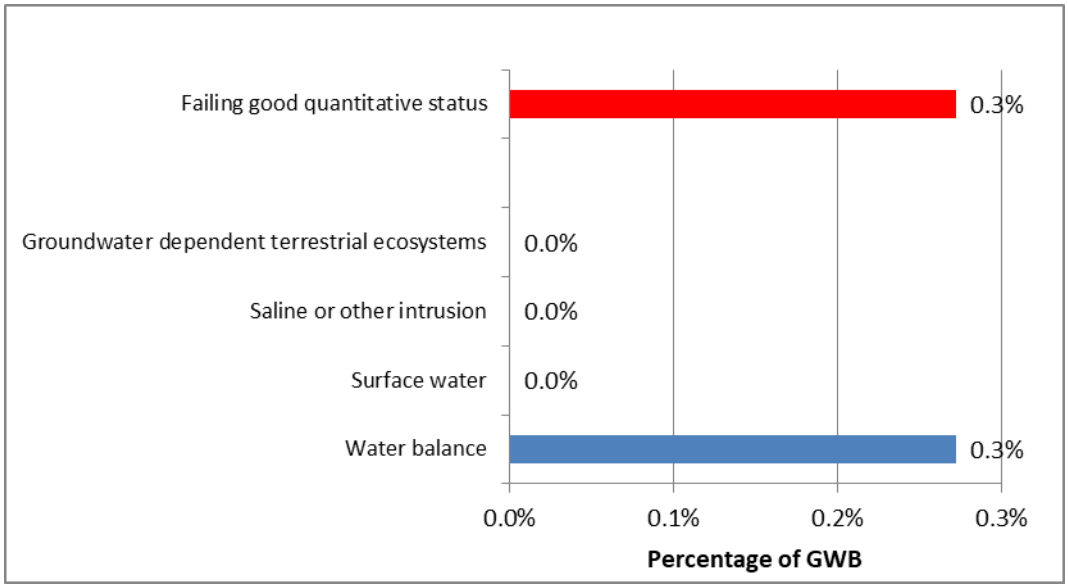
Source: WISE electronic reporting

Figure 5.2 Confidence in the classification of quantitative status of groundwater bodies in Sweden based on the most recent assessment of status



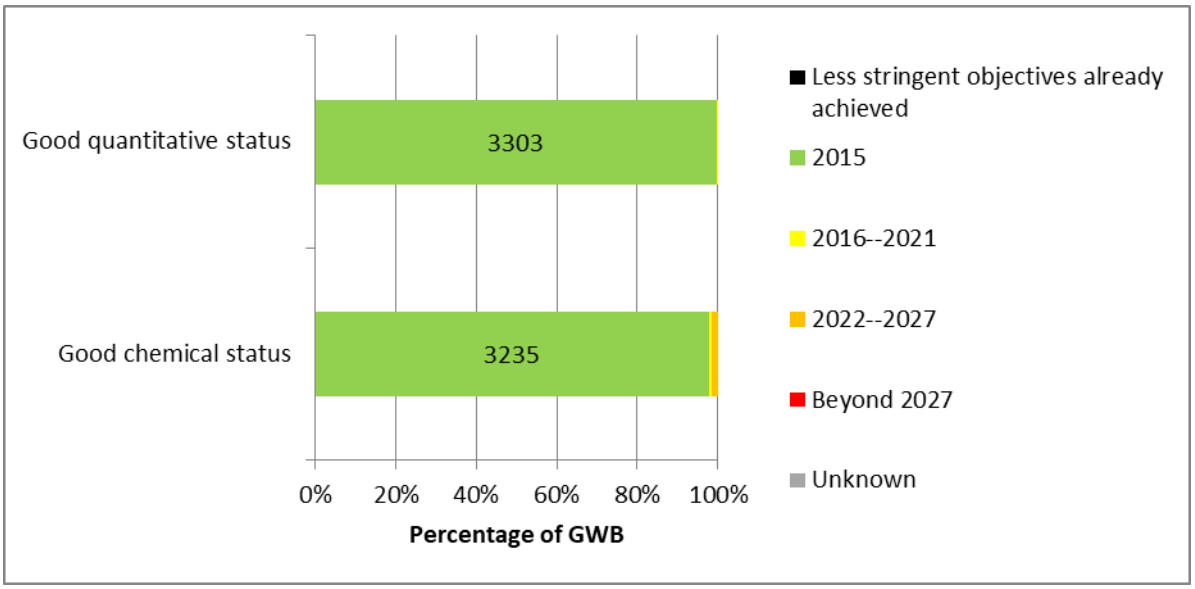
Source: WISE electronic reporting

Figure 5.3 Reasons for the failure of good quantitative status of groundwater in Sweden based on the most recent assessment of status



Source: WISE electronic reporting

Figure 5.4 ***Expected date of achievement of good quantitative and good chemical status of groundwater bodies in Sweden. 3311 groundwater bodies delineated for second RBMP***



Source: WISE electronic reporting

In all eight RBDs the criterion of 'available groundwater resource' has been partially applied in accordance with WFD Article 2(27).

With regard to environmental objectives, only water balance and saline intrusion were considered in status assessment in all RBDs.

In total, 63 groundwater bodies (2 %) are at risk of failing good quantitative status due to harm to actual or potential legitimate uses or functions of groundwater.

5.1.3 Consideration of groundwater associated surface waters and/or groundwater dependent ecosystems

Groundwater associated surface waters and groundwater dependent terrestrial ecosystems are reported for six of eight RBDs, and there are no such ecosystems in Bothnian Bay (Nordland) and Skagerrak and Kattegat (Glomma). They are not related to risk and they were not considered in status assessment. Also the needs of the terrestrial ecosystems have not been considered in any RBD.

5.2 Main changes in implementation and compliance since the first cycle

The number of groundwater bodies increased by about 10 % from 3023 to 3311. 3002 groundwater bodies remained unchanged since the first RBMP.

The monitoring situation has improved. The number of monitoring sites increased as well as the number of monitored groundwater bodies (from 38 to 62 groundwater bodies).

The status situation did not change. The number of groundwater bodies failing good status increased but the affected groundwater body area remained almost the same. Now all groundwater bodies are of a clear status which is a significant improvement since the first RBMP where 391 had unknown status.

There is a summary of changes or updates for this topic in all the RBMPs assessed. A number of relevant guidelines from the Swedish Geological Survey were updated in 2013 and 2014 - e.g. delineation of groundwater bodies, expert judgements etc. The description is found in an Annex to the RBMP describing the methods and work flow for the second cycle.

5.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendations: "*The described monitoring programme is not designed to be WFD compliant, but is a continuation of previous monitoring programmes (e.g. operational monitoring for groundwater bodies is missing and no or very few sites are monitored for botanical BQEs and HyMo QEs in both surveillance and operational mode). The RBMPs need for instance to be more transparent regarding which priority substances are monitored. The justifications for not monitoring certain quality elements are not adequate. Improvement of the monitoring programme to make it fully WFD compliant is on-going and is planned to be ready by 2012."*

- *"The knowledge base on groundwater should significantly be improved in Sweden. Enhanced and robust groundwater monitoring should be established based on WFD requirements. WFD based methodologies should be used to assess groundwater status correctly. Water body specific measures should be considered in the PoMs."*

- "*Sweden needs to complete the initial characterisation, to enable the establishment of WFD compliant monitoring networks. It is important to complete this first stage of the*

WFD implementation process to ensure cost effective implementation of subsequent steps."

Assessment: The number of monitoring sites was increased from 79 to 109 and the number of monitored groundwater bodies was increased from 38 to 62 which still only represents 2 % of all the groundwater bodies. In two RBDs (with only one and two groundwater bodies) there is still no monitoring. Therefore this part of the recommendation is partially fulfilled.

The part of the recommendation concerning the status assessment methodology cannot be assessed as not enough information on progress regarding this recommendation could be found in the second RBMPs[47].

- Recommendation: *Article 6 Groundwater Directive exemptions can only be used if efficient groundwater monitoring is established (Artice 6(3) Groundwater Directive).*

  Assessment: Article 6 of the Groundwater Directive has not been applied in the second cycle in Sweden and therefore the recommendation is not applicable.

[47] Sweden subsequently clarified, that the status assessment methodology has been further developed and the guidelines were published by the Swedish Geological Survey in 2014.

Topic 6 Monitoring, assessment and classification of chemical status of groundwater bodies

6.1 Assessment of implementation and compliance with WFD requirements in the second cycle

6.1.1 Monitoring of chemical status in groundwater

The total number of groundwater bodies in Sweden is 3311 (Table 2.3). In total 2589 (78 %) groundwater bodies are not subject to surveillance monitoring (Table 5.1). 611 groundwater bodies (19 %) are at risk and 200 are subject to operational monitoring

The number of groundwater bodies increased by 10 % from 3023 in the first cycle to 3311 in the second RBMP but the total groundwater body area remained almost the same. 3002 groundwater bodies remained unchanged since the first RBMP.

The number of groundwater bodies with surveillance monitoring doubled from 358 in the first cycle to 722 in the second cycle. The number of monitoring sites is listed in Table 3.9 and shows a significant increase from 456 surveillance monitoring sites in the first cycle to 1084 in the second RBMP. The number of operational monitoring sites has been increased significantly since the first RBMP, from 15 to 375.

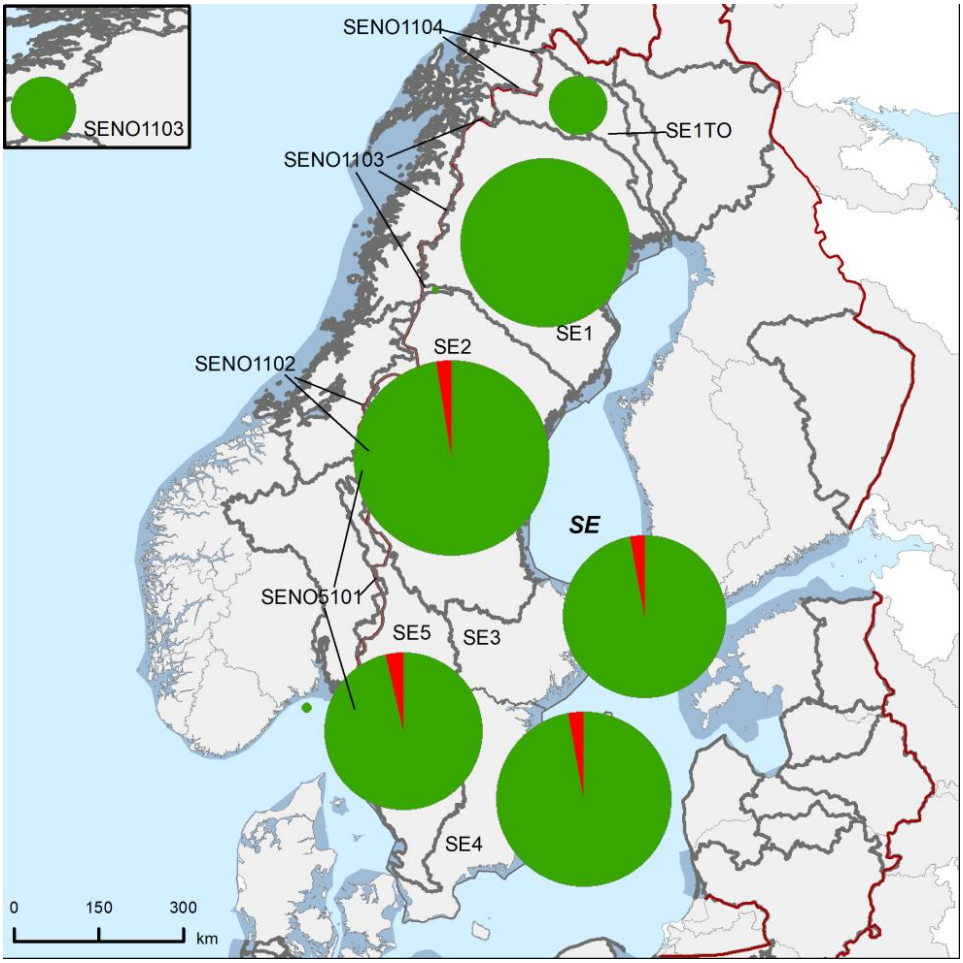
Not all substances causing risk of deterioration in chemical status are subject to surveillance monitoring. Except for dissolved oxygen and pH, all remaining WFD core parameters (nitrate, ammonium and electrical conductivity) are monitored.[48] In the Skagerrak and Kattegat (Glomma) RBD, conductivity is also not monitored.

6.1.2 Assessment and classification of chemical status in groundwater

Map 6.1 and Figure ***6.1*** display the chemical status of groundwater bodies for the most recently assessed status. It shows that 3235 of 3311 groundwater bodies (98 %) were of good chemical status, and the remaining 76 groundwater bodies (2 %) are failing good status. In terms of area, this means that about 6 % are failing good chemical status. Figure 6.2 shows the confidence in status classifications which is quite low or even unknown for the majority of the groundwater body areas. All groundwater bodies had, and still have a clear status, in the first and in the second RBMP.

[48] Sweden subsequently clarified that there might have been a reporting error as pH for example is regularly monitored.

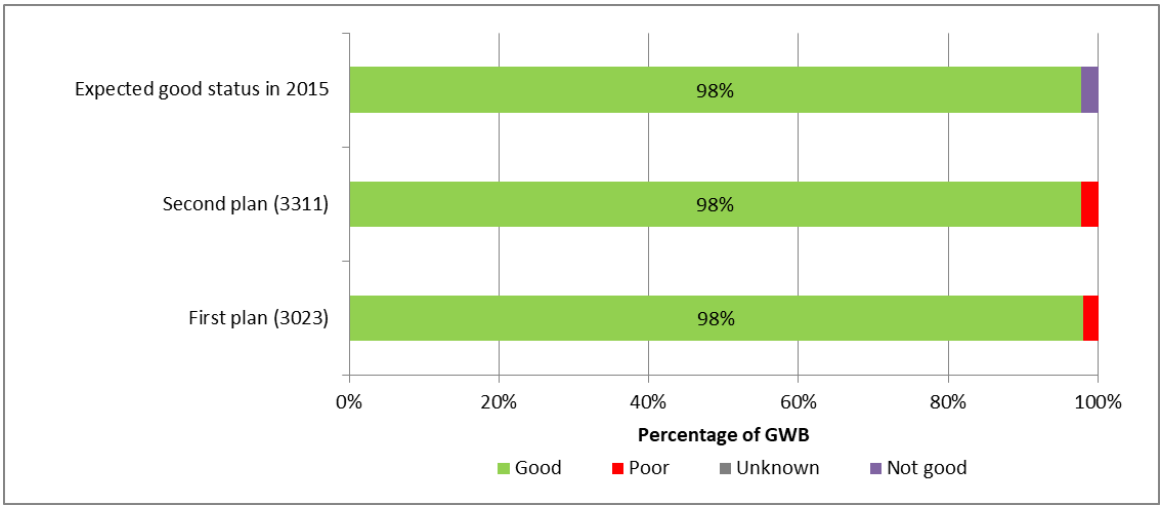
Map 6.1 Map of chemical status of groundwater bodies in Sweden based on the most recently assessed status of the groundwater water bodies



