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Second River Basin Management Plans - Member State: Denmark

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 and definitions

EQS Directive	Environmental Quality Standards Directive
FD	Floods Directive
Km	Kilometre
km^2	Kilometre squared
KTM	Key Type of Measure
PoM	Programme of Measures
QA/QC Directive	Quality Assurance / Quality Control Directive
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 River Basin Management Plans (RBMP) prepared earlier. The situation in the Member States may have changed since then.

General Information

The Danish population is 5.6 million (the exact number on 1 January 2012 was 5 560 628)[1]. Denmark has a total area of 43 321 km^2. Denmark's RBDs are shown in Map A.

Map A Map of RBDs

Source: WISE, Eurostat (country borders)

International RBDs (within European Union)
International RBDs (outside European Union)
National RBDs (within European Union)
Countries (outside European Union)
Coastal Waters

Denmark has one international RBD (Vidå-Kruså) shared with Germany. The international RBD shared with Germany is not jointly designated. There is more than one transboundary river basin in the RBDs.

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

The areas of the national RBDs including sharing countries is provided in Table A and Denmark's share of the international RBD is shown in Table B.

Table A Overview of Denmark's RBDs

RBD	Name	Size (km^2) (Area including coastal waters shown in brackets)	Countries sharing RBD
DK1	Jutland and Funen	32 040 (44 898)	-
DK2	Zealand	9 280 (16 364)	-
DK3	Bornholm	602 (825)	-
DK4	International (Vidå-Kruså)	1 100 (1 305)	DE

Source: RBMPs reported to WISE

Table B Transboundary RBDs by category and % share in Denmark

Name international RBD	National RBD	Countries sharing borders	Co-ordination category	
			3	
			km²	%
Krusaa/Krusau	DK4	DE	15	71.4
Vidaa/Wiedau (Rudboel Soe/Ruttebüller See)	DK4	DE	1081	80.5

Source: WISE electronic reports

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 four RBMPs of Denmark (Jutland and Funen, Zealand, Bornholm, International Vidå-Kruså) were published on 27 June 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 Denmark are as follows:

- **Governance and public consultation**
  - A broad range of stakeholder groups were actively involved in the preparation of Denmark's RBMPs, including via advisory groups.
  - Denmark and Germany have agreed to strengthen coordination in the iRBD.
  - Denmark did not adopt and publish the RBMPs in accordance with the timetable in the Water Framework Directive.
- **Characterisation of the RBD**
  - Significant changes in the delineation of small water bodies and heavily modified and artificial water bodies may lead to issues with the comparability of pressures and status between cycles.
  - Several of the national types for Denmark in all of the RBDs do not appear to have corresponding intercalibration types.
  - Type specific reference conditions have been established for some of the relevant biological quality elements in most water body types, and for all relevant biological quality elements in the others. Type specific reference conditions have not been established for physicochemical quality elements or hydromorphological quality elements.
  - There have been some improvements in the assessment of significant pressures since the first RBMPs, with the development of new models. For both surface and groundwater, the significance of pressures was reported to be defined in terms of thresholds and linked to the potential failure of objectives.
  - For the second RBMPs, there is no data reported on which significant pressures were not assessed for surface waters or groundwater. "Anthropogenic pressure - Unknown" was identified for 25 % of groundwater bodies, which may indicate some inadequacies in the methodologies used to assess pressures and impacts. Some of the

tools for assessing certain pressures could be improved (e.g. hydromorphological pressures and quantitative pressures on groundwater).

- Denmark reported inventories for all RBDs, each one including 19 of the 41 Priority Substances. According to the RBMPs, the substances not included in the inventories are not used in Denmark or screening has shown that they do not occur in significant quantities. The CIS Guidance Document recommends providing basic estimation of emissions, including for these substances of minor importance, which has not been done. Tier 1 (point source information) was implemented for substances not relevant at RBD level, and Tier 2 (riverine load) was used for other substances, while the Guidance Document recommends using at least Tier 1+2 for the relevant substances. The data quality was not reported.

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

  - The number of monitoring sites increased significantly since the first RBMPs, mostly due to a large increase in the number of operational monitoring sites in rivers.

  - There are gaps in the monitored biological quality elements: phytobenthos are not monitored in rivers and benthic invertebrates are not monitored in lakes. None of the water bodies included in surveillance monitoring were monitored for all the required biological, hydromorphological and physicochemical quality elements.

  - 15 River Basin Specific Pollutants were monitored in all relevant water categories (three in coastal waters, three in lakes and 13 in rivers), but the percentage of water bodies monitored is low. Monitoring in coastal waters was in biota only, while in surface freshwaters it was done in the water column and biota. River Basin Specific Pollutants were monitored at the minimum recommended frequency at some sites for surveillance monitoring but at no sites for operational monitoring.

  - New assessment methods have been developed since the first RBMPs for macrophytes and fish in rivers and lakes. The remaining gaps are phytobenthos in rivers, benthic invertebrates and phytobenthos in lakes, and macroalgae in coastal waters.

  - There is no biological quality element method which is sensitive to nutrients in rivers.

- Morphological conditions of rivers were assessed in terms of ecological status/potential and their classification boundaries are related to the class boundaries for the sensitive biological quality elements.

- Hydrological/tidal regime and river continuity were not assessed[2]. No hydromorphological quality elements are used in the classification of status/potential.

- Standards for assessment of general physicochemical elements are reported in supporting documents accompanying the RMBPs, even if they were not reported to WISE.

- Environmental Quality Standards values were reported for water for all 15 River Basin Specific Pollutants: 12 in rivers, three in lakes, as well as two in biota in coastal waters. The standards have been derived in accordance with Technical Guidance n. 27 and the analytical methods used meet the minimum performance criteria laid down in Article 4(1) of the QA/QC Directive (2009/90/EC)[3] for the strictest standard applied.

- River Basin Specific Pollutants are used for the classification of ecological status where they are monitored in surface waters.

- The reported values show an increase in the total number of water bodies in less than good ecological status since the first RBMPs. Denmark's analyse in the RBMPs states in general minor improvements in ecological status for coastal waters and lakes and no changes for watercourses. Comparison between the two cycles should however be analysed with care, considering changes in delineation of water bodies and in methodologies.

- The number of natural water bodies with unknown ecological status has significantly decreased since the first RBMP, which is an improvement. However, there is still a significant number of water bodies reported with unknown ecological status (20% for lakes, 23 % for rivers[4]), with the exception of coastal waters, which were always classified for ecological status, while 54% of coastal water bodies had unknown status in the first RBMPs.

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[2] Denmark subsequently stated that hydromorphological elements, including tidal regime, were applied in the definition of typology for coastal waters.

[3] 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

[4] Denmark subsequently stated that the correct number is 11 % for rivers.

- The confidence in classification is high for all coastal water bodies and for the large majority of rivers and lakes where the overall ecological status/potential is classified. There are no water bodies classified with low confidence. This is a major improvement compared to the first RBMPs, in which there was no information on confidence for more than 95 % of the river and lake water bodies.

- The one-out, all-out principle is reported as having been used in all RBDs, but has not included the supporting quality elements (except nutrient in lakes).

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

  - Between the two RBMPs, the proportion of unknown, good and failing to achieve good chemical status remained fairly stable, with in particular a very high percentage of unknown (almost 99 % of water bodies). There was a change in the delineation of water bodies, as well as a reported change in the methods for status assessment.

  - Chemical status assessment is based on monitoring only, with no use of grouping or expert judgement. Classifications have been assigned medium confidence.

  - Priority substances were not monitored in water in coastal and territorial waters in any of the four RBDs, and no monitoring in water was performed in lakes and rivers in the Bornholm and International (Vidå-Kruså) RBDs. In the other two RBDs, only four priority substances are reported to be monitored in water for status assessment in lakes, and 13 in rivers. About 95 % of lake water bodies were not monitored for any priority substances. Less than 3 % river water bodies were monitored for six or more Priority Substances. Monitoring frequencies were in line with the recommended minimum frequencies for surveillance monitoring but not operational monitoring, which Denmark said was justified on the basis of expert judgment and technical knowledge, but no further detail was provided.

  - According to WISE, not all discharged substances are monitored. Denmark subsequently clarified that all substances discharged were actually monitored, however it was not clear whether they were monitored in a matrix for which a standard exist, and therefore whether the monitoring could be used for status assessment.

  - Denmark mentioned that several priority substances were monitored for example in biota or sediment, but that the corresponding standard was not derived, despite the

requirement of the Directive, and there the monitoring cannot be used in the assessment of status.