Good
Poor
Unknown
River Basin Districts
Countries outside the EU

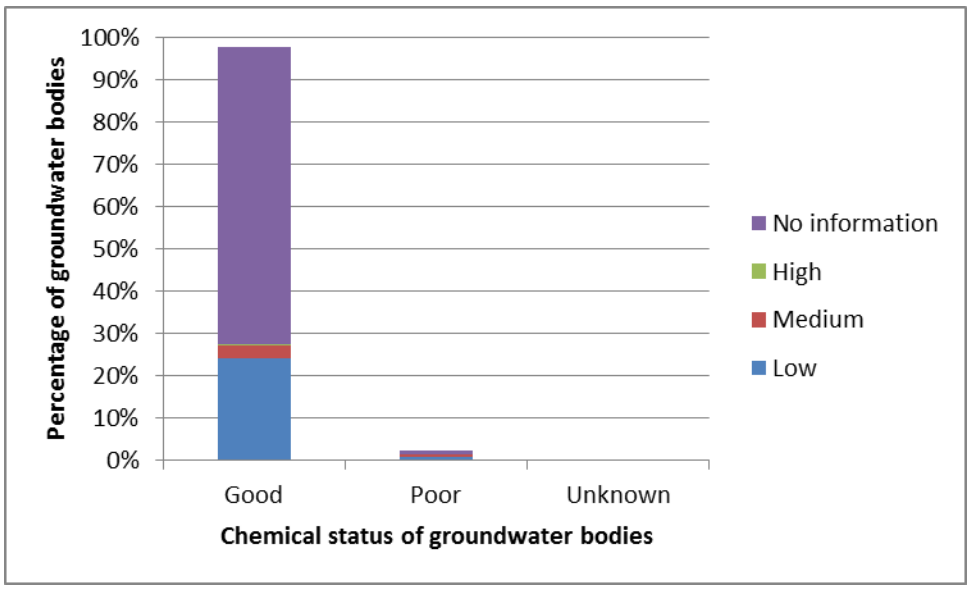
Note: Standard colours based on WFD Annex V, Article 2(4)(5).
Source: WISE, Eurostat (country borders)

Figure 6.1 ***Chemical status of groundwater bodies in Sweden for the second RBMP, for the first RBMP and expected in 2015. The number in the parenthesis is the number of groundwater bodies for both cycles. Note the period of the assessment of status for the second RBMP was 2004 to 2014. The year of the assessment of status for the first RBMP is not known***



Source: WISE electronic reporting

Figure 6.2 ***Confidence in the classification of chemical status of groundwater bodies in Sweden based on the most recent assessment of status***



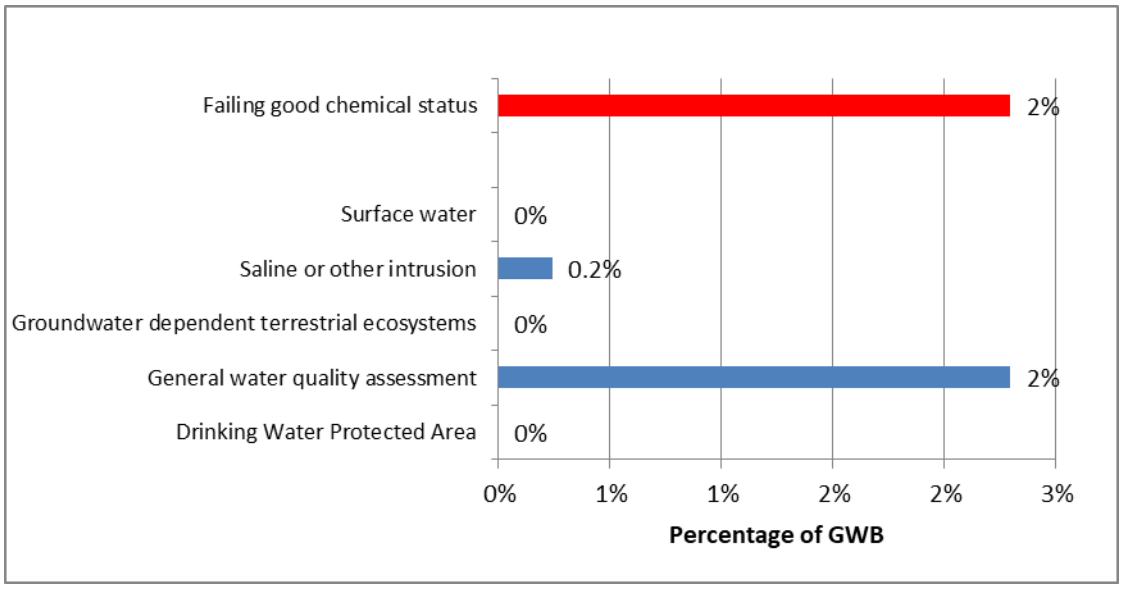
Source: WISE electronic reporting

The total number of groundwater bodies failing good chemical status increased since the first RBMP from 60 (2 %) to 76 (2 %) groundwater bodies (Figure ***25***) (reduction from 6.4 % to 6.1 % of the total groundwater body area). But also groundwater bodies in good status increased

from 2963 in the first cycle to 3235 in the second RBMP. The expected date of achievement of good chemical status in Sweden is shown in Figure 5.4.

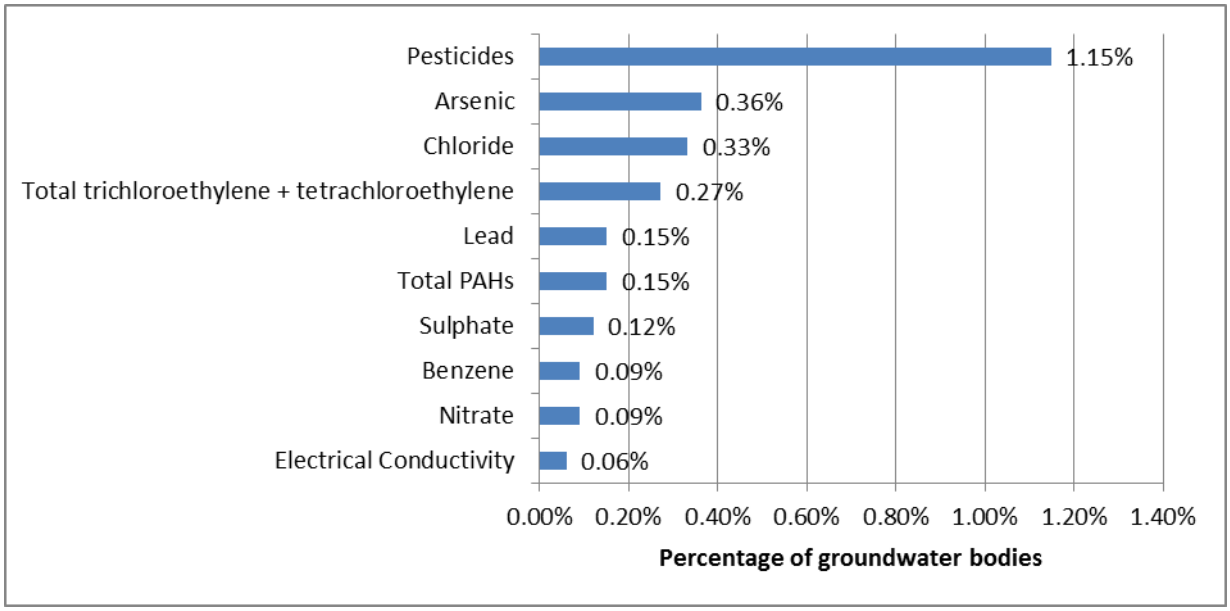
The reasons for the failure of good chemical status of groundwater bodies are shown in Figure 6.3. For 76 groundwater bodies, the general assessment of the chemical status for the groundwater body as a whole was failed. This assessment considers the significant environmental risk from pollutants across a groundwater body and a significant impairment of the ability to support human uses. Eight groundwater bodies are failing good chemical status due to saline or other intrusion. Figure 6.4 shows the top 10 pollutants causing failure of status and the pollutants causing a sustained upward trend.

Figure 6.3 Reasons for failing good chemical status in Sweden for the most recent assessment of status



Source: WISE electronic reporting

Figure 6.4 Top 10 groundwater pollutants causing failure of good chemical status in Sweden



Source: WISE electronic reporting

In all RBDs, the calculation of the extent of exceedance of a groundwater quality standard or a groundwater threshold value is based on the groundwater body area.

Groundwater threshold values have been established for all pollutants or indicators of pollution causing a risk of failure of good chemical status. The list of groundwater threshold values shows that the Groundwater Directive[49] Annex II substances have been considered. In all RBDs, natural background levels have been considered in the groundwater threshold value establishment.

A trend and trend reversal methodology is available and assessments have been performed in all RBDs.

6.1.3 Consideration of groundwater associated surface waters and/ or groundwater dependent ecosystems

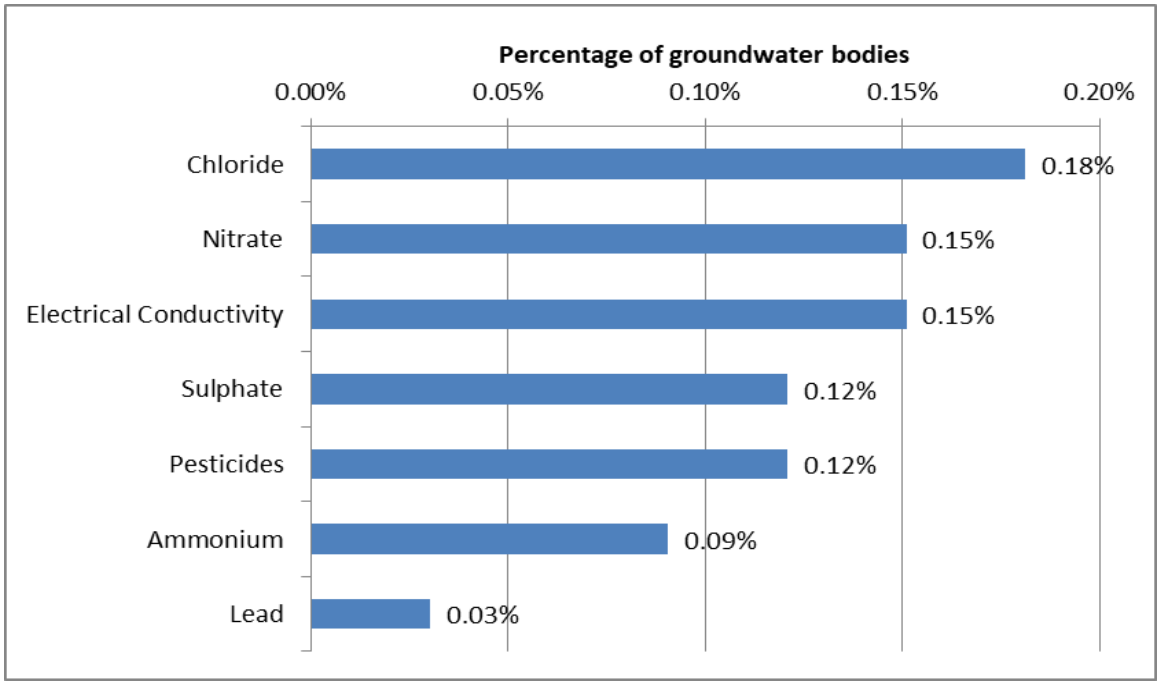
Groundwater associated surface waters and groundwater dependent terrestrial ecosystems are reported for six of eight RBDs, there are no such ecosystems in Bothnian Bay (Nordland) and

[49] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0118-20140711

the Skagerrak and Kattegat (Glomma) RBD. They are not related to risk and they were not considered in status assessment.

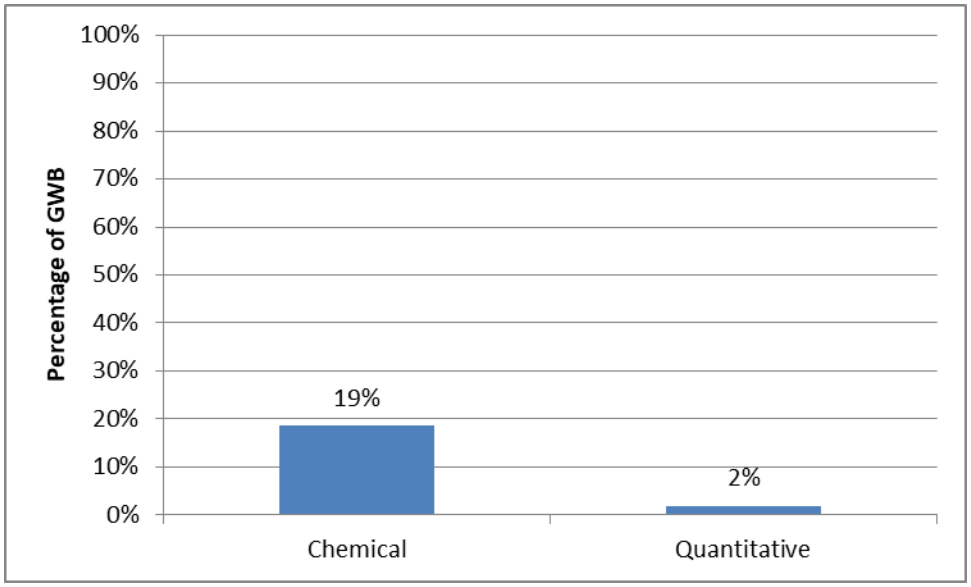
Groundwater associated aquatic ecosystems and groundwater dependent terrestrial ecosystems have not been considered in the establishment of groundwater threshold values. They are not related to risk. Figure 6.5 shows the seven pollutants with upward trends in groundwater bodies in Sweden. Figure 6.6 shows the percentage of groundwater bodies at risk of failing good chemical status and good quantitative status.

Figure 6.5 Top pollutants with upward trends in groundwater bodies in Sweden



Source: WISE electronic reporting

Figure 6.6 Percentage of groundwater bodies in Sweden at risk of failing good chemical status and good quantitative status for the second RBMP



Source: WISE electronic reporting

6.2 Main changes in implementation and compliance since the first cycle

The number of groundwater bodies increased by 10 % from 3023 in the first cycle to 3311 in the second RBMP but the total groundwater body area remained almost the same. 3002 groundwater bodies remained unchanged since the first RBMP.

The monitoring situation has improved. The number of monitored groundwater bodies as well as the number of surveillance monitoring sites doubled and the operational monitoring sites increased by 25 times.

There have been minor changes in the status situation. The number of groundwater bodies failing good status increased but the affected groundwater body area was slightly reduced, from 6.4 % to 6.1 % of the total groundwater body area.

There is a summary of changes or updates for this topic in all the RBMPs assessed. A number of relevant guidelines from the Swedish Geological Survey were updated in 2013 and 2014 - e.g. delineation of groundwater bodies, threshold values, expert judgements etc. The description is found in an Annex to the RBMP describing the methods and work flow for the second cycle.

6.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *The described monitoring programme is not designed to be WFD compliant, but is a continuation of previous monitoring programmes (e.g. operational monitoring for groundwater bodies is missing and no or very few sites are monitored for botanical biological quality elements and hydromorphology quality elements in both surveillance and operational mode). The RBMPs need for instance to be more transparent regarding which Priority Substances are monitored. The justifications for not monitoring certain quality elements are not adequate. Improvement of the monitoring programme to make it fully WFD compliant is on-going and is planned to be ready by 2012.*

  Assessment: For the aspect of this recommendation relevant to the chemical status of groundwaters, the number of surveillance monitored groundwater bodies as well as the number of surveillance monitoring sites doubled. The number of operational monitoring sites increased by 25 times and the number of groundwater bodies with operational monitoring increased from 13 to 200. Therefore the part of the recommendation concerning the improvement of groundwater monitoring is partially fulfilled.

- Recommendation: *The knowledge base on groundwater should be significantly improved in Sweden. Enhanced and robust groundwater monitoring should be established based on WFD requirements. WFD based methodologies should be used to assess groundwater status correctly.*

  Assessment: Surveillance monitoring is established in seven of eight RBDs (not in Bothnian Bay (Nordland) with one groundwater body) and operational monitoring is established in all five RBDs where groundwater bodies are identified at risk. Substances causing risk were identified and are covered by operational monitoring, but not completely. This part of the recommendation concerning enhanced monitoring is largely fulfilled.

  The part of the recommendation concerning the status assessment methodology cannot be fully assessed. A number of relevant guidelines from the Swedish Geological Survey were updated in 2013 and 2014 - e.g. delineation of groundwater bodies, threshold

values, expert judgements etc. These have not been assessed in detail; however, for example, at least groundwater associated aquatic and groundwater dependent terrestrial ecosystems, which exist, were neither considered in status assessment nor in the establishment of groundwater threshold values; but there is no related risk. Therefore not enough information on progress regarding this part of the recommendation could be found in the second RBMPs.

The part of the recommendation concerning the trend assessment methodology is fulfilled. Trend and trend reversal methodologies are available in all eight RBDs.

- Recommendation: *Article 6 Groundwater Directive exemptions can only be used if efficient groundwater monitoring is established (Article 6(3) Groundwater Directive).*

  Assessment: Article 6 of the Groundwater Directive[50] has not been applied in the second RBMP. Therefore this recommendation is fulfilled.

[50] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0118-20140711

Topic 7 Designation of Heavily Modified and Artificial Water Bodies and definition of Good Ecological Potential

7.1 Assessment of implementation and compliance with WFD requirements in the second cycle for designation

7.1.1 Designation of Heavily Modified and Artificial Water Bodies

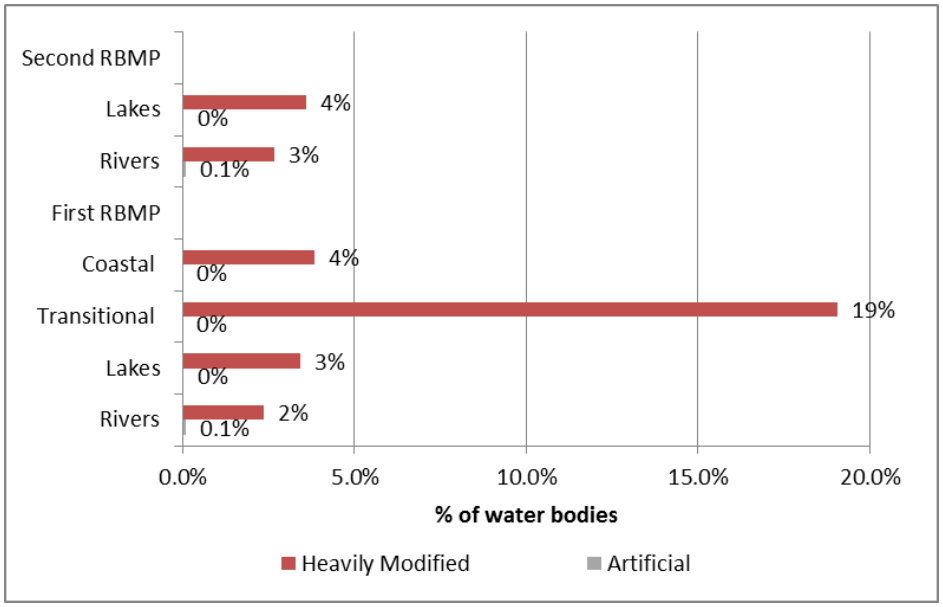
In the second cycle, heavily modified water bodies and artificial water bodies are designated in five RBDs (Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea, Skagerrak and Kattegat.

The WFD requires a review of designation every six years. As noted further below in this chapter, there have been modifications in the extent of designation of water bodies as heavily modified in several RBDs since the first RBMPs. However, Sweden subsequently clarified that the number of heavily modified water bodies has not changed, but that two designated water bodies have changed their identification in this second cycle (amended to the Norwegian identification). In the first RBMPs, four heavily modified water bodies were designated in the Bothnian Sea (Trondelagsfylkene) RBD but these have been de-designated in the second RBMP. At the same time, in the Bothnian Sea (Trondelagsfylkene) RBD, there were no heavily modified water body designations in the first RBMP but there are four heavily modified water body designations in the second RBMP. . However, Sweden subsequently clarified that the number of heavily modified water bodies has not changed, but that two designated water bodies have changed their identification in this second cycle (amended to the Norwegian identification).

In the Bothnian Sea and Skagerrak and Kattegat RBDs, the change in the number of river heavily modified water bodies is significant, increasing from 243 to 249 river heavily modified water bodies in Bothnian Sea and decreasing from 51 to 40 river heavily modified water bodies in the Skagerrak and Kattegat RBD. In the same two RBDs, there are also changes in the numbers of lake heavily modified water bodies. In the Bothnian Sea RBD, lake heavily modified water bodies increased from 119 to 167 and, in the Skagerrak and Kattegat RBD, lake heavily modified water bodies decreased from 41 to 12.

Figure 7.1 shows the proportion of total water bodies in each category in Sweden that has been designated as heavily modified or artificial.

Figure 7.1 Proportion of total water bodies in each category in Sweden that has been designated as heavily modified or artificial



Source: WISE electronic reporting

All of the coastal and transitional heavily modified water bodies designated in the first RBMP have been de-designated in the second RBMP.

No major changes are noted for artificial water bodies.

Several of the designated heavily modified water bodies are reservoirs. 120 water bodies are reservoirs which were originally rivers; 52 of these are designated as river heavily modified water bodies and 68 are designated as lake heavily modified water bodies. According to Common Implementation Strategy guidance on this issue, reservoirs which were originally rivers should all be designated as river heavily modified water bodies. There are also 107 water bodies which are reservoirs and were originally lakes. These are all designated as heavily modified water body lakes except one which is designated as a river heavily modified water body.

The main water use for which river and lake water bodies are designated as heavily modified water bodies is hydropower. The main physical alterations of river and lake heavily modified water bodies are weirs/dams/reservoirs.

Two new guidelines for the designation of heavily modified water bodies have been developed since the first RBMPs: a general guideline and one specific to hydropower. It is noted that these will be supplemented with more detailed guidance for other various activities that can lead to a water body being designated as heavily modified. The methodology addresses criteria for the identification of substantial change in character, the assessment of significant adverse effect on the use and explanations of how WFD Article 4(3)(b) has been applied (better environmental option).

Concerning the assessment of significant adverse effects, the guideline notes that different forms of data should be used to demonstrate whether measures have a significant negative effect on activities beyond natural variation. Furthermore, there will be in the future sector-specific guidelines for heavily modified water bodies specifying the benefits of different water uses and giving further guidance on how different measures can affect these.

The reason for the designation of most heavily modified water bodies in Sweden is hydropower production (in particular large-scale hydropower over 10 megawatts). In all cases of heavily modified water body designation, it has been deemed very difficult to achieve good ecological status unless the activities are significantly affected. The lack of designations due to other uses is related to the lack of national guidance on how water bodies affected by other water uses should be assessed from a heavily modified water body perspective.

7.1.2 Definition of good ecological potential for Heavily Modified and Artificial Water Bodies

Good ecological potential is reported as defined at water body level, following the Prague approach (based on the identification of mitigation measures).

Good ecological potential is reported as not defined in terms of biology, but other information reported in WISE indicates that biological values have been derived for fish to define maximum ecological potential and good ecological potential. In addition, a comparison between good ecological potential and good ecological status has been made, according to the WISE reporting.

Information in the RBMPs and background documents outline that the first step for the definition of good ecological potential is the definition of maximum ecological potential for biological quality elements. For the selection of relevant quality elements, a distinction is made between most similar category (river, lake, transition zone, or coastal waters) and similar hydomophology type for the water body. Overall, based on the information found, it is concluded that good ecological potential definition in terms of biology is foreseen in theory in

the relevant guidelines, but it has not been done yet in practice (as the measures for heavily modified water bodies have not been defined yet but will be in 2018). It is also indicated that additional guidelines will be developed in the future on the definition of maximum, good, moderate and poor ecological potential.

Biological quality element assessment methods sensitive to hydrological and morphological changes are reported only for rivers for the biological quality element fish. No sensitive methods are reported for lakes, coastal and transitional waters.

Mitigation measures for defining good ecological potential have been reported for five out of the six RBDs for which heavily modified water bodies and artificial water bodies have been reported (no mitigation measures are reported for Bothnian Sea (Trondelagsfylkene)). However, the RBMPs do not include a description of the ecological changes expected from the mitigation measures. At the same time, the programmes of measures contain no measures for water bodies classified as heavily modified water bodies or artificial water bodies for hydropower and the RBMPs indicate to future work planned within 2018 to define mitigation measures for good ecological potential.

The water authorities (in all districts) have started a project in 2016 in order to develop river basin-based plans of measures which would be used to identify the measures that are reasonable for achieving good ecological potential for heavily modified water bodies and artificial water bodies related to hydropower. These plans of mitigation measures would form the basis for decisions on environmental quality standards (good ecological potential) for heavily modified water bodies and artificial water bodies with regard to hydropower, which were planned for December 2018.

7.2 Main changes in implementation and compliance since the first cycle

As described above, there have been modifications in the extent of designation of water bodies as heavily modified in several RBDs since the first RBMPs. The changes in the designation of heavily modified water bodies are mainly related to new assessments following the new guidelines for heavily modified water bodies. A further review of whether there are more water bodies with conditions relevant for extended deadlines, less stringent objectives or designating them as artificial water bodies /heavily modified water bodies (e.g. for water bodies affected by small-scale hydropower) will be carried out in the near future.

Coastal water bodies have been reclassified from heavily modified water bodies to natural water bodies based on the new guidance on heavily modified water bodies. Less stringent

objectives for the hydromorpological quality elements have been applied instead for these water bodies that were previously designated as heavily modified water bodies. The transitional water bodies, previously designated as heavily modified water bodies, have also been reclassified as coastal waters, as it is not possible to distinctively separate them from nearby coastal waters.

As noted above, there have been methodological developments since the first RBMPs, with two guidelines developed in 2015 and 2016 for heavily modified water bodies in general and one specific to hydropower. However it is not specifically discussed how the methodology differs from the first RBMPs.

Concerning the definition of good ecological potential, it is not clear if specific improvements took place compared to the approach in the first cycle but there are several references to work scheduled by 2018 to complete the classification of heavily modified water bodies/ artificial water bodies.

7.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *The designation of heavily modified water bodies should comply with all the requirements of Article 4(3). The procedure for designation of heavily modified water bodies has not been followed. Water bodies exposed to major hydromorphology pressures like large hydro power installations and harbours have been designated as heavily modified water bodies/ artificial water bodies, whereas water bodies exposed to other hydromorphology pressures have only been designated as candidates for heavily modified water bodies/ artificial water bodies. The designations of the latter will be decided for the next planning cycle. The heavily modified water body designation process therefore needs to be completed before the next cycle. The assessment of significant adverse effects to the environment and the lack of significantly better environmental options should be specifically mentioned in the RBMPs. This is needed to ensure transparency of the designation process.*

  Assessment: In the second RBMPs, the reason for the designation of most heavily modified water bodies in Sweden is still hydropower production (in particular large-scale hydropower over 10 megawatts). The lack of designations due to other uses is related to the lack of national guidance on how water bodies affected by other water

uses should be assessed from a heavily modified water bodies-perspective. It is, however, mentioned that guidelines for the designation due to other water uses will be developed in the future. Two new guidelines developed since the first RBMPs address heavily modified water bodies in general and hydropower in specific. These guidelines address criteria for the identification of substantial change in character, the assessment of significant adverse effect on the use and explanations of how WFD Article 4(3)(b) has been applied (better environmental option).

Therefore, this recommendation has been partially fulfilled.

- Recommendation: *Measures for defining good ecological potential has furthermore not been defined for each individual heavily modified water bodies/AW - only general descriptions are provided of the possible measures.*

  Assessment: Work to define good ecological potential is still on-going; therefore this recommendation has not been fulfilled yet. The water authorities (in all districts) have started a project in 2016 in order to develop river basin based plans of measures which would be used to identify the measures that are reasonable for achieving good ecological potential for heavily modified water bodies and artificial water bodies related to hydropower. These plans of mitigation measures would form the basis for decisions on environmental quality standards (good ecological potential) for heavily modified water bodies and artificial water bodies with regard to hydropower, which were planned for December 2018.

Topic 8 **Environmental objectives and exemptions**

8.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

8.1.1 Environmental objectives

The environmental objectives are defined in Article 4 of the WFD. The aim is long-term sustainable water management based on a high level of protection of the aquatic environment. Article 4(1) defines the WFD general objective to be achieved in all surface and groundwater bodies, i.e. good status by 2015. Within that general objective, specific environmental objectives are defined for heavily modified water bodies (good ecological potential and good chemical status by 2015[51]), groundwater bodies (good chemical and quantitative status by 2015) and for Protected Areas (achievement of the objectives of the associated Directive by 2015 unless otherwise specified).

Environmental objectives for ecological and chemical status in surface water and quantitative and chemical status in groundwater have been reported in all RBDS.

Assessments of the current status of surface and groundwater bodies in Sweden are provided elsewhere in this report: for ecological status/potential of surface waters (Chapter 3); chemical status of surface waters (Chapter 4); quantitative status of groundwater bodies (Chapter 5); chemical status of groundwater bodies (Chapter 6); status of surface and groundwater bodies associated with Protected Areas (Chapter 15).

For the second cycle plans, Member States are required to report the date when they expect each surface and groundwater body to meet its environmental objective. This information is summarised for Sweden elsewhere in this report: for ecological status/potential of surface waters (Chapter 3); chemical status of surface waters (Chapter 4); quantitative status of groundwater bodies (Chapter 5); chemical status of groundwater bodies (Chapter 6).

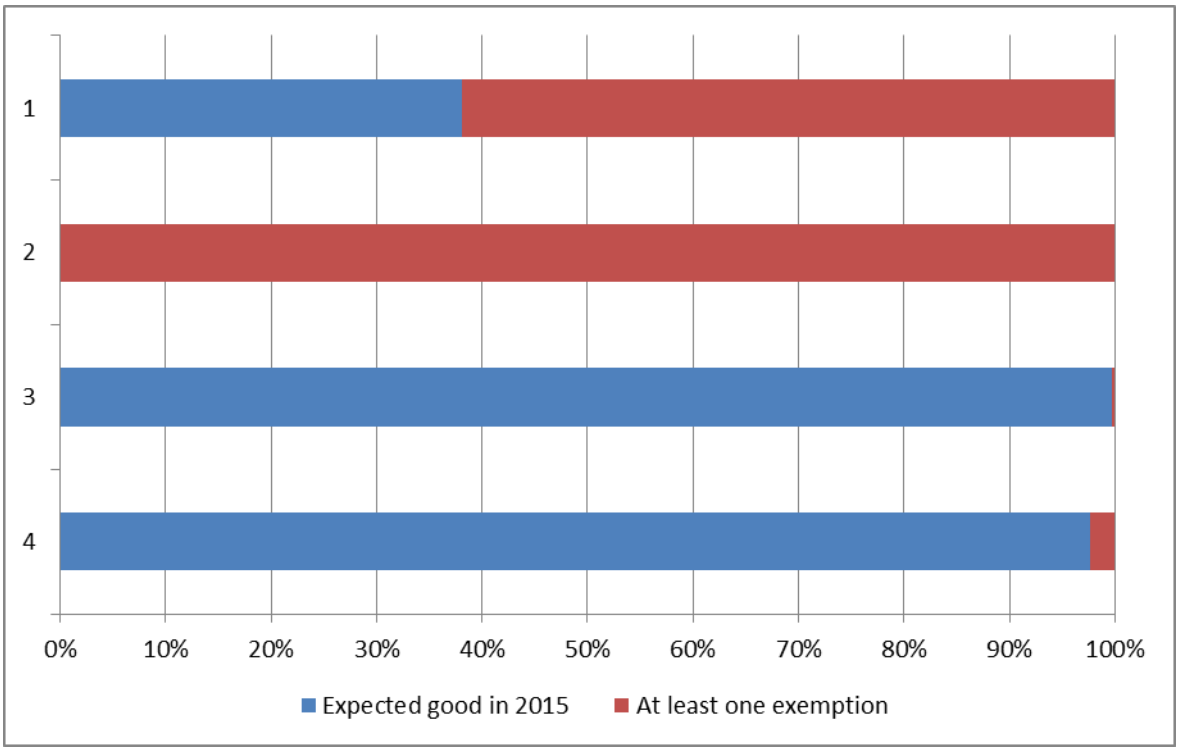
8.1.2 Exemptions

Where environmental objectives are not yet achieved exemptions can be applied in case the respective conditions are met and the required justifications are explained in the RBMP. Figure 8.1 summarises the percentage of water bodies expected to be at least in good status in 2015

[51] For priority substances newly introduced by Directive 2013/39/EU, good status should be reached by 2027, and for the 2008 priority substances, for which the Environmental Quality Standards were revised by Directive 2013/39/EU, good status should be reached in 2021.

and the use of at least one exemption in Sweden for the four main sets of environmental objectives.