- Mercury was monitored in biota for status assessment in coastal and surface freshwaters, and hexachlorobenzene in coastal waters only. Denmark highlighted that hexachlorobutadiene was not monitored because it was not discharged. The monitoring frequencies were lower than the recommended minimum frequencies, which according to Denmark was justified on the basis of expert judgment and technical knowledge, but no further detail was provided.

- Trend monitoring was reported in biota for four substances, all of which were monitored in coastal waters, but only one in lakes and rivers. Monitoring for trends was also reported in water. The frequencies were not always in line with the recommended minimum frequency.

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

  - The number of monitoring sites has increased significantly by 35 % from the first cycle.

  - The total number/total area of groundwater bodies failing good status has significantly decreased from the first cycle.

  - Groundwater dependent terrestrial ecosystems are not considered in the status assessment.

  - Groundwater associated surface waters are considered in the status assessment.

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

  - The coverage of groundwater bodies by monitoring is not complete, neither for surveillance monitoring nor for operational monitoring, but grouping of groundwater bodies has been applied in all river basin districts. Denmark informed that all core substances are being monitored and that only those parameters and substances that were included in the status assessment and calculation of trends have been reported.

- The status situation improved significantly with a decrease of the groundwater body area failing good chemical status from 52.7 % to 19.6 % of the total groundwater body area from the first to the second cycle.

- 30% of the groundwater bodies have no clear status and the confidence in status results is low or unknown for more than the half of the groundwater bodies.

- **Designation of Heavily Modified and Artificial Water Bodies and definition of Good ecological potential**

  - A new guidelines document for the designation of heavily modified water bodies has been developed since the first RBMPs. The reduction in the number of designated heavily modified and artificial water bodies is partly due to the new guidelines and partly due to the re-delineation of water bodies. Further changes to the extent of designations may take place until the end of 2019. An information gap is related to the water uses for which water bodies are designated, namely most heavily modified river water bodies are designated due to unknown uses.

  - The method for defining Good ecological potential is more clearly explained than in the first cycle. The approach used is the Common Implementation Strategy Guidance approach and not the Prague approach which was reported in the first RBMPs. Furthermore, improvements have been made since the first cycle, mainly related to the inclusion of more quality elements in the assessment. The mitigation measures for two out of four RBDs (Jutland and Funen and Zealand) have been defined, whereas in the first RBMPs, mitigation measures were not defined in any RBD. For the International (Vidå-Kruså) and Bornholm RBD, no mitigation measures have been used for water bodies which have been defined as being at good ecological potential in the districts. For the Bornholm RBD, good ecological potential is not defined. Work to designate heavily modified water bodies and set environmental goals is still on going in all four RBDs, and will continue during 2019, as part of the *Food and Agriculture Package* (2015).

- **Environmental objectives and exemptions**

  - Environmental objectives for ecological status of surface water bodies have been reported in all RBDs, whereas for some water bodies the date for the achievement of the objectives is unknown.

- Drivers and pressures leading to exemptions were not reported.

- Article 4(4) is used more widely in surface water and groundwater in the second cycle than in the first.

- Article 4(5) was not applied in the first cycle but is now used in the second cycle for surface waters. The information provided is not sufficient to assess whether the application is compliant.

- **Programme of Measures**

  - There is a shortage of meaningful information so it is not possible to judge whether any progress has been made, other than the indication that "some measures have been completed".

  - A clear financial commitment has been secured in all four RBDs for the relevant sectors.

  - All except one significant pressure has been covered by operational KTMs in surface water and groundwater in all four RBDs. One significant pressure (Anthropogenic – unknown) is not covered by an operational KTM in one RBD.

  - A total of 18 national supplementary measures have been mapped against eight predefined KTMs and one KTM defined by Denmark. No national basic measures have been mapped.

  - The information on measures on River Basin Specific Pollutants and Priority Substances is unclear (but seems to be covered under general significant pressures). Denmark has clarified that Priority Substances are covered by the Programmes of Measures, and newly identified Priority Substances will be covered by preliminary Programmes of Measures plan running from 2018-2021.

  - The objectives and requirements of the Floods Directive[5] have not been considered in the second RBMP and Programme of Measures. However, there has been some co-ordination between RBMPs and FRMPs in all four RBDs.

[5] 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

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

  - A low proportion of groundwater bodies face water quantity-related problems for achieving good quantitative status and water abstraction pressures significantly affect only a few surface water bodies.

  - Water abstraction pressures were reported as relevant for Denmark. However, the Water Exploitation Index + is not calculated, but water quantity data have been reported to support the European State of the Environment Report in relation to Water Quantity.

  - The RBMPs include a water resource allocation and management plan in all RBDs. Measures on Article 11(3)(c) for efficient and sustainable water use have not been implemented in the previous cycle.

  - There is a concession, authorisation and/or permitting regime to control surface and groundwater abstractions and water impoundment; and a register of impoundments exists in all RBDs.

- **Measures related to pollution from agriculture**

  - There is a clear link between agricultural pressures and agricultural measures for surface and groundwater.

  - An assessment of the gaps to the achievement of WFD environmental objectives for nutrients has partly been undertaken in all RBDs. In the RBMPs gap analyses are made for coastal waters (nitrogen) and lakes (phosphorus).

  - Safeguard zones have been established for abstractions.

  - The implementation of basic measures according to Article 11(3)(h) for the control of diffuse pollution from agriculture at source is ensured in all RBDs where the same rules apply across the whole RBD.

  - Financing of measures is secured in all RBDs.

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

  - Denmark is implementing measures regarding wastewater (small wastewater treatment plants, stormwater overflow and wastewater from scattered settlements) in order to improve water quality in rivers and lakes.

  - Measures in relation to Priority Substances and River Basin Specific Pollutants were described only in a broad manner; i.e. not specific to each substance, and it is not clear whether all relevant substances have been identified, nor whether the non-specific measures will be sufficient to achieve the objectives.

- **Measures related to hydromorphology**

  - Overall, the second RBMPs reflect a significant improvement in measures to tackle hydromorphological pressures. It is expected that efforts will improve the condition of up to 3 575km of rivers/streams (which amounts to approximately half of the river kilometres which are not in good status due to poor physical conditions).

  - Whilst KTMs relevant to hydromorphological pressures have been mapped against national hydromorphological measures, information is not available in WISE on the links of these KTMs to specific significant pressures. However, Denmark subsequently clarified that information is included in the RBMPs. In addition, there is no information available on the indicator gap to be filled for significant hydromorphological pressures by 2021 or 2027. Nevertheless, based on information from the published RBMPs, it is evident that hydromorphological measures (both supplementary and basic) are planned for the second cycle.

  - Ecological flows have been derived only partly and not implemented yet in any RBD. The work to make operational the new methodology on ecological flow is still on going.

- **Economic analysis and water pricing policies**

  - Environmental and resource costs have only partly been included.

  - A narrow definition of water services has been used.

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

  - Protected Areas for all relevant types have been reported. Compared to the first cycle, comparable numbers of Article 7 (groundwater) and shellfish production areas, and many more Birds and Habitats areas were reported in the second cycle.

  - Additional objectives have been set for shellfish production areas; some of which have been met, which reflects significant progress since the first cycle.

  - The majority of Habitats Directive Protected Areas are also protected under the Birds Directive so monitoring of these areas covers both directives. The extent of the reported monitoring programmes is reduced in the second cycle compared to the first cycle.

  - Monitoring programmes for specific Protected Area types have not been reported for all types. Monitoring of Habitats areas does not cover all water categories and the number of monitoring sites is low.

- **Adaptation to drought and climate change**

  - A climate check of the Programme of Measures has been carried out in the second cycle.

Recommendations

- The preparation of the next RBMPs should be carried out in accordance with the WFD timetable, so that the third RBMPs are adopted on time.
- Denmark should continue to improve cooperation in iRBD and ensure transparency regarding coordination of the technical aspects of the WFD such as ensuring a harmonized approach and a coordinated Programme of Measures in order to ensure the timely achievement of the WFD objectives.
- Denmark needs to continue its work on the apportionment of significant pressures among different sectors, in order to further improve the identification of the appropriate mitigation measures.
- Denmark should further strengthen monitoring of surface waters by covering all relevant biological, physico-chemical and hydromorphological quality elements in all water categories. The proportion of water bodies covered by monitoring for River Basin Specific Pollutants should increase.
- Denmark should complete the development of assessment methods for all biological quality elements in all water categories, including methods that are sensitive to nutrients in rivers. Hydromorphological quality elements should be included in the classification of ecological status.
- The use of grouping for the classification of ecological status and the methodology used for grouping needs to be clearly described.
- Denmark should make significant efforts to reduce the number of surface water bodies in unknown chemical status. Monitoring should be performed in the relevant matrix in a way that ensures sufficient spatial coverage and temporal resolution to reach sufficient confidence in the assessment for all water bodies, if necessary in combination with robust grouping/extrapolation methods. If a different matrix is used, the corresponding standards need to be derived to provide at least the same level of protection, and the corresponding explanations should be provided, as required by the Directives. Explanations should also be provided if reduced frequencies are used. All priority substances discharged should be monitored so that monitoring can be used for status assessment.
- Denmark should further improve trend monitoring for all relevant substances, in a way that provides sufficient temporal resolution and spatial coverage.