Figure 8.1 ***Water bodies in Sweden expected to be in at least good status in 2015 and use of exemptions. 1 = Surface water body ecological status/potential; 2 = Surface water body chemical status; 3 = Groundwater body quantitative status; 4 = Groundwater body chemical status***

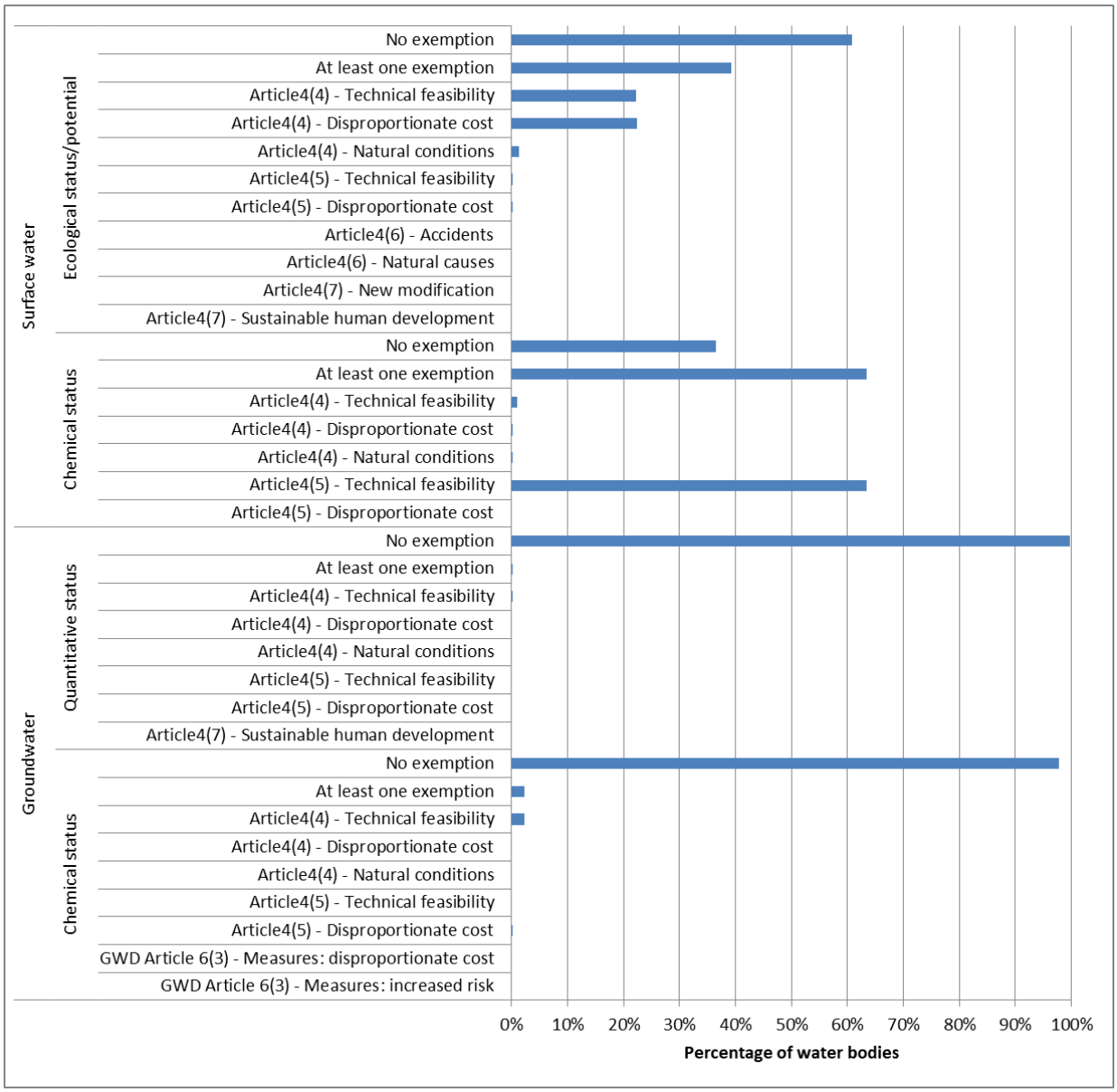


Source: WISE electronic reporting

Article 4 of the WFD allows under certain conditions for different exemptions to the objectives: extension of deadlines beyond 2015, less stringent objectives, a temporary deterioration, or deterioration / non-achievement of good status / potential due to new modifications, provided a set of conditions are fulfilled. The exemptions under WFD Article 4 include the provisions in Article 4(4) - extension of deadline, Article 4(5) - lower objectives, Article 4(6) - temporary deterioration and Article 4(7) new modifications / new sustainable human development activities. Article 4(4) exemptions may be justified by: disproportionate cost, technical feasibility or natural conditions, and for Article 4(5) by disproportionate cost or technical feasibility.

Figure 8.2 summarises the percentage of water bodies subject to each type of exemption (and reason) in relation to the four types of environmental objectives in Sweden.

Figure 8.2 ***Type of exemptions applied to surface water and groundwater bodies for the second RBMP in Sweden. NB - Ecological status and groundwater quantitative status exemptions are reported at the water body level. Chemical exemptions for groundwater are reported at the level of each pollutant causing failure of good chemical status, and for surface waters for each Priority Substances that is causing failure of good chemical status***



Source: WISE electronic reporting

Application of Article 4(4)

In the first cycle, according to the WISE reporting, all exemptions related to Article 4(4) were justified by technical feasibility except exemptions related to chemical status for groundwater

bodies, where also natural conditions are stated as a reason. In the second cycle for surface water justifications are based on technical feasibility, disproportionate costs and natural conditions. Also, for groundwater, the situation has changed and Article 4(4) is applied in the Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs with technical feasibility as justification. Natural conditions are no longer used. Exemptions are applied on the water body level.

The section in the RBMPs on exemptions points to the Swedish WISE (VISS) providing details on the use of justifications for exemptions and their type (e.g. technical feasibility) on the water body level.

Sweden has developed a national guidance on exemptions in the second cycle. The Swedish Guidance document is based on the Common Implementation Strategy Guidance Document on Exemptions to the Environmental Objectives[52] with subsequent revisions and updates.

The national guidance document on “extended deadlines and less stringent requirements - exemptions for achieving a good status / potential by 2015" provides quite specific guidance on a principle level also for exemptions due to technical feasibility. The justifications used for technical feasibility relate to:

- The cause of the negative effects is unknown;
- There are practical limitations of administrative nature;
- No known technical solution exists; or,
- The problem cannot be solved because of the lack of action in other countries.

Disproportionate costs for groundwater are justified by Cost-Effectiveness Analysis in all RBDs and for surface water the justification methods include: Cost-Benefit Analysis, Cost-Effectiveness Analysis, social and sectoral impacts and other reasons. The national guidance document "on extended deadlines and less stringent requirements - exemptions for achieving a good status / potential by 2015" provides quite specific guidance on a principle level in relation to disproportionate costs[53]. Yet, the Swedish RBMPs on the water body level lack economic data on costs and benefits of measures proposed. However, Sweden subsequently clarified that the costs and benefits are calculated at water body level.

[52] https://circabc.europa.eu/sd/a/2a3ec00a-d0e6-405f-bf66-60e212555db1/Guidance_documentN%C2%B020_Mars09.pdf

[53] https://www.havochvatten.se/download/18.549ab516149e19df88fc2e0d/1418917813322/rapport-2014-12-vagledning-vattenforvaltning.pdf

The justifications provided for disproportionate costs, for both Article 4(4) and 4(5), are textual/qualitative and often rather vague and thus difficult to assess. The Preface to the Guidance states that questions about the economic analysis, including the application of disproportionate costs have been dealt with at an overall level and the responsible authority will need to return with more precise guidance on this.

The national guidance document provides also guidance on a principle level also for exemptions due to natural conditions. Exemptions due to natural conditions are aimed at the conditions that determine the rate of natural recovery. The delay may be due to the time it takes for plants and animals to recolonise and establish after physico-chemical and hydromorphological conditions have been restored to states consistent with good status. Delay can also be due to the time it takes for the environment to stabilise after implementation of measures.

Climate change is used in the justifications as a factor that can affect the natural conditions for recovery and thus the recovery time. Regarding acidification, there is a natural recovery process which limits the ability to achieve good status within a certain period of time. This applies to both the water being limed and those not being limed.

For each water body, there is an assessment on the main impact/drivers justifying exemptions. This is provided in the VISS Water Info System and applies to all RBMPs.

The drivers behind the Article 4(4) exemptions in surface water in all RBDs are urban development, transport, industry, forestry, flood protection, energy - hydro power, agriculture and unknown/other sectors. In the case of groundwater, it is agriculture, urban development, transport and industry. The impacts causing exemptions in surface water are nutrient pollution, altered habitats, acidification, chemical pollution and other significant impacts. For groundwater, the impacts in all RBDs are saline pollution/intrusion, alterations in flow directions resulting in saltwater intrusion, abstraction exceeds available groundwater resource (lowering water table) and chemical pollution.

The pressures responsible for exemptions to surface water are diffuse and point pollution and various hydromorphological pressures (dams, barriers, etc) in all RBDs. The Bothnian Bay and Skagerrak and Kattegat RBD also report introduced species and diseases. For groundwater, point and diffuse pollution as well as abstraction are reported as key pressures responsible for exemptions.

Table 8.1 shows the pressures responsible for exemptions in relation to Priority Substances in surface waters and Table 8.2 shows the pressures responsible for exemptions in groundwater bodies in relation to good chemical status.

The impacts causing these exemptions are chemical pollution in surface water and groundwater and altered habitats due to morphological changes in surface water.

Table 8.1 ***Pressures on surface water bodies responsible for Priority Substances in Sweden failing to achieve good chemical status and for which exemptions have been applied***

Significant pressure on surface water bodies	Number of failing Priority Substances	Number of exemptions				
		Article 4(4) - Technical feasibility	Article 4(4) - Disproportionate cost	Article 4(4) – Natural conditions	Article 4(5) - Technical feasibility[54]	Article 4(5) - Disproportionate cost
1.1 - Point - Urban wastewater	40	57	0	0	0	0
1.3 - Point - IED plants	107	163	0	0	348	0
1.4 - Point - Non IED plants	55	124	0	0	0	0
1.5 - Point - Contaminated sites or abandoned industrial sites	27	17	0	0	14	
1.9 - Point - Other	67	116	0	0	388	1
2.1 - Diffuse - Urban run-off	60	151	0	0	0	1
2.2 - Diffuse - Agricultural	30	43	0	0	3	0
2.3 - Diffuse - Forestry	38		0	0	5594	0
2.4 - Diffuse - Transport	35	70	0	0	0	0
2.5 - Diffuse - Contaminated sites or abandoned industrial sites	123	357	0	1	854	1
2.7 - Diffuse - Atmospheric deposition	154	415	1	1	46298	1
2.10 - Diffuse - Other		15	0	0	0	1

Source: WISE electronic reporting

[54] Sweden subsequently clarified that this was a reporting error, as Article 4(5) exemptions were not applied.

Table 8.2 ***Pressure responsible for pollutants in Sweden failing to achieve good chemical status in groundwater and for which exemptions have been applied***

Significant pressure on groundwater	Number of failing pollutants	Number of exemptions	
		Article 4(4) - Technical feasibility	Article 4(5) – Disproportionate cost
1.5 - Point - Contaminated sites or abandoned industrial sites	12	47	1
1.9 - Point - Other	9	11	
2.1 - Diffuse - Urban run-off	10	24	
2.10 - Diffuse - Other	3	13	
2.2 - Diffuse - Agricultural	2	16	
2.4 - Diffuse - Transport	5	32	
2.6 - Diffuse - Discharges not connected to sewerage network	1	1	
3.1 - Abstraction or flow diversion - Agriculture	2	4	
3.2 - Abstraction or flow diversion - Public water supply	2	4	
3.7 - Abstraction or flow diversion - Other	3	9	

Source: WISE electronic reporting

Application of Article 4(5)

In the first cycle, Sweden reported that 100 % of surface water bodies are subject to Article 4(5) exemptions due to pollution by mercury. This has not changed in the second cycle and again Article 4(5) has been applied to all surface water bodies. Article 4(5) is justified by technical infeasibility and disproportionate costs. The justifications behind Article 4(5) are technical infeasibility in the Bothnian Sea, Bothnian Bay, North Baltic Sea, South Baltic Sea, Skagerrak and Kattegat RBDs and in the Bothnian Sea RBD disproportionate costs are also cited. Natural conditions are no longer used as a justification in relation to Article 4(5).

The drivers behind Article 4(5) exemptions in surface water are in all RBDs: transport, contaminated sites and atmospheric deposition. For groundwater the main driver is industry. The main impacts are chemical pollution in surface waters and groundwater and altered habitats in surface waters.

Application of Article 4(6)

Article 4(6) has not been applied in any of the RBDs.

Application of Article 4(7)

Article 4(7) has not been reported to be applied in any of the RBDs. Neither the national guidance, nor a respective section of the RBMP is addressing Article 4(7) exemptions. However, the RBMPs of all basin include an explanation on why exemptions under Article 4(7) were not needed to be applied in this cycle.

Application of Article 6(3) of the Groundwater Directive

No exemptions according to Article 6(3) Groundwater Directive[55] have been applied.

8.2 Main changes in implementation and compliance since the first cycle

In the first cycle, Sweden reported that 100 % of surface water bodies are subject to Article 4(5) exemptions due to pollution by mercury (lower environmental objectives). In the second cycle, Article 4(5) on surface water chemical status is again applied for all water bodies.

In the first cycle according to the WISE report, all exemptions related to Article 4(4) are due to technical feasibility except from exemptions related to chemical status for groundwater bodies, where also natural conditions are stated as a reason. In the second cycle, for surface waters the

[55] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0118-20140711

arguments have been extended and technical feasibility, disproportionate costs and natural conditions are used as justifications. Also, for groundwater, the situation has changed and Article 4(4) is applied in the Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat RBDs with the argument of technical feasibility. Natural conditions are no longer used.

Sweden has developed a national guidance on exemptions prepared by the Swedish Agency for Marine and Water Management in 2014.

8.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM reports requested action on the following:

- Recommendation: *A significant number of exemptions have been applied in this first cycle of RBMPs. Environmental objectives are set for all water bodies, but time exemptions are applied for almost all water bodies at risk, indicating a low ambition level to meet the WFD good status environmental objective, although for chemical status the exemptions are due to long-range mercury pollution that takes a long time to change. The high number of exemptions applied in these first RBMPs is a cause of concern. Sweden should take all necessary measures to bring down the number of exemptions for the next cycle, including the needed improvements in the characterisation process, monitoring networks and status assessment methods, as well as reducing significantly the degree of uncertainties.*

  Assessment: The justification of exemptions is now better detailed and on a water body level. As in the first cycle, all surface water bodies are subject to Article 4(5) for chemical status. This recommendation has been partially fulfilled.

- Recommendation: *Where Article 4(5) is used, that is setting less stringent environmental objectives, such other objectives need to be transparently applied, and they need to go beyond repeating other already binding requirements such as no further deterioration.*

  Assessment: Environmental objectives for ecological and chemical status in surface water and chemical and quantitative status in groundwater have been reported in all RBDs. In the second cycle still nearly all surface water bodies are subject to Article 4(5) exemptions for chemical status. Exemptions are provided on water body level. This recommendation has been partially fulfilled.

- Recommendation: *The use of exemptions under Article 4(7) should be based on a thorough assessment of all the steps as requested by the WFD, in particular an assessment of whether the project is of overriding public interest and whether the benefits to society outweigh the environmental degradation, and regarding the absence of alternatives that would be a better environmental option. Furthermore, these projects may only be carried out when all possible measures are taken to mitigate the adverse impact on the status of the water. All conditions for the application of Article 4(7) in individual projects must be included and justified in the RBMPs as early in the project planning as possible.*

  Assessment: The application of Article 4(7) is not reported. Sweden subsequently clarified that this was not applied in the second cycle. Further information would be needed to assess whether the recommendation has been fulfilled.

- Recommendation: *Provide in RBMPs (in relation to exemptions under Article 4.4 - calculation of disproportionate cost and the definition of technical unfeasibility) additional clarification and examples of unclear sources of pollution and diffuse leakages, as well as measures for nutrient pollution, which should be implemented as soon as possible.*

  Assessment: This recommendation is assessed in Chapter 12.

- Recommendation: *Also Sweden should ensure better justification and application of exemptions, including linking water and nature legislation.*

  Assessment: The justifications for Article 4(4) and 4(5) exemptions have been updated and are more detailed in the second cycle following the elaboration of a national guidance. However, the use of justifications for disproportional costs is hampered by the lack of cost information in some cases. Links to nature legislation have been developed in the guidance. This recommendation has been partly fulfilled.

Topic 9 **Programme of Measures**

The aim of this chapter is to provide an overview of the PoM reported by Member States; more specific information on measures relating to specific pressures (for example arising from agriculture) is provided in subsequent chapters.

The Key Types of Measure (KTM) referred to in this section are groups of measures identified by Member States in the PoM, which target the same pressure or purpose. The individual measures included in the Programme of Measure (being part of the RBMP) are grouped into KTMs for the purpose of reporting. The same individual measure can be part of more than one KTM because it may be multi-purpose, but also because the KTMs are not completely independent silos. KTMs have been introduced to simplify the reporting of measures and to reduce the very large number of Supplementary Measures reported by some Member States (WFD Reporting Guidance 2016).

A KTM may be one national measure but it would typically comprise more than one national measure. The 25 predefined KTMs are listed in the WFD Reporting Guidance 2016.

The KTMs should be fully implemented and made operational within the RBMP planning period to address specific pressures or chemical substances and achieve the environmental objectives.

9.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

9.1.1 General issues

An indication or whether or not measures have been made operational is when they have been reported as being planned to tackle significant pressures (Key Types of Measure level). Significant pressures are also reported at the water body level. It would be expected that there would be measures planned to tackle all significant pressures. However, in Sweden, many of the reported significant pressures are not covered with operational KTMs. For example, for the Bothnian Bay RBD, there are no operational KTMs for point source pressures from contaminated sites and others sources on groundwater and none for diffuse source pressures from transport on groundwater. However, KTMs are reported for unreported pressures on groundwater, i.e. point source Industrial Emissions Directive plants, diffuse source - other, and anthropogenic - unknown. Similarly for surface water, there are no KTMs reported for the significant pressures causing failures of good status for point source - non- Industrial Emissions Directive plants, diffuse sources - urban, transport, and contaminated sites, physical

alterations - navigation and shoreline, hydrological alterations - hydropower, hydromorphological alterations - loss of water body and other, and anthropogenic - unknown. KTMs for pressures that are not reported to be causing surface waters for failure to achieve good status include point source - contaminated sites, physical alterations - unknown or obsolete, and anthropogenic - other. Significant other pressures from drainage are also indicated but no KTM is in place to address them. A similar situation can be seen in the North Baltic Sea and Skagerrak and Kattegat RBDs where, for groundwater, there are no KTMs, among others, for diffuse pressures from urban run-off, agriculture and transport, or for abstractions for public water supply and others. For surface waters in these RBDs, not all point source pressures or diffuse pressures are covered, notably there are no KTMs for diffuse pressures from urban run-off, transport, contaminated sites and others in both RBDs, nor are there any KTMs for physical alterations - agriculture and shores, hydrological alterations - hydropower and others, and hydromorphological alterations. One significant other pressure, recreation, is included as a significant pressure in RBD Skagerrak and Kattegat, but no operational KTM seems to be linked with this.

National basic measures (52) and national supplementary measures (45) have been mapped against 14 of the 25 pre-defined KTMs. All measures apply in all RBDs. Of these: 19 % of national basic measures and 16 % of the national supplementary measures have been mapped against KTM21 –"Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure"; 13 % of the national basic measures have been mapped against KTM5 –"Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)" with a further 13 % mapped against KTM7 –"Improvements in flow regime and/or establishment of ecological flows"; 13 % of the national supplementary measures have been mapped against KTM6 –"Improving hydromorphological conditions of water bodies other than longitudinal continuity", and a further 13 % have been mapped against KTM25 –"Measures to counteract acidification". Basic measures have been mapped against KTMs for which no operational measures have been reported, for example KTM13 –"Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)" and KTM25 –"Measures to counteract acidification". None of the basic measures are reported to implement Articles 11(3)(b), (f) or (k). Links to further information on Article 11(3)(c) to (k) basic measures for all RBDs are provided in the WISE electronic reporting, as well as an inventory of national measures.

A comparison of KTMs reported for significant pressures with those mapped against national measures includes one KTM not previously reported mapped against national measures, i.e. KTM 12 –"Advisory services for agriculture". Some significant pressures for which no

operational KTMs were reported (e.g. for groundwater: point source - contaminated sites, point source - other, and diffuse - transport) are not included, others have been added, e.g. pressures for which KTMs were reported operational without indicating any significant pressure (point source Industrial Emissions Directive plants, diffuse sources - other, anthropogenic - unknown). The picture is consistent for all RBDs and water body types suggesting that no national measures are in place for some significant pressures. No information is reported for the percentage of water bodies failing to achieve WFD objectives by 2027, except for the significant pressures diffuse agricultural and dams, barriers and locks for hydropower in surface waters, where all are expected to achieve WFD objectives. The reported significant pressures are identical for all RBDs; no significant other pressures are reported for any RBD.

Data on the number of groundwater bodies where substances are causing a failure of chemical status are reported for four RBDs – no data is provided for Bothnian Bay. No information is provided on the measures to address these failures in any of the RBDs. No information is provided for surface waters in any of the RBDs. Pesticides are the main substances of concern, with a total of 38 groundwater bodies failing to achieve good status.

The number of surface water bodies failing to achieve good chemical status due to Priority Substances has been provided in all RBDs. However, the KTMs to address these substances have not been reported. By far the substances of most concern are mercury and brominated diphenylethers, with over 22 000 water bodies failing to achieve good status as a result of the presence of each of these substances.

Information on analyses of the gap to good status and the level of implementation of measures that is expected has been provided for all pressures for which national measures have been mapped. Examples of the indicators of the expected gap to good status used include "number of water bodies failing Environmental Quality Standards", "number of contaminated sites preventing achievement of objectives", and "reduction in phosphorus loads (tonnes phosphorus annum) needed". Well defined indicators of the expected progress with the implementation of measures are also provided, and include "the number of installations where upgrades or improvements are required to achieve objectives", and the "number of water bodies to be covered by measure to achieve objectives". Indicator values are provided for 2015 and 2021, but none for 2027. However, in many cases the gaps are expected to be closed by 2021 or substantial improvements are predicted, and in some cases the gap was expected to be closed by 2015[56].

[56] Sweden subsequently clarified that the gaps were closed by 2015, so the value of gaps remaining at 2021 is zero.

The biggest problem area to be addressed in the second and third PoM (gap not closed by 2021) seems to be dams, barriers and locks - unknown or obsolete with a total of 487[57] dams/weirs/barriers and locks associated with other uses that have conditions not compatible with the achievement of objectives expected to be still in place by 2021. This pressure occurs in all five RBDs, but by far the largest number, 334[58] in 2021, are in the South Baltic Sea RBD. The most progress is expected to be made in the Skagerrak and Kattegat RBD where the number of dams/weirs/barriers and locks associated with other uses that have conditions not compatible with the achievement of objectives is expected to reduce from 1 504 in 2015 to 36 in 2021. The indicators of the gap to good status from diffuse sources from agriculture in terms of phosphorus in surface water are reported to increase between 2015 and 2021, with a significant increase in the area of land covered by measures to reduce emissions. For example, in the Skagerrak and Kattegat RBD the load reduction needed in surface water is predicted to increase from 22 t/y in 2015 to 170 t/y in 2021, and the area of agricultural land required to be covered by measures to achieve this reduction increases from 190 km^2 to 1 600 km^2. However, significant progress is expected in addressing the number of farms not covered by advisory services, with a reduction from 10 897 in 2015 to 0 in 2021. For groundwater, the largest gap to good status is reported to be from unknown anthropogenic pressures, with a total of 246 groundwater bodies affected. This is predicted to reduce to 0 by 2021 through the introduction of 266 drinking water protection zones.

The significant pressures for which there are no operational KTMs are listed but no gap analyses are provided. A number of individual chemicals, including priority pollutants, are indicated as causing significant pressures or failure of good status (in groundwater and surface water), but these are also not addressed with any specific measures or gap analyses.

Cost-effectiveness analysis is an appraisal technique that provides a ranking of alternative measures on the basis of their costs and effectiveness, where the most cost-effective has the highest ranking. In the first PoM cost-effectiveness analysis was used for the selection of measures for nutrient reduction. Most of the other measures put in place in the first RBMP were administrative measures for which cost-effectiveness analysis is not appropriate. For the second RBMP it was reported that a combination of qualitative and quantitative cost-effectiveness analysis was carried out in all five RBDs. The prioritisation of measures was further examined in the RBMP and background documents where it was found that prioritisation and cost effectiveness analysis has only been described for nutrients. In the

[57] Sweden subsequently noted that these figures for total gaps not closed by 2021 should be Skagerrak and Kattegat: 1 030, South Baltic Sea: 494, North Baltic Sea: 143, Bothnian Sea: 3 075, Bothnian Bay: 857, Total: 5 599.

[58] Sweden subsequently noted that the largest number (3075) are in the Bothnian Sea.

national guideline, a method for prioritising measures according to cost effectiveness is very briefly described and an example from a constructed RBD is shown. It has not been possible to see if and how this national approach has been implemented in the RBDs or in the catchment of particular water bodies. The prioritisation is not consistent as it is, for example, a precondition that single houses will have to clean their wastewater before other measures are introduced. Wastewater treatment for single houses has been given priority to satisfy the legal requirements, although it is not the most cost effective measure for removing phosphorus.

A critical factor in the success of the implementation of the PoM is the availability of funding to support the investments required. Sweden has reported that €2 590 m was invested in all measures for the first PoM (2009-2015). For the second PoM it has been reported that a total capital investment of €3 280 m will be required for measures required by Articles 11(3)(b)(l), 11(4) and 11(5) (all other measures) with annual operation and maintenance costs of €5 m. Depreciation has not been included in the calculation of these costs. Sweden reported that European Union funds contributed €28 m to the first PoM, and are expected to contribute €10 m to the second PoM. A clear financial commitment is reported as having been secured for the implementation of PoM in all five RBDs. On a sectoral basis, commitments have been secured in all five RBDs for agriculture, industry, urban, hydropower, recreation and flood protection. The transport, energy, and aquaculture sectors were reported to be not applicable in all RBDs.

Co-ordination of the preparation of all RBMPs and PoM with the Marine Strategy Framework Directive[59] is reported for all five RBDs, as is joint consultation on the RBMPs and the Marine Strategy, and consideration of the need for additional or more stringent measures beyond those required by the WFD in order to contribute to the achievement of the relevant Marine Strategy Framework Directive objectives in coastal and marine environments. The required additional or more stringent measures relate to nutrients in all five RBDs. KTMs that are relevant to the Marine Strategy Framework Directive are listed for all RBDs, with an indication of the type of measure, but not indicating the pressures they are addressing.

The RBMPs and Floods Directive[60] Flood Risk Management Plans have not been integrated into a single plan in any of the five RBDs[61], financial commitments for the implementation of PoM in the flood protection areas are in place, and WFD Article 9(4) has been applied to

[59]Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive) http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

[60]Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

[61] Sweden subsequently clarified that "A summary of the Flood Risk Management Plans were included in all RBMPs but there's no joint WFD/Floods Directive-plan produced. A text describing the necessity of cooperation WFD/Floods Directive is included in the RBMPs".

impoundment for flood protection. However, it is reported that joint consultation of RBMPs and Flood Risk Management Plans was not carried out but consideration was given to the objectives and requirements of the Floods Directive in the second RBMPs and PoM[62]. Win-win measures in terms of achieving the objectives of the WFD and Floods Directive, drought management and use of Natural Water Retention Measures have not been included in the RBMP, nor has the design of new and existing structural measures, such as flood defences, storage dams and tidal barriers been adjusted to take account of WFD Environmental Objectives. This seems to be inconsistent with the reported integration of the plans.

9.1.2 Measures related to other significant pressures

Other significant pressures are indicated for groundwater and surface water in all five main RBDs. In groundwater and surface water, the significant other pressures are reported as "unknown anthropogenic" in all five RBDs. These are to be addressed through the introduction of drinking water protection zones (KTM13 – "Drinking water protection measures"), the number of water bodies where these are required has been clearly identified in the indicators of the gap to good status. For surface waters, introduced species is a significant pressure in all RBDs. Measures (KTM 18 – "Measures to prevent or control the adverse impacts of invasive alien species and introduced diseases") have been identified to address these, the gap to good status has been identified and clear targets for the expected progress in the implementation of the measures have been set. It is expected that good status will have been achieved in relation to this pressure by 2021 in all RBDs except the Bothnian Bay RBD where further measures are anticipated in the third PoM (2021-2027).

9.1.3 Mapping of national measures to Key Types of Measure

It was expected that Member States would be able to report their PoM by associating their national measures with predefined KTMs. These are expected to deliver the bulk of the improvements through reduction in pressures required to achieve WFD Environmental Objectives. A KTM may be one national measure but it would typically comprise more than one national measure. Member States are required to report on the national measures associated with the KTMs, and whether the national measures are basic (Article 11(3)(a) or Article 11(3)(b)(l)) or supplementary (Article 11(4)).

Table 9.1 summarises the number of national measures that have been mapped to the relevant KTMs in Sweden. Also shown is the number of RBDs for which the KTMs has been reported.

[62] Sweden subsequently noted that the period for consultation was overlapping in time and a number of public consultation meetings addressed both WFD and Floods Directive. At some County Administrative boards measures and objectives concerning both WFD and Floods Directive were talked over and included in the WFD and Floods Directive plans.

Table 9.2 then summarises the type of basic measures associated with the national measures mapped against the KTMs.

Table 9.1 Mapping of the types of national measures to Key Types of Measure in Sweden

Key Type of Measure	National basic measures	National supplementary measures	Number of RBDs where reported
KTM1 - Construction or upgrades of wastewater treatment plants	6	2	5
KTM12 - Advisory services for agriculture		3	5
KTM13 - Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)	4	1	5
KTM16 - Upgrades or improvements of industrial wastewater treatment plants (including farms).	5	1	5
KTM18 - Measures to prevent or control the adverse impacts of invasive alien species and introduced diseases		1	5
KTM2 - Reduce nutrient pollution from agriculture	3	5	5
KTM21 - Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	10	7	5
KTM22 - Measures to prevent or control the input of pollution from forestry	1	3	5
KTM25 - Measures to counteract acidification	1	6	5
KTM3 - Reduce pesticides pollution from agriculture.	3	4	5
KTM4 - Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)	3	2	5
KTM5 - Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)	7	2	5
KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity	2	6	5
KTM7 - Improvements in flow regime and/or establishment of ecological flows	7	2	5
Total number of Mapped Measures	**52**	**45**	**5**

Source: WISE electronic reporting

Table 9.2 Type of basic measure mapped to Key Type of Measures in Sweden

	Basic Measure Type									
Key Type of Measure	Accidental pollution	Controls water abstraction	Efficient water use	Hydromorphology	Nitrates	Point source discharges	Pollutants diffuse	Protection water abstraction	Surface Priority Substances	Urban Wastewater
KTM1 - Construction or upgrades of wastewater treatment plants					1	4	2		2	3
KTM13 - Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)								4		
KTM16 - Upgrades or improvements of industrial wastewater treatment plants (including farms).						4	3			
KTM2 - Reduce nutrient pollution from agriculture						1	3		1	
KTM21 - Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	2					3	9		1	
KTM22 - Measures to prevent or control the input of pollution from forestry				1			1		1	
KTM25 - Measures to counteract acidification						1				
KTM3 - Reduce pesticides pollution from agriculture.	1					2	3		2	
KTM4 - Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)			1	1		1	3		1	
KTM5 - Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)		5		7						
KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity				2						
KTM7 - Improvements in flow regime and/or establishment of ecological flows		4		7						

Source: WISE electronic reporting

Key

'Accidental pollution' = Article 11(3)(l): Any measures required to prevent significant losses of pollutants from technical installations and to prevent and/or reduce the impact of accidental pollution incidents.
'Controls water abstraction' = Article 11(3)(e): Controls over the abstraction of fresh surface water and groundwater and impoundment of fresh surface waters including a register or registers of water abstractions and a requirement for prior authorisation of abstraction and impoundment.
'Efficient water use' = Article 11(3)(c): Measures to promote efficient and sustainable water use.
'Hydromorphology' = Article 11(3)(i): Measures to control any other significant adverse impact on the status of water, and in particular hydromorphological impacts.
'Nitrates' = Nitrates Directive (91/676/EEC).
'Point source discharges' = Article 11(3)(g): Requirement for prior regulation of point source discharges liable to cause pollution.
'Pollutants diffuse' = Article 11(3)(h): Measures to prevent or control the input of pollutants from diffuse sources liable to cause pollution.
'Protection water abstraction' = Article 11(3)(d): Measures for the protection of water abstracted for drinking water (Article 7) including those to reduce the level of purification required for the production of drinking water.
'Surface Priority Substances' = Article 11(3)(k): Measures to eliminate pollution of surface waters by Priority Substances and to reduce pollution from other substances that would otherwise prevent the achievement of the objectives laid down in Article 4.
'Urban Wastewater' = Urban Wastewater Treatment Directive (91/271/EEC).