- Monitoring should improve as well as confidence status to address the number of groundwater bodies with unknown chemical status, and grouping methodologies should be further clarified.
- Groundwater monitoring and methodologies for chemical should all in line with the WFD obligations. Measures to ensure good chemical status of groundwater should be established considering all WFD aspects. Trend reversals should be carried out.
- Denmark should continue progressing on the designation of HMWBs and definition of good ecological potential, and complete the required assessments for all RBDs.
- Meaningful information regarding the timing of the measures should be included in the Programmes of Measures.
- Denmark should provide clear information on the links of KTMs to specific significant pressures.
- All Priority Substances and River Specific Pollutants identified as causing failure should be individually associated with KTMs.
- Denmark should ensure that its Programme of Measures as regards chemical pollutants from non-agricultural sources is based on reliable assessment of the pressures, so that all relevant pollutants are addressed. It should also assess whether the measures proposed will be sufficient to meet the objectives.
- Denmark needs to continue its efforts to ensure that appropriate measures are applied in all water bodies subject to hydromorphological pressures. Even if the ecological flows have been derived, the necessary steps to make it operational in all RBDs need still to be taken.
- Cost recovery should be applied for water services. Any exemption should be justified using Article 9(4). Denmark should also 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. The water-pricing policy should be set out in a transparent fashion and a clear overview of estimated investments and investment needs should be provided.

  Denmark needs to establish objectives for its relevant Protected Areas for surface and groundwater.

Topic 1 Governance and public participation

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

1.1.1 Administrative arrangements – RBDs

Denmark has fourRBDs: Jutland and Funen, Zealand, Bornholm and International (Vidå-Kruså). One RBD, International (Vidå-Kruså), is part of an international RBD shared with Germany.

1.1.2 Administrative arrangements – competent authorities

Denmark has reported one Competent Authority for the second cycle, the Danish Environmental Protection Agency (EPA), responsible for all the main roles for the RBMPs: monitoring and assessment of status of groundwater and surface water, enforcement of regulations, pressure and impact analysis, economic analysis, preparation of the RBMPs and Programme of Measures, public participation, implementation of measures, coordination of implementation and reporting to the European Commission. Denmark subsequently informed that for the second cycle, the Danish Minister for Environment and Food delegated administrative powers to the Danish EPA. For the first RBMPs, the administrative powers of the Competent Authority, at the time the Minister for the Environment, were delegated to, the Danish Nature Agency, which was indicated as the main Competent Authority for the first RBMPs.

1.1.3 RBMPs – structure and Strategic Environmental Assessment

Denmark did not report any sub-plans for its RBMPs. In the first cycle, Denmark prepared individual sub-plans for the 23 main catchments that make up the four River Basin Districts.

Denmark carried out Strategic Environmental Assessments for all 4 RBMPs.

1.1.4 Public consultation

For all four RBMPs, the public and interested parties were informed by: Internet, invitations to stakeholders, local authorities, media (papers, TV and radio), and meetings. Documents were available for download for the requisite six months. Public consultation was not coordinated at international level (i.e. with Germany) in the International (Vidå-Kruså) RBD.

The following stakeholder groups were actively involved in the development of all four RBMPs: agriculture/farmers, fisheries/aquaculture, local/regional authorities, navigation/ports,

NGOs/nature protection and water supply and sanitation. The mechanisms for active involvement were the establishment of advisory groups and involvement in drafting.

For all four RBMPs, public consultation had the following impacts: addition of new information, adjustment to specific measures, changes to the selection of measures, changes to the methodology used and commitment to further research.

1.1.5 Integration with the Floods Directive and the Marine Strategy Framework Directive

Denmark carried out a joint consultation of its RBMPs and the Floods Directive[6] Flood Risk Management Plans.

Denmark did not carry out joint consultation with the Marine Strategy Framework Directive[7].

1.1.6 International coordination

One of Denmark's four RBMPs is part of an international RBMP (Vidå-Kruså), which is shared with Germany. There is an international agreement on water management in place but without a coordination body nor an international RBMP (designated as Category 3 cooperation).

According to the RBMP for International (Vidå-Kruså), Denmark and Germany exchanged information on the assessment of border river catchments. Nonetheless, there were some differences in the classification in waters and the two Member States do not fully follow the same surveillance monitoring programme. Denmark and Germany have agreed to coordinate with regard to a number of issues: transboundary river basins, in particular analysis and reviews, monitoring programmes, programmes of measures, river basin management plans, timetables and work programmes, interim overviews of significant water management issues, measures for consulting and informing the public and reporting to the European Commission.

Denmark subsequently informed that the Competent Authority on the German side was consulted in parallel with relevant Danish authorities.

Further information on international co-operation with respect to measures is provided in Chapter 9 of this report.

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[6] 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

[7] 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

1.2 Main changes in implementation and compliance since first cycle

For the first cycle, Denmark prepared a sub-plan for each of the 23 main catchments that make up the four RBDs. RBD-wide RBMPs were also prepared for the Bornholm RBD and the International (Vidå-Kruså) RBDs. No RBD-wide RBMPs were prepared for the Jutland and Funen RBD or the Zealand RBD.

In the second cycle Denmark reports the preparation of four RBMPs, one for each RBD covering all main catchments within the RBD, and no sub-plans.

For the first RBMPs the administrative powers of the Competent Authority, at the time the Danish Minister for the Environment, were delegated to the Danish Nature Agency, which was indicated as the main competent authority (with the Minister of Environment as overall water authority); for the second cycle the administrative powers of the Competent Authority, now the Danish Minister for Environment and Food, were delegated to the Danish Environmental Protection Agency.

1.3 Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Given the late adoption of the sub-district RBMPs, Denmark needs to take special care to ensure that the preparation of the next cycle of RBMPs is carried out in accordance with the WFD timetable, to ensure the second RBMPs are adopted no later than December 2015.*

Assessment: According to the information reported by Denmark the second RBMPs were published on 27 June 2016 and thus were 6 months late. Consequently, Denmark did not meet the deadline set in the recommendation (nor the timetable set and in the WFD). This recommendation has not been fulfilled.

Topic 2 Characterisation of the River Basin District

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

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

Overall there was a significant decrease in the number of river water bodies delineated between the first and second RBMPs of 49 % (Table 2.1). The same was true for coastal water bodies with a decrease of 28 %[8]. Territorial waters were only reported in the second cycle[9]. For lake water bodies, however there was an increase of 23 % overall, with the largest increase in the International (Vidå-Kruså) RBD (83 %). In the second RBMP, 91 % of identified surface water bodies were natural with 5 % being designated as heavily modified and 4 % as artificial water bodies. In the first RBMP, the situation was quite different with 72 % natural, 16 % heavily modified and 11 % artificial (Figure 2.1). Table 2.2 shows the differences in size distribution of surface water bodies in Denmark between the second and first RBMPs.

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

Cycle	RBD	Rivers		Lakes		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
second	DK1	6 206	15 246 (15 248)	598	306	83	12 803
second	DK2	1 276	2 765	214	162	33	7 085
second	DK3	184	369	11	1	2	233
second	DK4	110	518	33	8	1	205
second	Total	7 776	18 898[10] (18 900)	856	477	119	20 325
first	DK1	11 513 (11 516)	15 191 (15 197)	477	272 (273)	106	27 754
first	DK2	2 919 (2 922)	2 763	190	157 (159)	56	11 656
first	DK3	431	370	11	1	3	4 071

[8] Denmark subsequently clarified that this decrease was due to the fact that territorial waters were only reported to be delineated as such in the second cycle and were reported as coastal waters in the first cycle.