9.1.4 Pressures for which gaps to be filled to achieve the WFD objectives and the Key Types of Measure planned to achieve objectives

Member States are required to report the gaps that need to be filled to achieve the WFD Environmental Objectives in terms of all significant pressures on surface waters and groundwater bodies, in terms of Priority Substances causing failure of good chemical status and in terms of River Basin Specific Pollutants causing failure of good ecological status/potential. Member States were asked to report predefined indicators of the gaps to be filled or other indicators where relevant. Values for the gap indicators were required for 2015 and 2021, and were optional for 2027.

The information reported in WISE on the gaps to fulfil to achieve good ecological status include detailed data on the significant pressures on surface and groundwaters that may cause failure on the environmental objectives. For chemical status, the Member States reported the specific chemical substances causing failure.

This information is reported at the sub-unit level. Sub-units are smaller geographic areas within particular RBDs identified by Member States. Not all Member States have defined and reported sub-units.

Member States were required to report which KTMs are to be made operational to reduce the gaps to levels compatible with the achievement of WFD environmental objectives. A number of indicators were predefined for each KTM. Values of the indicators for the second and subsequent planning cycles were also to be reported to give an indication of the expected progress and achievements: the values for 2027 could be optionally reported. This means that the value of the indicator will be reduced with time as measures are implemented. A value of zero is comparable with 100 % good ecological status or potential or good chemical status.

This information was reported at sub-unit level, or at RBDs level if sub-units have not been reported by the Member State.

9.2 Main changes in implementation and compliance since the first cycle

The level of implementation of the first cycle of PoM in Sweden was reported as “some measures completed” for all five main RBDs. Obstacles to the implementation of the PoM were reported to be lack of finance, lack of measures and lack of mechanisms in all RBDs. The most significant progress made seems to be the definition of a significant number of national measures in relation to specific pressures (although not all pressures appear to have been

addressed), the planning of more measures and/or the extension of measures in the second and third cycles, for example to control nutrients and in particular phosphorus loads, and the integration of the RBMPs with Flood Risk Management Plans.

New legislation or regulations to implement the PoM in the first cycle was reported necessary and already adopted in all five RBDs.

9.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *For groundwater, waterbody specific measures should be considered in the Programme of Measures.*

- Assessment: In at least two RBDs, for groundwater, there are no KTMs, among others, for diffuse pressures from urban run-off, agriculture and transport, or for abstractions for public water supply and others. Data on the number of groundwater bodies where substances are causing a failure of chemical status are reported for four RBDs – no data is provided for the Bothnian Bay RBD. No information is provided on the measures to address these failures in any of the RBDs. A number of individual chemicals, including priority pollutants, are indicated as causing significant pressures or failure of good status (in groundwater and surface water), but these are also not addressed with any specific measures or gap analyses. There is a lack of water body specific measures in relation to groundwater. This recommendation has not been fulfilled.

- Recommendation: *Provide a more comprehensive cost effectiveness analysis of the measures in the RBMPs.*

  Assessment: A combination of quantitative and qualitative cost effectiveness analyses were carried out in all five RBDs, but no details on individual measures are available from this assessment. This was further examined in the RBMPs where it was found that cost effectiveness analysis was, again, only applied to measures relating to nutrients. This recommendation has therefore not been fulfilled.

- Recommendation: *Establish source apportionment for at least the polluting substances (or groups of substances, e.g. pesticides) most commonly found and/or having the most significant impact in each RBD, and link the impact to specific measures because the*

connection between source and impact is very vague in the first RBMPs, especially at a single substance level.

Assessment: For surface water bodies, significance of pressures is reported as being linked to the potential failure of objectives and is defined in terms of thresholds. New and more reliable classification of biological quality elements were established after a national classification project WATERS (ending in 2013). This allowed a more confident assessment of pressures than what was feasible for the first RBMPs. Sweden has made major attempts to improve the assessment of significance in their analyses of pressures, developing a set of new methods for each of the major pressure/impact categories: nutrient enrichment, acidification, contamination by hazardous substances (both River Basin Specific Pollutants and Priority Substances) and morphological pressures. For groundwater bodies, numerical tools and expert judgement were used for defining significant pressures from point and diffuse sources. For abstraction and artificial recharge and other pressures expert judgement was used. The significance of pressures is reported to be linked to the potential failure of objectives but the significance of pressures has not been defined in terms of thresholds. There is no information on substance specific measures in the second RBMPs, except for phosphorus; in particular, there is no information on river basin specific substances and Priority Substances[63].

This recommendation is partially fulfilled.

- Recommendation: *Sweden needs to improve its Programme of Measures to be more explicit on the specific measures that are being planned, to enable a transparent planning tool showing how the environmental objectives can be met in a coordinated manner across the RBDs. Meaningful information regarding the scope, the timing and the funding of the measures should be included in the Programme of Measures so the approach to achieve the objectives is clear.*

  Assessment: A significant number of national measures have been defined in relation to significant pressures, although some pressures identified at RBD level still do not seem to have measures to tackle them; the scope, timing and funding is not clear for all required measures, although financial commitments are in place. The RBMPs and Flood Risk Management Plans have not been integrated into single plans. Indicators of

[63] Sweden subsequently clarified that has reported the national measures and which priority substances and RBSPs they specifically should address in a background document. SE has reported the general implementation of article 11.3.k in table 4.9 in the second PoM, including the legislation and the measures in the PoM that addresses specific substances and priority substances

the gap to good status have been developed as have clear targets of the level of implementation of the measures expected, for those pressures where measures have been developed. This recommendation has been partially fulfilled.

- Recommendation: *There is no clear link between status assessment and the need for pressure reduction (nutrients, chemical pollutants and hydromorphology) and measures. Many of the measures are "administrative" (new investigations, monitoring etc.).*

- Recommendation*: Where there are currently high uncertainties in the characterisation of the RBDs, identification of pressures, and assessment of status, these need to be addressed in the current cycle, to ensure that adequate measures can be put in place before the next cycle.*

  Assessment: Whilst a significant number of measures have been defined in relation to specific pressures, there is minimal information in terms of pressures and measures at water body level, and no information on specific substances including priority pollutants. There is also minimal information on gap analyses in terms of achieving good status. With respect to measures, these recommendations have not been addressed[64].

[64] Sweden subsequently noted that measures are not reported at water body level but they are publicly available in the national Water Information System Sweden. Gap analysis are reported in the reporting of KTM at district level but are also are publicly available in the national Water Information System Sweden.

Topic 10 **Measures related to abstractions and water scarcity**

10.1 Assessment of implementation and compliance with WFD requirements in the second cycle and main changes in implementation and compliance since the first cycle

10.1.1 Water exploitation and trends

Water abstraction pressure has not been reported as relevant for Sweden, where only the North Baltic Sea and Skagerrak and Kattegat RBDs report minor numbers of groundwater bodies failing good quantitative status (0.17 and 0.19 % respectively) and minor numbers of surface water bodies with significant abstraction pressures (2.63 and 0.5 %). The Water Exploitation Index + is not calculated; though water quantity data have been reported to support the European State of the Environment Report in relation to Water Quantity. Water scarcity is not considered an issue at the international level. The RBMPs do not include a water resource allocation and management plan.

10.1.2 Main uses for water consumption

No data have been reported for the uses of water consumption, as water quantity pressures are not significant.

10.1.3 Measures related to abstractions and water scarcity

Regarding basic measures (Article 11(3)(e) in Sweden, there is a permitting regime and a register of abstractions for surface water and groundwater, a concession, authorisation and/or permitting regime to control water impoundment and a register of impoundments. Furthermore, small abstractions do not require permits but are all registered. Measures on this topic have been implemented in the previous cycle, and new measures and/or significant changes are not planned for the second cycle.

Under Article 11(3)(c), measures promoting efficient and sustainable water use have been implemented in the previous cycle and new measures and/or significant changes are planned. A number of measures related to efficient and sustainable water use are mentioned, divided between central and regional/local authorities. The measures are predominantly administrative (develop guidelines, strengthen the supervision/control within Protected Areas with e.g. companies, planning etc.). A special focus is on hydropower plants - but again administrative measures (e.g. identify needs for improvement) dominate. In the detailed sub-basin PoM (only

available for the Skagerrak and Kattegat RBD), some proposed measures are described (e.g. for Skagerrak and Kattegat, sub-basin 42, a minimum flow is required for the 34 fish passes in connection to hydropower stations).

Measures for the prior authorisation of artificial recharge or augmentation of groundwater bodies (Article 11(3)(f)) have been implemented in the first cycle and new measures or significant changes are planned for the second cycle for all RBDs.

Complementary measures under KTMs are not reported for addressing abstraction pressures. Water reuse is not foreseen as a measure.

10.2 Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and PoM relevant to this topic.

Topic 11 **Measures related to pollution from agriculture**

11.1 Assessment of implementation and compliance with WFD requirements in the second cycle

While in the first cycle for the southern RBDs (North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat) agriculture has been identified as a major pressure for the diffuse loading of nutrients, in the second cycle this is the case for all RBDs. This is also reflected in the selected measures where measures to reduce nutrients are now applied in all RBDs and not only in the South Baltic Sea and Skagerrak and Kattegat RBDs. For hydromorphology, agriculture is mentioned as a pressure in all RBDs. As in the first cycle, chemical pollution is also mentioned as a factor affecting water bodies. While in the first cycle, abstraction by the agriculture sector did not seem to be a significant pressure, lowering of the groundwater water table due to abstraction is reported in the South Baltic Sea and Skagerrak and Kattegat RBDs in the second cycle. Saline intrusion in groundwater is newly reported in the South Baltic Sea RBD in the second cycle.

A gap assessment was carried out for the load of nitrogen/phosphorus to be reduced and for the reduction in the number of applications of pesticides.

Measures to address these pressures or impacts are KTM 3 – Reduce pesticides pollution from agriculture, KTM 2 – Reduce nutrient pollution from agriculture, KTM 12 – Advisory services for agriculture, KTM 13 – Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.), and KTM 23 – Natural water retention measures. Implementation of basic measures (the minimum requirement to be complied with) under Article 11(3)(h) for the control of diffuse pollution from agriculture at source is ensured in all RBDs with the same rules for different parts of the RBDs. Supplementary measures are applied in all RBDs. General binding rules for nitrates, pesticides and phosphorus to control diffuse pollution from agriculture are set and applied in all RBDs. The area to be covered by the measure tackling nutrient pollution is expected to increase significantly in the second cycle.

The "physical" measures meant to reduce nutrient load from agriculture are described regarding their effects, costs etc. in a national catalogue of measures - but there is no indication of the method of implementation, i.e. mandatory or voluntary or both. The measures from the national catalogue are then used in the sub-basin plans to address the gap to the achievement of the objectives. In these sub-plans, the measures planned to reduce nutrient input from agriculture are indicated as voluntary; they are presented as "proposals". For KTM 3 - Reduce

pesticides pollution from agriculture and KTM 12 - Advisory services for agriculture, no reference was found to these KTMs in the sub-plans. For KTM 17 - Measures to reduce sediment from soil erosion and surface run-off, there was a reference in the sub-plan but no information is reported to WISE.

With regard to drinking water safeguard zones, these are in place but there will be significant changes to them in their implementation as a result of the second RBMP. Only a brief, general explanation has been found in the RBMPs mentioning that for the Skagerrak and Kattegat RBD, 66 % of the Protected Areas (safeguard zones) for drinking water needs to be assessed again and if necessary, revised. However, what this revision should contain is not described.

Furthermore, there is some regulation within the safeguard zones, as regards additional control measures on land. In the PoM, a list is presented with the responsibilities for three public authorities in relation to Article 11(3)(d). This general description is detailed to some extent in the sub-basin PoM (not found for the North Baltic Sea RBD, but referring to Skagerrak and Kattegat RBD), where there is a chapter targeting drinking water and groundwater protection. Significant pressures are identified, the need for improvement described and, in the end, the measures proposed. In general, the measures are described as supervision and control within the safeguard zones but not outside the zone. So, the overall impression is that measures are mainly administrative and targeted within the safeguard zones.

Farmers/Farmers' Unions have been consulted under the Public Consultation process in all RBDs.

Financing of agricultural measures is secured in all RBDs. There is no indication if national sources are used in addition to the Rural Development program.

It remains unclear if the application of the polluter pays principle in the agricultural sector has been fully implemented.

11.2 Main changes in implementation and compliance since the first cycle

While in the first cycle for the southern RBDs (North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat) agriculture has been identified as a major pressure for diffuse loading of nutrients, this is the case for all RBDs in the second cycle. This is also reflected in the selected measures where those to reduce nutrients are now applied in all RBDs and not only in the South Baltic Sea and Skagerrak and Kattegat RBDs as in the first cycle. While in the first cycle abstraction by the agriculture sector does not seem to be a significant pressure, lowering the groundwater water table due to abstraction is reported in the South Baltic Sea and

Skagerrak and Kattegat RBDs in the second cycle. Saline intrusion in groundwater is newly reported in the South Baltic Sea RBD.

11.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and first PoM requested action on the following:

- Recommendation: *Increase the number of basic measures in place to address agriculture's impact on water quality and quantity.*

  Assessment: Measures have been taken under all relevant Articles of the WFD relevant to this recommendation. Therefore, this recommendation is fulfilled.

- Recommendation: *Ensure it is clear in the RBMPs what the gap on pressures from agriculture is and to what extent the gap will be filled by basic measures and to what extent by supplementary measures.*

  Assessment: A gap assessment was carried out for pesticides and nutrients. Basic and supplementary measures are reported in all RBDs. Measures under Article 13(a), (e), (i) and (h) are taken and reported. Therefore this recommendation is fulfilled.

- Recommendation: *Provide information in RBMPs on what nutrient load reduction is necessary from agriculture to reach nutrient conditions consistent with good status, and to what extent the measures included in Sweden's Programme of Measures (nitrates measures, WFD basic measures, WFD supplementary measures) will bridge this gap. Sweden should ensure such an approach and calculations are clearly set out as the basis for consultation on measures.*

  Assessment: A gap assessment was carried out for pesticides and nutrients. Therefore this recommendation is fulfilled.