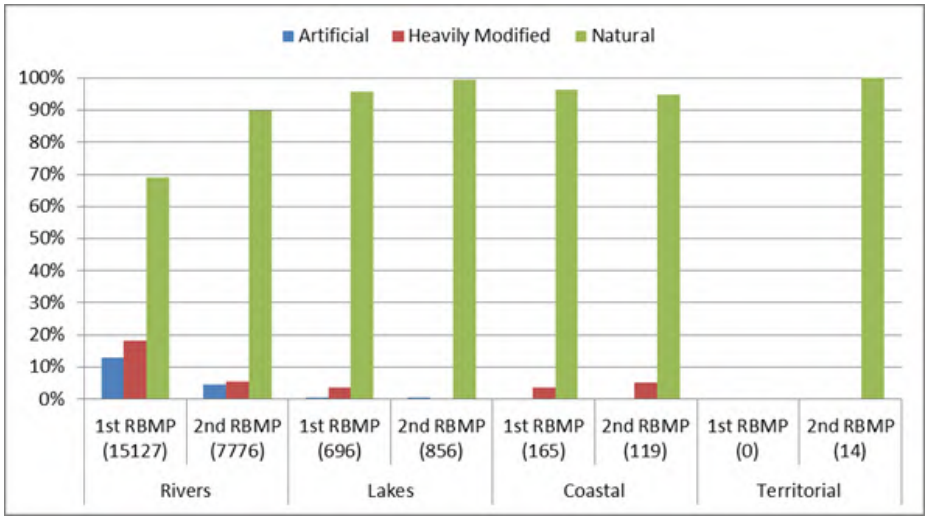
[9] Denmark further clarified that 28 coastal water bodies reported for the first cycle were re-delineated/merged and reported as territorial waters in the second cycle.

[10] Very small rivers with a catchment area of less than 10 km^2 that are flat, narrow and dug will be excluded from delineation in the second RBMP in 2018 and 2019. This falls under the new *Food and Agriculture Package* (2015).

Cycle	RBD	Rivers		Lakes		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
first	DK4	264	518	18	7	0	0
first	Total	15 127 (15 133)	18 842	696	437 (440)	165	43 481

Source: WISE electronic reports.
Numbers in brackets were provided subsequently by Denmark

Figure 2.1 Proportion of surface water bodies in Denmark designated as artificial, heavily modified and natural for the second and first cycles. NB - the numbers in parenthesis are the numbers of water bodies in each water category



Source: WISE electronic reports.

Table 2.2 Size distribution of surface water bodies in Denmark in the second and first cycles

Cycle	RBD	River length (km)			Lake area (km^2)			Coastal (km^2)			Territorial (km^2)		
		Mini-mum	Maxi-mum	Aver-age	Mini-mum	Maxi-mum	Aver-age	Mini-mum	Maxi-mum	Average	Mini-mum	Maxi-mum	Average
second	DK1	0.01	37.11 (37.08)	2.46	0.01	16.55 (17.13)	0.51	0.08	1 807.01	154.25	60.08	4 225.79	1 883.59
second	DK2	0.01	20.61	2.17	0.01	39.54 (35.35)	0.76	5.19	1 131.35	214.7	179.2	1 863.58	899.34
second	DK3	0.03	10.19 (10.21)	2.01	0.04	0.13	0.07	18.95	213.69	116.32	3 827.22	3 827.22	3 827.22
second	DK4	0.04	16.87 (16.85)	4.71	0.01	2.02	0.23	204.99	204.99	204.99			
first	DK1	0	21.24	1.32	0.01	16.54 (17,13)	0.57	0.08	2 495.79	261.83			
first	DK2	0	9.17	0.95	0.02	39.54 (87)	0.83	3.41	1 166.84	208.13			
first	DK3	0	8.08	0.86	0.04	0.13	0.07	19	3 837.96	1 357.08			
first	DK4	0.04	10.44	1.96	0.03	2.02	0.39						

Source: WISE electronic reports. Numbers in brackets were provided subsequently by Denmark

Transitional waters were not delineated in the first or the second cycle. The RBMP reports that there are no large river outlets to Danish coastal waters, but only gradual changes in salinity from the near-shore areas to the open sea. Therefore, the Danish fjords have been defined as separate types of coastal waters.

It was reported in the RBMP that many river water bodies were aggregated where they were considered to have similar typology and status and were generally homogenous in character. Small water bodies for example that were less than 500 metres in length were also aggregated. The aggregation of water bodies, has resulted in an increase of the average length of rivers from 1.25 km to 2.43 km (Table 2.2). No changes in the criteria for delineation of lakes or coastal waters were reported, yet more lakes were included in the second RBMP, mainly lakes between one and five hectares.

Table 2.3 Number and area of delineated groundwater bodies in Denmark for the second and first cycles

Year	RBD	Number	Area (km^2)		
			Minimum	Maximum	Average
second	DK1	241	0.48	6 175.01	219.44
second	DK2	136	0.92	1 315.18	109.75
second	DK3	19	0.35	368.62	30.5
second	DK4	6	0.49	730.42	218.36
second	Total	402	0.35	6 175.01	173.39
first	DK1	271			
first	DK2	101			
first	DK3	6			
first	DK4	7			
first	Total	385			

Source: WISE electronic reporting

For groundwater bodies, there was an overall increase of 4 %, however within the Jutland and Funen RBD there was a significant decrease (Table 2.3). The boundaries of groundwater bodies have been updated based on the proximity and/ or connection to dependant surface water bodies.

Table 2.4 summarises the information provided by Denmark on how water bodies have evolved between the two cycles. The changes to the river water bodies and groundwater bodies have been reported as “creation” and “deletion” of new water bodies.

Table 2.4 Type of change in delineation of groundwater and surface water bodies in Denmark between the second and first cycles

Type of water body change for second cycle (wiseEvolutionType)	Groundwater	Rivers	Lakes	Coastal	Territorial
Aggregation					
Splitting					
Aggregation and splitting					
Creation	402	7 776	162	18	814
Deletion	385	15 127	2	2858	
Change in code					
ExtendedArea					
change			694	36	6
Delineated for second cycle (after deletion from first cycle)	402	7 776	856	119	14

Source: WISE electronic reports

2.1.2. Identification of transboundary water bodies

No transboundary surface or groundwater bodies have been identified by Denmark. However, the International (Vidå-Kruså) RBD borders with Germany and is an international RBD. It was identified that there are differences in delineation of transboundary water bodies between Denmark and Germany, indicating that the delineation may not have been coordinated, and that joint approaches and methods are not in place.

2.1.3. Typology of surface water bodies

The number of water body types per RBD and water body categories remained largely the same between the first and second RBMPs (Table 2.5). However, there was a decrease in the number of lake water body types reported overall, from 17 to 12 types[11].

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 intercalibrated. Several of the national types for Denmark in all of the RBDs do not appear to have corresponding intercalibration types. It is the case for two types of river water bodies, nine types of lake water bodies, and 11 types of coastal water bodies[12]. For the national types that have been linked to common intercalibration types, the Danish classification

[11] Denmark subsequently clarified that the number of lake types are the same in first and second cycle; there are 16 possible types of lakes in Denmark, of which only 11 are actually found in the second cycle RBMP. In addition Denmark stated that for some lakes the type is registered as unknown.

[12] Denmark subsequently highlighted that results from Decision 2013/480/EU have been applied/translated to all national coastal water types.

system has been successfully intercalibrated for all the biological quality elements. This indicates that the Danish typology is biologically relevant for those national types. For the other national types that are not linked to any common type, there is no information available as to whether those types are biologically relevant.

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

RBD	Rivers		Lakes		Coastal	
	first	second	first	second	first	second
DK1	6	5	17 (11)	12 (11)	15	17
DK2	6	5	17 (8)	10 (9)	8	9
DK3	6	2	17 (2)	4	1	1
DK4	6	5	17 (6)	8 (7)	1	1
TOTAL	6	5	17 (11)	12 (11)	17	19

Source: WISE electronic reports. Numbers in brackets were provided subsequently by Denmark. 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

Table 2.6 shows the percentage of surface water body types in Denmark with reference conditions established for the first and second cycles. Type specific reference conditions have been established for some or all relevant biological quality elements. Type specific reference conditions have not been established for physicochemical quality elements or hydromorphological quality elements.

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

Water category	Water types	Biological quality elements	Hydromorphological quality elements	Physicochemical quality elements
Rivers (6)	All			
	Some	100%		
	None		100%	100%
Lakes (12 (11))	All	17% (18%)		
	Some	83% (82%)		
	None		100%	100%
Coastal (20(19))	All	95% (100%)		
	Some			
	None	5% (0%)	100%	100%

Source: WISE electronic reports.
Numbers in brackets were provided subsequently by Denmark

Type-specific reference conditions have been intercalibrated with other relevant Member States and is part of the European Commission Decisions on Intercalibration.

2.1.5. Characteristics of groundwater bodies

The geological formation of the aquifer types in which groundwater bodies reside along with details of whether groundwater bodies are layered or not were reported. Further characterisation work has been reported since the first cycle with the inclusion of the assessment of linkages to surface water bodies and terrestrial ecosystems.