- Recommendation: *Ensure that designation of Nitrate Vulnerable Zones and revision of Action Programmes (Nitrates Directive[65]) take into account action needed to contribute towards meeting WFD obligations.*

[65] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

Assessment: A gap assessment was carried out for pesticides and nutrients. However, it has not been possible to find a clear understanding – or some kind of assessment of the effects of the Nitrate Action Plans. The nitrate-sensitive areas have been reviewed in 2014, and adjusted towards achieving WFD objectives. The actual nitrate sensitive area can be seen in VISS. Therefore this recommendation is fulfilled.

- Recommendation: *Ensure proper consideration of WFD in Rural Development Programmes.*

  Assessment: No assessment of the Rural Development Program has been made in relation to this issue. The RBMPs clearly state that the Swedish Board of Agriculture is responsible for the implementation of the Rural Development Program, which will contribute to compliance with environmental quality standards for water. The action shall be taken no later than three years after the establishment of the action program. This recommendation has been fulfilled.

- Recommendation: *Put more in focus the need to reduce the load of phosphorus in coastal areas – according to the gap analysis - and link it directly to measures.*

  Assessment: In the sub-plans (e.g. the Skagerrak and Kattegat RBD, sub-plan 41) phosphorus load reduction is accounted for in a number of measures. The calculation method for the modelling of eutrophication is documented[66]. The amount of phosphorus to be reduced per water body (including coastal areas) is publicly available in the national VISS Measures and are based on these reduction needs. This recommendation is fulfilled.

[66] See http://www.vattenmyndigheterna.se/SiteCollectionDocuments/gemensamt/publikationer/%C3%96vriga%20publikationer/Rapport2016-19-%C3%85tg%C3%A4rder%20mot%20%C3%B6verg%C3%B6dning.pdf

Topic 12 Measures related to pollution from sectors other than agriculture

12.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

In the context of this topic, pollution is considered in terms of nutrients, organic matter, sediment, saline discharges and chemicals (Priority Substances, River Basin Specific Pollutants, groundwater pollutants and other physico-chemical parameters) arising from all sectors and sources apart from agriculture.

Key types of measures (KTM) are groups of measures identified by Member States in their Programmes of Measures which target the same pressure or purpose. A KTM could be limited to one national measure but would typically comprise more than one national measure. The same individual measure can also be part of more than one KTM because it may be multipurpose, but also because the KTMs are not completely independent of one another.

The following KTMs relevant to non-agricultural sources of pollution causing failure of WFD objectives have been reported for all RBDs in Sweden:

- KTM 1 - "Construction or upgrades of wastewater treatment plants"
- KTM 4 - "Remediation of contaminated sites (historical pollution including sediments, groundwater, soil)"
- KTM 13 - "Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.)"
- KTM 16 – “Upgrades or improvements of industrial wastewater treatment plants (including farms)” KTM 21 - "Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure"
- KTM 22 - " Measures to prevent or control the input of pollution from forestry"
- KTM 25 - "Measures to counteract acidification"

Information was not provided for the Bothnian Bay (Torne), Bothnian Sea (Trondelagsfylkene), Bothnian Bay (Nordland), Bothnian Bay (Troms) or Skagerrak and Kattegat (Glomma) RBDs. Sweden clarified that the information is to be found as a part of the management plans of the main districts responsible for the management of these international areas with minor parts in Sweden.

The WFD specifies that Programmes of Measures shall include, as a minimum, "basic measures" and, where necessary to achieve objectives, "supplementary measures" when basic measures are not enough to address specific significant pressures (see the chapter 9 in this report). Sweden has indicated the number of basic and supplementary measures per RBD for each KTM mentioned above.

Sweden provided more targeted information on basic measures required under Article 11(3)(c to k) but not the use of authorisation and/or permitting regimes to control wastewater point source discharges. The operation of a register of wastewater discharges was reported for five of the 10 Swedish RBDs for surface and groundwater. Information was not reported for the other RBDs. Small wastewater discharges are exempted from controls in five of the 10 RBDs. Some direct discharges to groundwater are authorised in Sweden in accordance with Article 11(3)(j) in five of the 10 RBDs.

Five of the 10 RBDs reported that there are measures in place to eliminate / reduce pollution from Priority Substances and other substances (Basic measures Article 11(3)(k))[67].

Concerning measures for Priority Substances causing failure, mercury and brominated diphenyl ethers are causing failure for all (100 %) of the water bodies. The main source of these two substances is reported as atmospheric deposition of mainly non-Swedish origin. Other substances (both Priority Substances and River Basin Specific Pollutants) and their sources are mentioned in the general description, but not in any way aggregated or quantified[68]. Specific problems with Priority Substances can be found in the sub-plan but only a few have been examined. All chapters regarding Priority Substances begin with describing mercury and brominated diphenyl ethers. Even in the specific sub-plans the description of other substances is vague; for example, in the Skagerrak and Kattegat RBD sub plan 11, significant impact is described but only in terms of the potential sources, e.g. 18 urban wastewater treatment plants, two industries, five aquaculture plants, not in terms of actual occurrence of Priority Substances. The need for improvement is described mainly as the need for more investigations. Measures are directed towards old industrial sites - and the rest are proposals for the competent authorities and are not mandatory measures.

There is no detailed description of groundwater-related pollutants. In the description of the sub-basins, a chapter is dedicated to chemical pollutants but it is general and very unspecific. For example in the Skagerrak and Kattegat RBD sub-basin 42, it is stated that 25 % of the

[67] Sweden subsequently clarified that the general implementation of Article 11.3.k is reported in the second PoM, including the legislation and the measures that address specific substances and priority substances.

[68] Sweden subsequently clarified that the national measures and the Priority Substances and River Basin Specific Pollutants they specifically should address are provided in a background document.

groundwater bodies are at risk of not achieving good status - due to heavy metals (no further specification) and other industrial pollution and pesticides (not specified). The measures seem not to be connected to the pollutants.

12.2 Main changes in implementation and compliance since the first cycle

In the first RBMPs measures were not substance specific. From the electronic reporting to WISE it seems that nothing in the PoM has changed since the reports were published on the assessment of the first RBMPs because information on substance-specific measures is missing in the second RBMP as well, despite the fact that information reported to WISE on the chemical status of surface and groundwater bodies indicates that certain Priority Substances (in all 10 RBDs) and River Basin Specific Pollutants (in six RBDs) are causing failure in the achievement of the environmental objectives. Information reported to WISE shows no KTMs reported for significant pressures from individual Priority Substances causing failure on the objectives, and indicates that KTM 15 - "Measures for the phasing-out of emissions, discharges and losses of Priority Hazardous Substances or for the reduction of emissions, discharges and losses of Priority Substances" has been neither mapped against national measures nor reported to be tackling significant pressures in the RBDs in Sweden.

Sweden informed that the measures addressing pollution with Priority Substances and River Basin Specific Pollutants are associated with other KTMs.

12.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *Provide in RBMPs (in relation to exemptions under Article 4(4) - calculation of disproportionate cost and the definition of technical unfeasibility) additional clarification and examples of unclear sources of pollution and diffuse leakages, as well as measures for nutrient pollution, which should be implemented as soon as possible.*

  Assessment: Measures to tackle diffuse as well as point sources are reported in five RBDs.

  For nutrient pollution, each sub-basin plan (e.g. for the Skagerrak and Kattegat RBD there are 43 different sub-plans) in Sweden contains, if relevant, a source apportionment for nitrogen and phosphorus so that it is clear which sources are

dominating. The sub-plan also contains a proposal for measures to reduce the load. This is very specific, e.g. for the coast area to Kattegat – sub-plan 41 - a total reduction of 1 999 kg N/y and 2 109 kg P/y is planned. This contributes together with the 42 other sub-plans to a total effect of 2.9 tonnes N out of a calculated reduction need for nitrate of 6.7 tonnes N. When it comes to hazardous substances including metals, the description is much more unclear – both as regards the dominating sources and as regards the measures necessary to achieve good status.

This recommendation is partially fulfilled.

- Recommendation: *Put more in focus the need to reduce the load of phosphorus in coastal areas – according to the gap analysis - and link it directly to measures.*

  Assessment: Key Types of Measure have been reported to tackle phosphorus emissions, and these KTM have been mapped against national measures.

  Although in the above case (coast area) it was possible to determine the effectiveness of the measures in relation to N, it has not been possible to find similar information in the WISE reporting or RBMP (on reduction need) for P, therefore the effectiveness of the measures is not clear[69].

  This recommendation is partially fulfilled.

- Recommendation: *Consider additional measures needed to achieve the WFD objectives in water bodies (in relation to Directive 91/271/EEC).* [70]

  Assessment: It is in general assumed that the requirements of the Directive 91/271/EEC are fulfilled. For most of the sub-plans, a reduction need is calculated - e.g. for the Skagerrak and Kattegat RBD, sub-plan 8, the reduction need is calculated to be 1.3 tonnes P/y to bring all water bodies in the sub-catchment to good status. A number of measures are proposed (though it is unclear how they will be implemented) with a total effect of 681 kg P/y – meaning it will only cover half of the need. No information has been found on how to cover the other half[71].

  This recommendation is partially fulfilled.

[69] Sweden reported that a document published in 2016 on measures against eutrophication describes the effectiveness of measures for phosphorus

[70] Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991L0271

[71] Sweden subsequently informed that there is no basis for proposing additional measures (with reference to technically feasibility).

Topic 13 **Measures related to hydromorphology**

13.1 Assessment of implementation and compliance with the WFD requirements in the second cycle

Significant hydromorphological pressures are reported in all RBDs (except for Bothnian Bay (Troms)). These pressures are assigned to specific sectors only to some extent. Significant physical alterations are mainly related to uses not specified according to the uses listed in WISE (other use) or the use is unknown/obsolete. To a certain extent, physical alterations are related to the agricultural sector. Hydrological alterations and continuity barriers (dams/barriers/locks) are mainly assigned to the hydropower sector and to uses not specified according to the uses listed in WISE (other use). In most water bodies affected by dams/barriers/locks, however, the sector is unknown or obsolete.

Operational KTMs to tackle significant hydromorphological pressures are reported in the five main RBDs (Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat) for dams/barriers/locks linked to hydropower and other uses. For the small RBDs, hydromorphological measures are implemented, but these are to be found in the programmes of measures of the respective main RBDs. The main KTMs reported as operational to tackle continuity barriers are KTM 5 – "Improving longitudinal continuity" and KTM 7 – "Improvements in flow regime and/or establishment of ecological flows". However, overall management objectives in terms of restoring river continuity have not been set. It is also noted that no operational KTMs are reported to address significant physical alterations, hydrological alterations and hydromorphological alterations. Sweden subsequently clarified that the RBMPs include environmental objectives set with regard to river continuity for all water bodies where it was considered necessary. The plans also include measures to address the relevant hydromorphological pressures, which are administrative measures already adopted, and additional physical measures, which have been only proposed.

These planned specific hydromorphological measures planned include fish ladders and bypass channels, removal of structures, restoration of modified bank and bed structure and setting of ecological flows.

In terms of basic measures, there is an authorisation and/or permitting regime in place to control physical modifications in the five main RBDs, which covers changes to the riparian area of water bodies according to WFD Article 11(3)(i). There is also a register of physical modifications of water bodies.

Win-win measures in terms of achieving the objectives of the WFD[72] and Floods Directive[73], drought management and use of Natural Water Retention Measures (NWRM) are not reported as included in the PoM. Also, the design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, is reported not to have been adapted to take into account WFD objectives. KTM 23 – "Natural Water Retention Measures" is not reported either to tackle any significant pressures.

Ecological flows have been derived partly, i.e. for some relevant water bodies, in the five main RBDs but the work is still on-going. The ecological flows which have been derived so far have been implemented only in some relevant water bodies. The issue of Ecological Flows is generally not described in any detail.

Concerning the level of ambition for tackling significant hydromorphological pressures, indicators on the pressure gap to be filled and KTM value indicators are reported for 2015 and 2021 (but not for 2027) and only for dams/barriers/locks due to hydropower and other uses in the five main RBDs. No gap indicators are provided for the other types of significant hydromorphological pressures or other RBDs.

From the information available, there will be considerable progress in closing the gap by 2021 in terms of continuity barriers; the number of dams/ weirs/ locks associated with hydropower and other uses which have conditions not compatible with the achievement of objectives will be reduced by approximately 88 % until 2021. Nevertheless, after 2021 and according to the KTM 7 - "Improvements in flow regime and/or establishment of ecological flows" value indicators reported for barriers, there will still be a considerable number of water bodies where ecological flows need to be established to achieve the objectives, especially in the Bothnian Sea, South Baltic Sea and Skagerrak and Kattegat RBDs.

13.2 Main changes in implementation and compliance since the first cycle

In the first RBMPs, no concrete hydromorphological measures were identified to achieve improvements in hydromorphology within the first cycle. The proposed measures were mainly aiming at an improved basis for decisions upon specific measures to be taken in the next planning cycle. Now in the second RBMPs, operational KTM to tackle significant hydromorphological pressures are reported in the five main RBDs.

[72] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

[73] Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060

13.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *Provide clear commitment in the RBMPs to properly prioritised measures and the review of hydropower permits because no specific hydromorphological measures are identified in the Programme of Measures despite the large number of water bodies being affected by this kind of pressure. A clear link for the protection of biological quality elements should be established.*

  Assessment: The number of water bodies affected by significant hydromorphological pressures is reported, but not the number of water bodies requiring hydromorphological measures to achieve good ecological status/good ecological potential for all the relevant significant hydromorphological pressures. Information on the number of water bodies is only reported for water bodies, where ecological flows need to be established (KTM 7 - "Improvements in flow regime and/or establishment of ecological flows") to achieve objectives for 2015 and 2021 for hydropower dams in the five main RBDs (Bothnian Bay, Bothnian Sea, North Baltic Sea, South Baltic Sea and Skagerrak and Kattegat). In general, reported information on the gap indicators is not complete. Indicators are only reported on the number of barriers due to hydropower and other uses in the five main RBDs. No gap indicators are provided for the other types of significant hydromorphological pressures. Operational KTMs to tackle significant hydromorphological pressures are only reported for dams/barriers/locks linked to hydropower and other uses. No operational KTMs are reported for significant physical alterations, hydrological alterations and hydromorphological alterations.

  There is no indication in the RBMP of a systematic revision of permits to address hydromorphological problems[74]. The PoM however states the necessity to plan for initiatives in relation to the revision of permits. Therefore, this recommendation is partially fulfilled.

- Recommendation: *Consider river restoration and prioritise the use of green infrastructure and/or natural water retention measures that provide a range of environmental (improvements in water quality, increase water infiltration and thus*

[74] Sweden subsequently informed the Commission that a new environmental legislation will apply as from January 2019, which will result in a national plan ensuring that all hydropower plants will have to be subject to updated permits. This will also apply to other water uses.

aquifer recharge, flood protection, habitat conservation etc.), social and economic benefits which can be in many cases more cost-effective than grey infrastructure.

Assessment: No progress is noted. Win-win measures in terms of achieving the objectives of the WFD and Floods Directive, drought management and use of Natural Water Retention Measures (NWRM) are not included in the PoM[75]. KTM 23 – "Natural Water Retention Measures" is not reported either to tackle any significant pressures. Therefore, this recommendation is not yet fulfilled.

[75] Sweden clarified that this may be related to an incomplete reporting

Topic 14 **Economic analysis and water pricing policies**

14.1 Assessment of implementation and compliance with WFD requirements in the second cycle and main changes in implementation and compliance since the first cycle

As in the first cycle, the definition of water services is a narrow one, i.e. water supply and wastewater treatment (combined). Cost recovery rates are provided for these services i.e. the municipal water and wastewater system (combined).

There is no information in the RBMPs regarding cost recovery of self-abstraction in agriculture or regarding collection and discharge of waste water from scattered settlements.

It is reported in WISE that Article 9(4) is used for some water services, although these are not reported as such regarding financial cost recovery (flood protection, irrigation, navigation, self-abstraction and water storage)[76].

Water uses are identified and described, being abstraction, agriculture, industry, households (urban/domestic), wastewater treatment, water supply, cooling water, diffuse pollution from agriculture or forestry (as "other use"). Cost recovery is applied through water service charges for public water supply and public wastewater treatment. The cost recovery rates also cover costs relating to water use[77]. These users may be households, industries, and agricultural enterprises. The contributions of these sectors to the recovery of the costs are elaborated in detail in a background document prepared by Sweden.