2.1.6. Significant pressures on water bodies

In the second RBMP the significant pressures reported on surface water bodies overall were 'Diffuse - Discharges not connected to sewerage network' (49 %), followed by 'Dams, barriers and locks – Other' (26 %), which was mainly applicable to river water bodies (Figure 2.2). Diffuse pollution from agriculture is not reported as a significant pressure overall for surface water bodies (4 %). However, when it comes to coastal water bodies 98 % have diffuse pollution from agriculture and 30 % of lake water bodies but it is not a significant pressure for river water bodies (<1 %). 'No significant pressure' was reported for 22 % of surface water bodies overall.

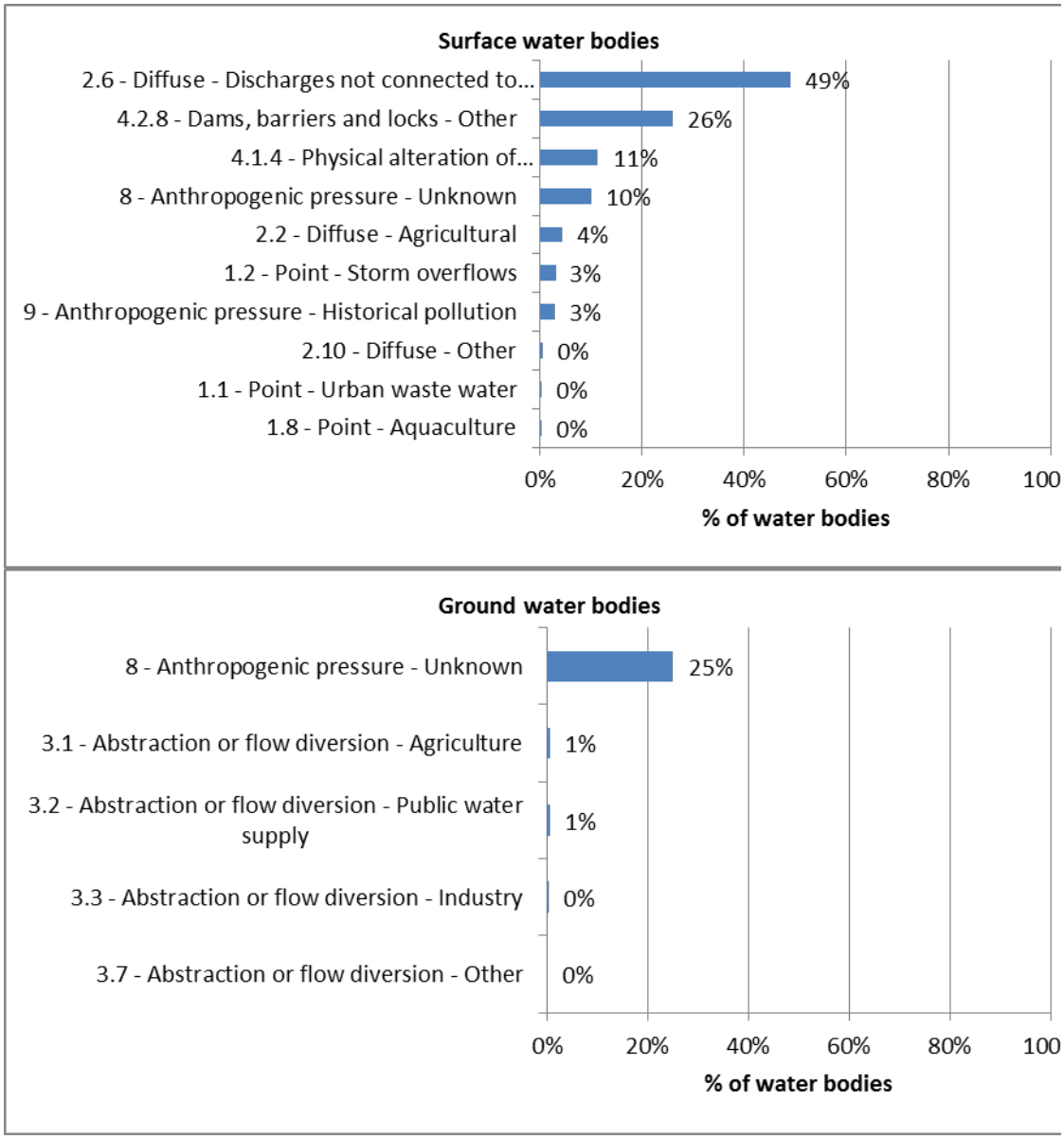
Figure 2.3 shows the comparison of pressures at an aggregated level between the first and second cycle in Demark, which shows an increase in the number of surface water bodies with associated diffuse pressures. It appears that this increase relates to 'discharges not connected to the sewerage network.' However due to important changes in the delineation of water bodies between the first and the second RBMPs, changes of pressures between the two RBMPs have to be analysed with caution.

For groundwater bodies "No significant pressure" was reported 75 % of the time and the most significant pressures were 'Anthropogenic pressure – Unknown' (25 %) and 'pressures due to abstractions' (Figure 2.2).

For the second RBMP, there is no data reported on which significant pressures were not assessed for surface waters or groundwater, and it does not appear that all pressures have been apportioned. For example, the main pressure on groundwater is 'Anthropogenic pressure – Unknown.' However, the changes in the significant pressures between the first and the second cycle were reported. For rivers since the first RBMP, phosphorus emissions from scattered dwellings, have been included whilst acidifying substances and pathogens were removed. For coastal waters since the first RBMP, nutrients from scattered dwellings have been added, whilst pathogens were removed. For coastal waters, atmospheric deposition of nutrients and nutrients coming from other countries was added since the first RBMP. It is unclear whether

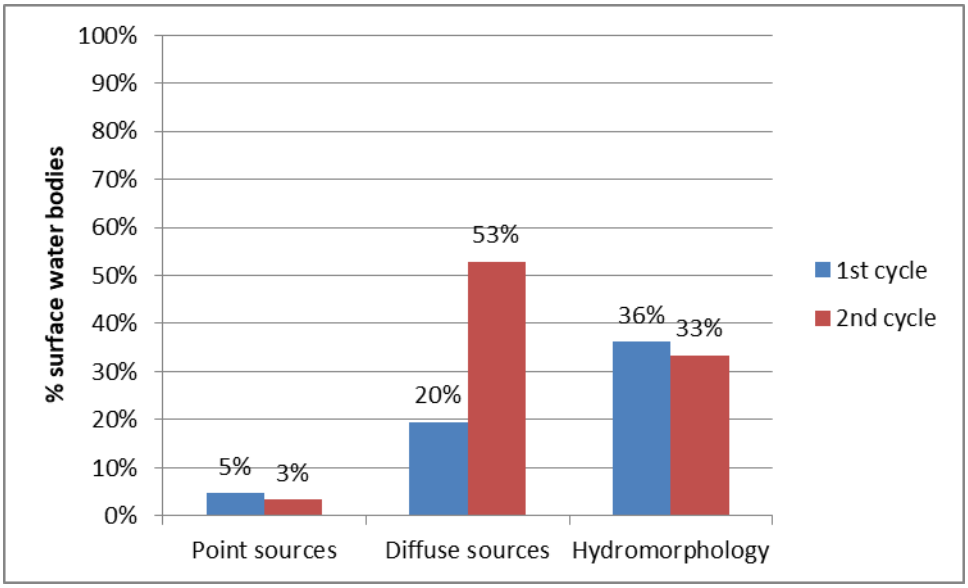
the changes relate to exclusion of pressures from the assessment or to changes in the methodologies.

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



Source: WISE electronic reports.

Figure 2.3 ***Comparison of pressures on surface water bodies in Denmark in the first and second cycles. Pressures are presented at the aggregated level. NB - there were 8 765 identified surface water bodies for the second cycle and 15 988 for the first cycle.***



Source: WISE electronic reports.

2.1.7. Definition and assessment of significant pressures on surface and groundwater

For surface waters, a combination of both expert judgement and numerical tools were used for defining point source pressures and pressures from water flow. Numerical tools were used for assessing diffuse source pressures. The tools used to assess significant pressures are Geographical Information System analyses, models, and threshold values linking the pressure to the good/moderate status boundary for the sensitive biota. The tools for hydromorphological pressures are not well developed and pressures are considered significant if the physical index exceeds a certain threshold.

The RBMPs reported that there have been significant changes in the methodology for assessing significant pressures from diffuse and point source pollution by nutrients and organic matter since the first RBMP. New models have been developed to estimate nitrogen loads to coastal waters, which include the future prediction of nutrient loads. An equivalent methodology has been developed for updated calculations of nutrient and organic loads from point sources and scattered dwellings.

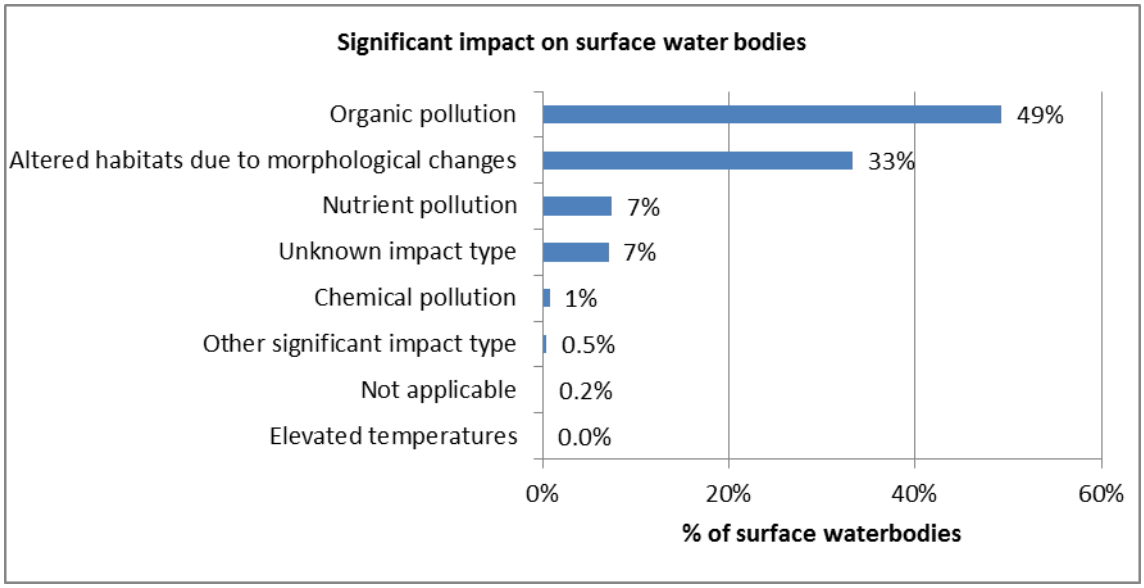
For groundwater, the tools used for defining significant pressures were reported as "Not Assessed" for point and diffuse pollution, and numerical tools were used for abstraction pressures. For groundwater, significance of pressures was reported to be defined in terms of thresholds and linked to the potential failure of objectives. Water abstraction for irrigation is

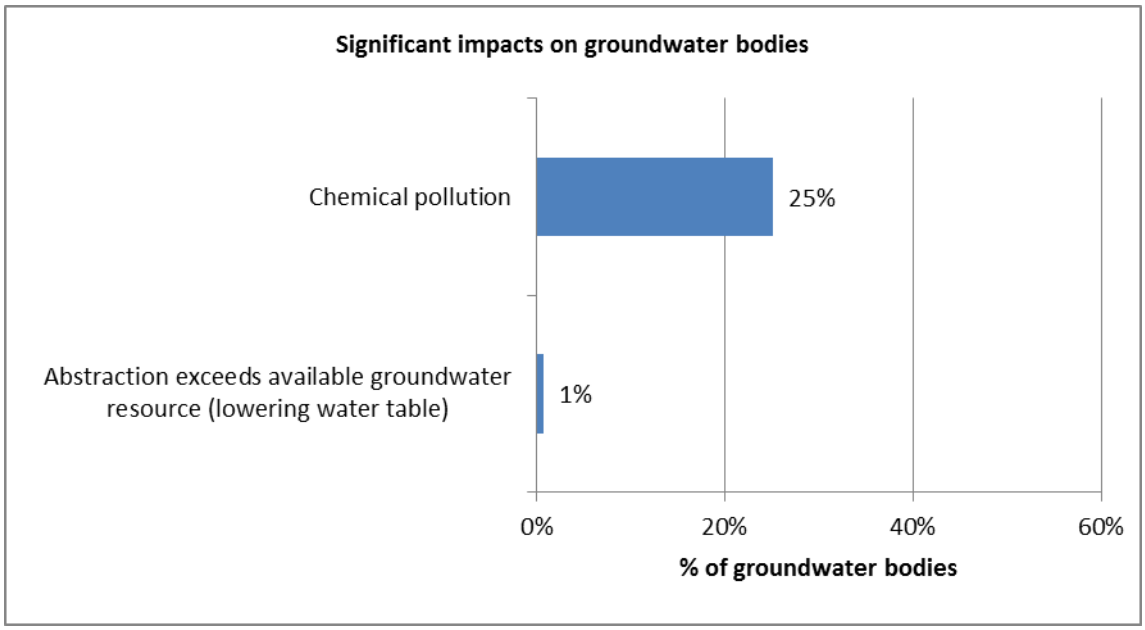
estimated with hydrogeological models. The significance of this pressure has been linked to the high probability of deterioration to less than good status of the dependent surface waters (river, benthic invertebrate ecological quality ratio values), as well as to a screening criterion of the maximum acceptable exploitation of groundwater. The hydrogeological models are also reported to be improved since the first cycle.

2.1.8. Significant impacts on water bodies

In the second RBMP, the most significant impact on surface water bodies overall was classified as 'Organic pollution' (49 %), followed by 'Altered habitats due to morphological changes' (33 %) which relates mainly to impacts on rivers (Figure 2.4). For coastal water bodies the main impact was reported to be nutrient pollution affecting 98 % of water bodies and for lakes water bodies it was 62 %. For groundwater, 74 % of water bodies were classified as 'no significant impact' and the most significant impact was 'Chemical pollution' (25 %). Denmark did not report on impacts in the first RBMP.

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





Source: WISE electronic reports

2.1.9. Groundwater bodies at risk of not meeting good status

Groundwater bodies were reported to be at risk of failing to meet good chemical status in three RBDs, ranging from 17 to 27 % in the Jutland and Funen, Zealand and International (Vidå-Kruså) RBDs. For the Bornholm RBD, no groundwater bodies were reported to be at risk. The pollutants putting groundwater bodies at risk of failing good chemical status have been reported.

In the Zealand RBD groundwater bodies were reported to be at risk of failing to meet good quantitative status (2 % of water bodies) and none were reported to be at risk for the remaining water bodies. Further information on the chemical status of groundwater bodies can be found in Chapter 6 of this report.

2.1.10. Quantification of the gap and apportionment of pressures

There was one inconsistency in the pressures for which measures are planned and the significant pressures reported at the water body level. In the International (Vidå-Kruså) RBD, 'Anthropogenic pressure – Unknown' has been reported at the groundwater body level but this pressure has not been reported as being tackled in the Programme of Measures. Further information on the Programme of Measures can be found in Chapter 9 of this report.

The Priority Substances and other substances causing the failure of good chemical status have been reported. However, the measures to tackle Priority Substances and other substances causing the failure of good chemical status and the indicator gap to achieving good status have not been reported for 2027. Denmark has however clarified that according to the RBMPs and Executive Order on programme of measures relevant environmental authorities must, within their area, investigate sources of pollutants that prevent the achievement of environmental objectives. If necessary, the Authority, if authorised in the sectoral act concerned, shall review notified approvals and permits to comply with applicable Environmental Quality Standards.

Denmark has also stated that projects are also being launched to obtain further knowledge on pollutants in the aquatic environment, and substances added to the EU list of priority substances in 2013 are covered by a preliminary program of measures from the end of 2018 to the end of 2021. Further information on measures related to pollution from sectors other than agriculture can be found in Chapter 12 of this report.

2.1.11. Inventories of emissions, discharges and losses of chemical substances

Article 5 of the Environmental Quality Standards Directive (EQS Directive)[13] 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 EQS 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

[13] 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

(respectively suppressing) emissions, discharges and losses for priority substances (respectively priority hazardous substances).

Denmark reported inventories for each RBD. However each of them included only 19 of the 41 Priority Substances. The RBMP reported that the Priority Substances not included on the inventories are not used in Denmark or that screening has shown that they do not occur in significant quantities. This does not seem to be entirely in line with the Common Implementation Strategy Guidance Document n°28, which recommends that "For the substances discarded (i.e. for substances of minor relevance) Member States should try to provide a basic estimation of emissions, discharges and losses from available data. This is especially important for PHS [priority hazardous substances – for which emissions must be phased out]".

The two-step approach from the Common Implementation Strategy Guidance Document n°28[14] has been followed for the substances considered in the inventories. Tier 1 (point source information) was implemented for substances not relevant at RBD level, and Tier 2 (riverine load) was used for other substances, while the Guidance Document recommends using at least Tier 1+2 for the relevant substances. The data quality was not reported.

2.2. Main changes in implementation and compliance since the first cycle

Overall there was a significant decrease of 49 % in the number of river water bodies delineated between the first and second RBMPs. The same was true for coastal water bodies with a decrease of 28 %[15]. For lake water bodies, however there was an increase of 23% overall, with the largest increase in the International (Vidå-Kruså) RBD (83%). For groundwater bodies, there was an overall increase of 4 %.