Regarding the integration of environmental and resource costs in the costs recovered there are rules on their inclusion in the relevant Swedish legislation[78].

There is no specific explanation with regard to the incentive function of water pricing policies and/or their adequateness.

No specific information is provided on the Polluter Pays Principle. It is only stated that the Polluter Pays Principle is generally covered by the municipal wastewater fees.

[76] Sweden subsequently clarified that this concerns a reporting error in WISE. Article 9(4) was not used in this reporting cycle.

[77] Cost recovery for water services is secured by the applicable law (lagen (2006:412) om allmänna vattentjänster).

[78] See 6, 10 and 24-34 §§ lagen om allmänna vattentjänster (2006:412)

The economic analysis is reported as updated.

14.2 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *The cost-recovery should address a broad range of water services, including impoundments, abstraction, storage, treatment and distribution of surface waters, and collection, treatment and discharge of waste water, also when they are "self-services", for instance self-abstraction for agriculture to collection and discharge of waste water, from scattered settlements, for which for instance environmental and resource costs also need to be recovered. The cost recovery should be transparently presented for all relevant user sectors, and environment and resource costs should be included in the costs recovered. Information should also be provided on the incentive function of water pricing for all water services, with the aim of ensuring an efficient use of water. Information on how the polluter pays principle has been taken into account should be provided in the RBMPs.*

  Assessment: As in the first cycle, the definition of water services is narrow, i.e. water supply and wastewater treatment (combined) are considered water services. Hence, cost recovery rates are provided only for the municipal water and wastewater system (combined). There is no information in the RBMPs regarding cost recovery of self-abstraction in agriculture or regarding collection and discharge of waste water from scattered settlements.

  It is reported in WISE that Article 9(4) is used for some water services, although these overall are not reported as such regarding financial cost recovery (flood protection, irrigation, navigation, self-abstraction and water storage)[79].

  Cost recovery is applied through water service charges for public water supply and public wastewater treatment[80].

  Water uses are identified and described, being abstraction, agriculture, industry, households (urban/domestic), wastewater treatment, water supply, cooling water, diffuse pollution from agriculture or forestry (as "other use"). The cost recovery rates

[79] Sweden subsequently clarified that this concerns a reporting error in WISE. Article 9(4) was not used in this reporting cycle.

[80] Cost recovery for water services is secured by the applicable law (lagen (2006:412) om allmänna vattentjänster).

also cover costs relating to water use. Cost recovery is applied through water service charges for public water supply and public wastewater treatment. Users may be households, industries, and agricultural enterprises. The contributions of these sectors to the recovery of the costs are elaborated in detail in a background document prepared by Sweden.

Regarding the integration of environmental and resource costs in the costs recovered there are rules on their inclusion in the relevant Swedish legislation[81].

There is no specific explanation with regard to the incentive function of water pricing policies and/or their adequateness. Volumetric pricing/charging is in place for all users connected to the public water supply system, which can be households, industries, and agricultural enterprises. It is unclear if "adequate incentives" are applied for those additional water uses beyond public water supply (and waste water) services. It seems self-abstraction is still an issue, with no charges/fees applied.

No specific information is provided on the Polluter Pays Principle. It is only stated that the Polluter Pays Principle is generally covered by the municipal wastewater fees.

Overall, there is progress on the recommendation (with regard to the contributions of different water uses to cost recovery), but significant gaps remain; the recommendation is partially fulfilled.

[81] See 6, 10 and 24-34 §§ lagen om allmänna vattentjänster (2006:412)

Topic 15 Considerations specific to Protected Areas (identification, monitoring, objectives and measures)

15.1 Assessment of implementation and compliance with WFD requirements in the second cycle

Sweden has identified all types of Protected Areas associated with surface and groundwaters in the second of RBMPs, except sensitive areas designated under the Urban Waste Water Treatment Directive in line with their whole territory approach to the implementation of this Directive. An overview of the number of each type of Protected Areas is shown in Table 15.1.

Table 15.1 Number of Protected Areas of all types in each RBD of Sweden, for surface and groundwater

Protected Area type	Number of Protected Area Associated with			
	Rivers	Lakes	Coastal	Groundwater
Abstraction of water intended for human consumption under Article 7	69	187		1010
Recreational waters, including areas designated as bathing waters under Directive 76/160/EEC[82]	3	187	249	
Protection of species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 79/409/EEC (Birds)	54	51	51	
Protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under Directive 92/43/EEC (Habitats)	643	446	310	
Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC (Nitrates Directive) [83]	1[84]	1	1	1
Areas designated for the protection of economically significant aquatic species	19	25	32	

Source: Member States reports to WISE

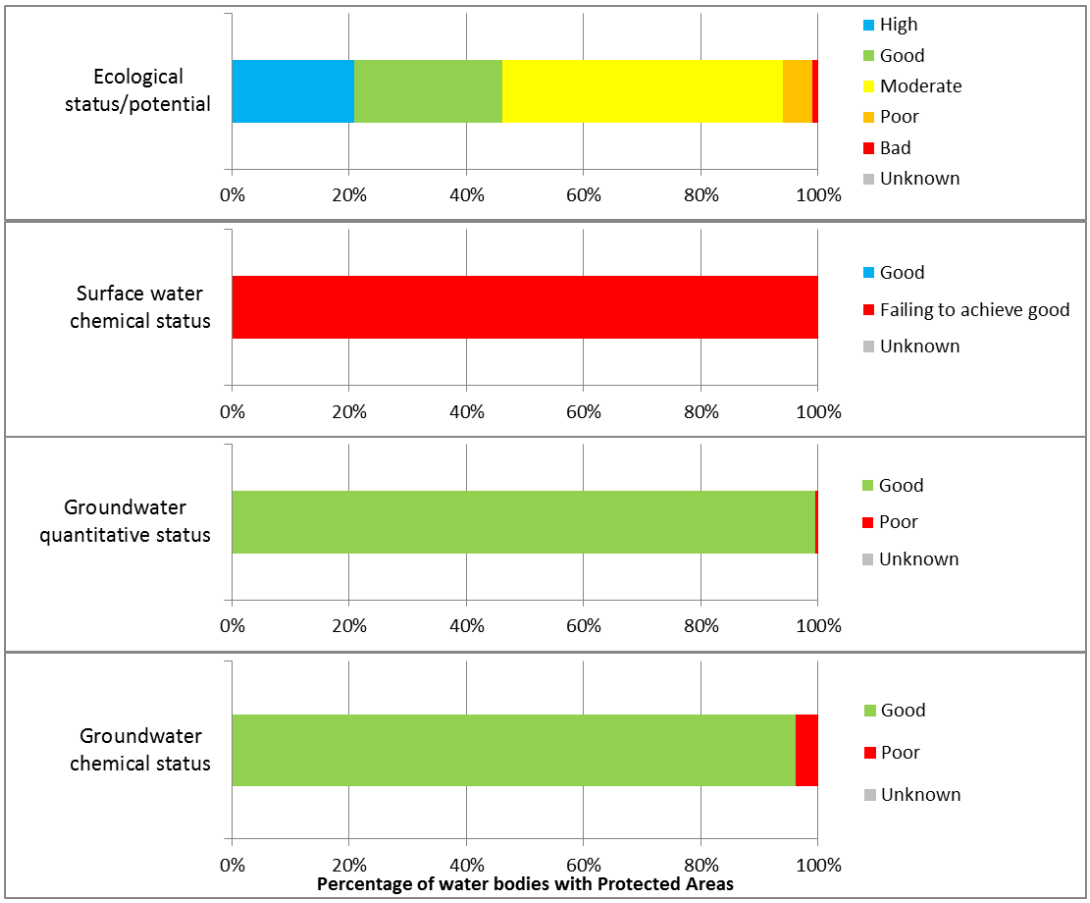
[82] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006L0007

[83] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

[84] Sweden subsequently clarified that this nitrate sensitive area covers a large part of the Swedish territory

An overview of the status assessment of all water bodies within Protected Areas is shown in Figure 15.1. A high proportion of the classifications of ecological status have been assigned low confidence or have no information; with extensive use of expert judgement in rivers and coastal waters.

Figure 15.1 Status of water bodies associated with the Protected Areas reported for Sweden. Note: based on status/potential aggregated for all water bodies associated with all Protected Areas



Source: WISE electronic reporting

In terms of setting specific objectives for Protected Areas designated under the Habitats and Birds Directives associated with surface waters, Sweden reports that some specific objectives have been set, but work is still on-going to determine needs. Sweden also reports for the most part WFD environmental objectives are sufficient to protect water dependent interest features but, where this is not the case, then additional more stringent standards are applied that ensure the requisite protection. No information is provided in WISE on whether these specific objectives have been met.

Where Protected Areas have been designated in relation to shellfish production (in the SE5 RBD), additional specific objectives have also been defined, comprising microbiological

standards that are different to those in the repealed Shellfish Directive 2006/113/EC. No information is provided in WISE on whether these specific objectives have been met.

Specific objectives have been set for Protected Areas designated under Article 7 associated with surface water bodies. These comprise 'general' environmental quality standards and further work is indicated to be underway to make these standards more water and substance specific. No information is provided in WISE on whether these specific objectives have been met.

No specific objectives have been set for Protected Areas designated under Article 7 associated with groundwater bodies but Sweden indicates that additional work will be undertaken to enhance existing protections in the second cycle[85].

Sweden reports monitoring programmes for Protected Area types for only some of the reported Protected Areas (Table 15.2): in groundwater, only for Article 7 and not for Nitrates Protected Areas and, in surface water, not for Habitats, Birds and fish and shellfish related Protected Areas. Where monitoring programmes are reported, the number of monitoring sites is often inconsistent with the number of Protected Areas of each type in each water category; sometimes the number of monitoring sites is higher than the number of Protected Areas, which is consistent with expectations, and sometimes not. The lack of some Protected Area monitoring programmes and the low number of monitoring sites in some cases indicates insufficient monitoring of water bodies associated with Protected Areas[86].

Information on measures targeted towards Protected Areas has only been found for Drinking Water Protected Areas (both surface and groundwaters); the measures described are mainly administrative in character, such as better supervision of abstraction catchments.

No exemptions have been applied.

[85] Sweden subsequently clarified that the national groundwater threshold values applied are based on drinking water standards and, as such, the objectives in the Article 7 Protected Areas should be met.

[86] Sweden subsequently highlighted that the responsibilities for the work with protected areas under various Directives are divided on many authorities which is hard to coordinate and can hide some of the work being done.

Table 15.2 Number of monitoring sites associated with Protected Areas in Sweden

Protected Area type	Number of monitoring sites associated with Protected Areas in				
	Groundwater	Rivers	Lakes	Coastal	Territorial
Abstraction of water intended for human consumption under Article 7	1253	29	58		
Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC (Nitrates Directive) [87]		172	489	228	9
Recreational waters, including areas designated as bathing waters under Directive 76/160/EEC			89		

Source: WISE electronic reporting

15.2 Main changes in implementation and compliance since the first cycle

There are only minor changes to the number of Protected Areas of each type reported in the second cycle compared to the first cycle; the most notable difference is a significant reduction in the number of Protected Areas designated under the Birds Directive[88].

Sweden reported little information on the monitoring of Protected Areas in the first cycle. The updated WISE reporting for the second cycle has facilitated the provision of more information on the number of monitoring sites.

15.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and PoM requested action on the following:

- Recommendation: *Ensure the link between the Bathing Water Directive and the WFD in the second RBMP cycle. Also Sweden should ensure better justification and application of exemptions, including linking water and nature legislation.*

[87] Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31991L0676

[88] Sweden subsequently clarified that there is significant overlap between Habitats and Birds Directive Protected Areas but each Protected Area has been reported with only one type.

Assessment: Information reported to WISE indicates that no exemptions from specific additional objectives set for water bodies associated with Protected Areas have been applied; though exemptions from WFD objectives are widely applied in surface waters in Sweden. In terms of linking water and nature legislation, work appears to be in progress to set appropriate specific additional objectives for Protected Areas related to Habitats and Birds stating that: "Yes, some specific water objectives have been set to protect dependent habitats and species but work is still on-going to determine needs."

The recommendation is partially fulfilled.

- Recommendation: *Identify clearly in the RBMPs the Protected Areas not expected to reach the more stringent objectives according to other Directives.*

  Assessment: Sweden has set specific additional objectives for the following Protected Area types: Article 7, Habitats, Birds and economically significant species (shellfish). Information reported to WISE indicates that no information is available on whether these additional objectives have been met for any Protected Area type. A clear identification of Protected Areas which will not reach the more stringent objective is not available in the RBMPs.

  The recommendation has not been fulfilled.

- Recommendation: *Ensure the link between the Bathing Water Directive and the WFD in the second RBMP cycle.*

  Assessment: No additional objectives or measures for Protected Areas related to Bathing Waters have been specifically reported in the second RBMPs[89].

  The recommendation has not been fulfilled.

- Recommendation: *Clarify that all water bodies used as drinking water abstraction sources are included in the Protected Areas, and measures that ensure compliance with Article 7 are included in the Programmes of Measures.*

  Assessment: This recommendation was made following an inconsistency between the reported number of Protected Areas for drinking water in the first RBMP (1099) and

[89] Sweden clarified that it has taken the objectives from the Bathing Water Directive in to account in determining environmental objectives for associated water bodies but that the reporting schemas focus on information on water bodies associated with Shellfish Directive, Habitats and Birds Directives, and waterbodies used for drinking water abstraction.

later information from Sweden (1700). From the data reported to WISE in the second cycle, there are approximately 256 surface water Protected Areas for drinking water abstraction and 1010 groundwater Protected Areas for drinking water abstraction. By way of comparison, 17 groundwater bodies and no surface water bodies were reported to be influenced by significant pressure '3.2 - Abstraction or flow diversion - Public water supply.' It is not possible to confirm whether this recommendation has been fulfilled on the basis of information reported to WISE.

Topic 16 Adaptation to drought and climate change

16.1 Assessment of implementation and compliance with WFD requirements in the second cycle

16.1.1 Climate change adaptation

Climate change was considered in various ways in all RBDs but it is stated that the guidance on how to adapt to climate change (Common Implementation Strategy Guidance Document No. 24[90]) was not used. The specific climate change aspects have been considered when checking the effectiveness of measures and in flood risk management. KTM 24 - "Adaptation to climate change" is not made operational to address significant pressures in any of the RBDs. No specific sub-plans addressing climate change have been reported in any of the RBDs.

16.1.2 Effects and impacts of prolonged droughts, as well as related measures

According to the 2012 Topic Report on Assessment of Water Scarcity and Drought aspects in a selection of European Union RBMPs[91], droughts are not relevant in Sweden, except for the Bothnian Sea and North Baltic Sea RBDs which are facing local droughts. No exemptions have been applied following Article 4(6) due to prolonged droughts.

Even though there is no legal obligation to prepare Drought Management Plans, many Member States have prepared them in order to cope with droughts.No Drought Management Plans have been reported for Sweden. This situation is similar to the first RBMP (2012 Topic Report on Assessment of Water Scarcity and Drought aspects in a selection of European Union RBMPs).

16.2 Main changes in implementation and compliance since the first cycle

The main development since the first cycle is the implementation of the checking of the effectiveness of measures in relation to specific climate change aspects even if this was not done according to the Common Implementation Strategy Guidance Document No. 24[92].

16.3 Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and PoM.

[90] https://circabc.europa.eu/sd/a/a88369ef-df4d-43b1-8c8c-306ac7c2d6e1/Guidance%20document%20n%2024%20-%20River%20Basin%20Management%20in%20a%20Changing%20Climate_FINAL.pdf

[91] http://ec.europa.eu/environment/water/quantity/pdf/Assessment%20WSD.pdf

[92] https://circabc.europa.eu/sd/a/a88369ef-df4d-43b1-8c8c-306ac7c2d6e1/Guidance%20document%20n%2024%20-%20River%20Basin%20Management%20in%20a%20Changing%20Climate_FINAL.pdf