In the second RBMPs, 91 % of identified surface water bodies were natural, 5% were designated as heavily modified and 4 % were artificial water bodies. In the first RBMPs, the situation was somewhat different with 72 % natural, 16 % heavily modified and 11 % artificial.

The number of water body types per RBD and water body categories remained largely the same between the first and second RBMPs.

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

[15] Denmark subsequently clarified that this decrease was due to the fact that territorial waters were only reported to be delineated as such in the second cycle and were reported as coastal waters in the first cycle.

There are increases in the number of surface water bodies with diffuse pressures between the first and the second cycle. It appears that this increase relates to discharges not connected to the sewerage network.

2.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Transitional waters are not designated, and no justification is given as to why this water category has not been used. Denmark should review its designation of at least some coastal waters, notably those referred to as inner coastal fjords water, and consider transitional water designation, considering physical and chemical factors that determine the characteristics of transitional waters and hence the biological population structure and composition.*

  Assessment: Transitional waters are not delineated in the first or the second cycle. The RBMP reports that there are no large river outlets to Danish coastal waters, but only gradual changes in salinity from the near-shore areas to the open sea. Therefore, the Danish fjords have been defined as separate types of coastal waters. This justification is adequate and therefore the recommendation has been fulfilled.

- Recommendation: *There are no criteria or thresholds given on how to define significant pressures from point and diffuse sources. 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. [Action: Improved and clear descriptions of how all pressures and impacts were quantified, in particular on how significance was defined]*

  Assessment: For surface waters, a combination of both expert judgement and numerical tools were used for defining point source pressures and pressures from water flow. Numerical tools only were used for assessing diffuse source pressures. For groundwater, the tools used for defining significant pressures were reported as "Not Assessed" for point and diffuse pollution, and numerical tools were used for abstraction pressures. For both surface water bodies and groundwater, significance of pressures was reported to be defined in terms of thresholds and linked to the potential failure of objectives for all RBDs. The criteria and thresholds are described in the RBMPs and

changes from the first cycle are highlighted. Therefore this recommendation has been mostly fulfilled.

- Recommendation: *There is no information on tools to assess significant hydromorphological pressures. Denmark needs to improve the identification of significant pressures, describe the methodologies, thresholds and tools better in the plans and report more detailed data by water body. This applies also to hydromorphological pressures and chemical pollution.*

  Assessment: The RBMP does not provide information on what pressures were excluded from the assessment, but the changes in the significant pressures between the first and the second cycle were reported. There is information in the RBMPs regarding the tools used to assess the significance of pressures including hydromorphological pressures. The tools for hydromorphological pressures are not well developed and pressures are considered significant if the physical index exceeds a certain threshold. Therefore this recommendation has been partially fulfilled.

- Recommendation: *The basis for assessing quantitative status in groundwater bodies is weak and needs to be improved.* [*Action: Water abstraction for irrigation is a major source of this pressure*].

  Assessment: In terms of characterisation, abstractions are only reported to be a significant pressure for 2 % of water bodies and impacts were identified where abstraction exceeds available groundwater resource (lowering water table). It was reported that the assessment of abstraction pressures has been improved since the first cycle with the use of a new hydrogeological model. All pressures including water abstraction for irrigation have been considered for the assessment of the quantitative status. However, only those pressures that have led to poor quantitative status have been specified to be significant. Therefore this recommendation has been partially fulfilled.

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

3.1. Assessment of implementation and compliance with WFD requirements in second RBMPs

3.1.1. Monitoring of ecological status/potential

Monitoring programmes

Article 8.1 of the WFD requires Member States to establish monitoring programmes for the assessment of the status of surface water and of groundwater in order to provide a coherent and comprehensive overview of water status within each RBD.

A number of different monitoring sub-programmes were reported by Denmark and are common across the four RBDs. Even though coastal waters were reported for all four RBDs, only three of the RBDs have indicated that there is a programme covering coastal waters: the Bornholm RBD did not have coastal monitoring, except one monitoring site for macroalgae.

Denmark subsequently clarified that the sub-programme for coastal waters that was the basis of the second RBMPs did not distinguish between surveillance and operational monitoring. Each monitoring site in that programme was used for both surveillance and operational monitoring.

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

The first RBMPs for Denmark were adopted on 21 December 2011 and reported to the Commission on 22 December 2012. Electronic reporting to WISE was submitted in the spring of 2012. However, for legal reasons the first plans were declared invalid by the Danish Authorities in the spring of 2013. The RBMPs were resubmitted to a consultation process and the revised RBMPs for the first planning period were adopted in October 2014. Data were also resubmitted to WISE, the latest in March 2015. This assessment is largely based on the data submitted to WISE in 2012, supplemented by information subsequently provided by Denmark.

There was a five fold increase in the number of operational sites in rivers in Denmark between the first RBMP (2 475) and the second (12 464). There was a smaller increase in the number of operational sites in coastal waters (434 to 625) and a decrease in sites in lakes (351 to 262).

There is no summary of the changes in the RBMPs or referenced background documents. The monitoring programme used for the second RBMPs (NOVANA 2011-2015) does not include

any information on the changes made since the first RBMPs. Due to the short time between the final adoption of the first and second RBMPs, the changes in the monitoring programme are likely to be minor. There are no differences in main monitoring approach between RBDs as the monitoring programmes are national.

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

There is a significant increase in the total number of monitoring sites in lakes from 351[16] for the first RBMPs to 1080 for the second RBMPs. For the first RBMPs, no surveillance sites were reported for lakes; whereas for the second RBMPs, 818 sites were reported. However Denmark subsequently clarified that there were 351 surveillance sites in lakes for the first RBMPs. Conversely, no surveillance sites were reported for coastal waters for the second RBMP and 243 were reported for the first RBMPs. However, Denmark subsequently clarified that the total number of monitoring sites for coastal waters has increased from 636 for the first RBMPs to 781 for the second, and that no distinction was made between surveillance and operational sites for the second RBMPs. Overall, there were only small changes in the numbers of surveillance sites in rivers between the two RBMPs.

There was a five-fold increase in the number of operational sites in rivers in Denmark between the first RBMP (2 475) and the second (12 464). There was a smaller increase in the number of operational sites in coastal waters (434 to 625[17]) and a decrease in sites in lakes (351 to 262).

There is no summary of the changes in the RBMPs or referenced background documents. The monitoring programme used for the second RBMPs (NOVANA 2011-2015) does not include any information on the changes made since the first RBMPs. Due to the short time between the final adoption of the first and second RBMPs, the changes in the monitoring programme are likely to be minor. There are no differences in main monitoring approach between RBDs as the monitoring programmes are national.

Table 3.1 Number of sites used for surveillance and operational monitoring in Denmark for the second and first RBMPs. Note that for reasons of comparability with data reported for the first RBMPs, the second RBMPs' data does not take into account whether sites are used for ecological and/or chemical monitoring

	Rivers		Lakes		Coastal	
	Surv.	**Op**	**Surv.**	**Op**	**Surv.**	**Op**
second RBMP						
DK_1	613	10 269	553	194	(519)	420 (519)

[16] Denmark subsequently corrected that the number of lakes for the first RBMP is 552.
[17] Denmark subsequently clarified that there were 781operational sites in coastal waters for the second RBMP.

	Rivers		Lakes		Coastal	
	Surv.	**Op**	**Surv.**	**Op**	**Surv.**	**Op**
DK_2	140	1766	230	56	(257)	202 (257)
DK_3	23	203	13	3	(1)	(1)
DK_4	14	226	22	9	(4)	3 (4)
Total by type of site	*790*	*12464*	*818*	*262*	*0 (781)*	*625 (781)*
Total number of monitoring sites	*13 116(13140)*		*1080*		*625 (781)*	
first RBMP						
DK_1	607	1 971	0 (250)	250	162	312
DK_2	140	393	(89) 0	89	77	119
DK_3	15	27	(3) 0	3	4	3
DK_4	14	84	(9) 0	9		
Total by type of site	*776*	*2 475*	*(351) 0*	*351*	*243*	*434*
Total number of monitoring sites	*3 251*		*351(552)*		*636*	

Sources: WISE electronic reports. Numbers in brackets were provided subsequently by Denmark.

Table 3.2 Number of monitoring sites in relevant water categories used for different purposes in Denmark

Monitoring Purpose	Rivers	Lakes	Coastal
CHE - Chemical status	24	37	156
ECO - Ecological status	20 (13 136)	1080	(625)
HAB - Protection of habitats or species depending on water		410	21
OPE - Operational monitoring	12 464	262	625 (781)
SOE - EIONET State of Environment monitoring	31	17	
SUR - Surveillance monitoring	790	818	(781)
Total sites irrespective of purpose	**13 140**	**1 080**	**783**

Source: WISE electronic reports. Numbers in brackets were provided subsequently by Denmark.

Quality elements monitored (excluding River Basin Specific Pollutants)

Table 3.3 illustrates the quality elements used for the monitoring of surface waters for the second RBMPs that have been reported in WISE: no differentiation is made between purposes of monitoring.

There are also gaps in the monitored biological quality elements: macroalgae are not reported in WISE to be monitored in coastal waters, although the biological quality element is included in the NOVANA programme for 2011-2015 with 46 sites, phytobenthos are not monitored in rivers[18], and benthic invertebrates are not monitored in lakes. Phytobenthos is not reported as

[18] Denmark subsequently stated that a research institution has been requested to provide the scientific basis for the preparation of a phytobenthos index in rivers.

being monitored in lakes, but Denmark subsequently clarified that it is monitored but not used in the assessment.

Table 3.3 ***Quality elements monitored for the second RBMPs in Denmark (excluding River Basin Specific Pollutants). Note: quality element may be used for surveillance and/or operational monitoring. Note that 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[19]	Macroalgae	Other aquatic flora	Other species	Hydrological or tidal regime	Continuity conditions	Morphological conditions
Rivers		Yes	No	Yes	Yes			No		No	No	No
Lakes	Yes	Yes	No	No	Yes			No		No		No
Coastal	Yes			Yes		Yes	No[20]	No		No		No

	General physicochemical quality elements								
	Transparency conditions	Thermal conditions	Oxygenation conditions	Salinity conditions	Acidification status	Nitrogen conditions	Phosphorus Conditions	Silicate	Other determinant for nutrient conditions
Rivers		No	No	No	No	No	No	No	No
Lakes	No	No	No	No	No	No	No	No	No
Coastal	No	No	No	No	No	No	No	No	No

Source: WISE electronic reports. Denmark subsequently clarified that due to reporting error, more elements are monitored than what was reported. In particular, all general physicochemical quality elements are monitored in coastal waters (except transparency and acidification), lakes (except silicate and other determinant for nutrient conditions) and rivers (except transparency, silicate and other determinant for nutrient conditions). All hydromorphological quality elements are monitored in rivers and lakes, while in coastal water freshwater flow and composition of sediments are monitored.

Phytobenthos in rivers and lakes was not monitored for the first RBMPs, it has been monitored in lakes but not in rivers for the second RBMPs. All biological quality elements were said to be

[19] Denmark subsequently clarified that for coastal waters, angiosperms and macroalgae are sub-types.
[20] Subsequently its was clarified that, according to NOVANA, macroalgae was monitored in coastal water bodies for the second RBMPs

monitored in coastal waters for the first RBMPs, but macroalgae were not included in the WISE reporting for the second RBMPs (although it was included in the NOVANA programme, see above). It appears that for the first RBMP some physicochemical and hydromorphological quality elements were monitored in some water categories, but for the second RBMPs none were reported to be monitored. However, Denmark has subsequently clarified that this is a reporting error. All hydromorphological quality elements are monitored in rivers and lakes, while in coastal water freshwater flow and composition of sediments are monitored. All general physicochemical quality elements are monitored in coastal waters (except transparency and acidification), lakes (except silicate and other determinant for nutrient conditions) and rivers (except transparency, silicate and other determinant for nutrient conditions). [Note: Denmark also reported that reference conditions had not been established for any type for any hydromorphological or physicochemical quality element.]

Annex V of the WFD gives a recommended minimum frequency for the sampling of biological quality elements unless greater intervals would be justified on the basis of technical knowledge and expert judgement. For phytoplankton, the minimum recommended frequency is once every six months in all water categories, and once every three years for the other biological quality elements. The highest rate of alignment with these frequencies was for coastal sites where benthic invertebrates, angiosperms and phytoplankton were sampled at the minimum recommended or higher frequency at 89 %, 88 % and 43 % of sites. The rate of alignment with the recommended frequencies was much lower in the other two water categories in Denmark. For lakes only 4 %, 1 % and 1 % of sites were sampled at least at the minimum recommended frequency for macrophytes, phytoplankton and fish, respectively. None of the 3631 sites sampled for fish in rivers were sampled in line with the recommended frequencies. 22 % and 12 % of river sites were sampled with at least at the minimum recommended frequency for benthic invertebrates and macrophytes.[21]

Monitored River Basin Specific Pollutants

15 different River Basin Specific Pollutants were reported to be monitored in Denmark. The substance monitored at the most sites (60) was “dioxin-like polychlorinated biphenyls”. Three River Basin Specific Pollutants were monitored in coastal waters, three in lakes and 13 in rivers. The substances in coastal water were only monitored in biota and those in lakes and rivers only in water.

[21] Denmark informed that for rivers, lakes and coastal waters monitoring frequencies and intervals are set on the basis of technical knowledge and expert judgement, from the Danish Centre for Environment and Energy, Aarhus University.

River Basin Specific Pollutants were not monitored at the recommended frequency at any of the sites. The analytical methods used meet the minimum performance criteria laid down in Article 4(1) of the QA/QC Directive (2009/90/EC)[22] for the strictest standard applied.

Table 3.4 shows the number of sites used to monitor River Basin Specific Pollutants in Denmark 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 Denmark. Note the data from both cycles may not be fully comparable as different definitions were used and also not all Member State reported information at the site level meaning that there were no equivalent data for the first RBMPs***

RBMP		Rivers	Lakes	Coastal
second RBMP	Sites used to monitor River Basin Specific Pollutants	21	4	61
first RBMP	Sites used to monitor non-priority specific pollutants and/or other national pollutants	NR	NR	NR

Source: WISE electronic reports
NR = Not reported to WISE

Surveillance monitoring of surface water bodies

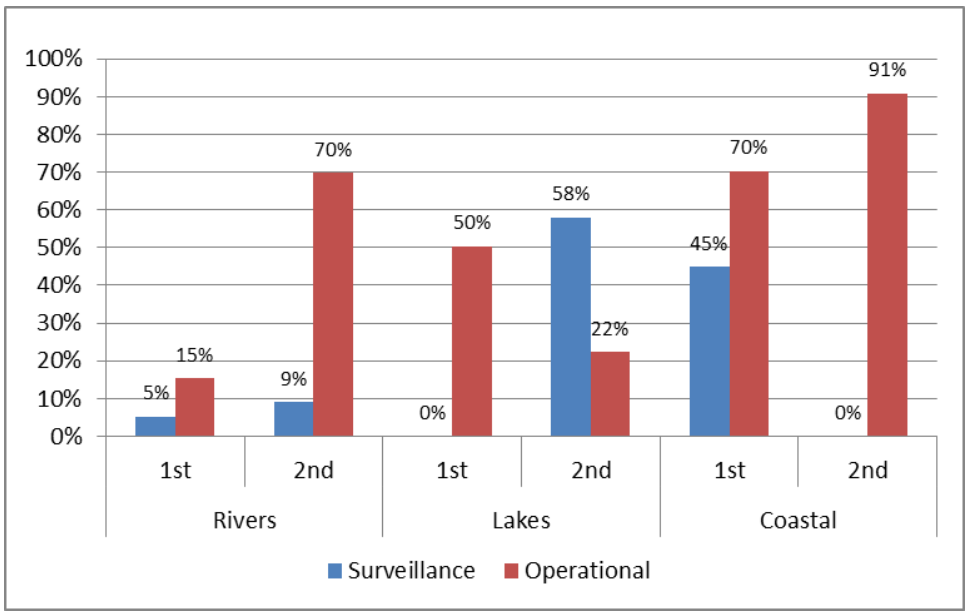
None of the water bodies included in surveillance monitoring of rivers, lakes and coastal waters were monitored for all the required biological, hydromorphological and physicochemical quality elements, which indicates non-compliance with the WFD.

Figure 3.1 shows the proportion of water bodies object of surveillance and operational monitoring in each cycle: operational monitoring generally covers a greater proportion of water bodies (except for lakes) in the second RBMPs. Surveillance monitoring was reported in WISE as occurring for the first time in lakes and not occurring at all in coastal waters in the second RBMPs. As explained above, for lakes in the first RBMPs and for coastal waters in the second, Denmark used the same monitoring programmes and the same monitoring sites for both surveillance and operational monitoring. Figure 3.2 shows the proportion of water bodies object of surveillance monitoring. Surveillance monitoring sites are distributed throughout the status classes, in water categories where it is reported, including good and high status classes as required.

[22] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:201:0036:0038:EN:PDF

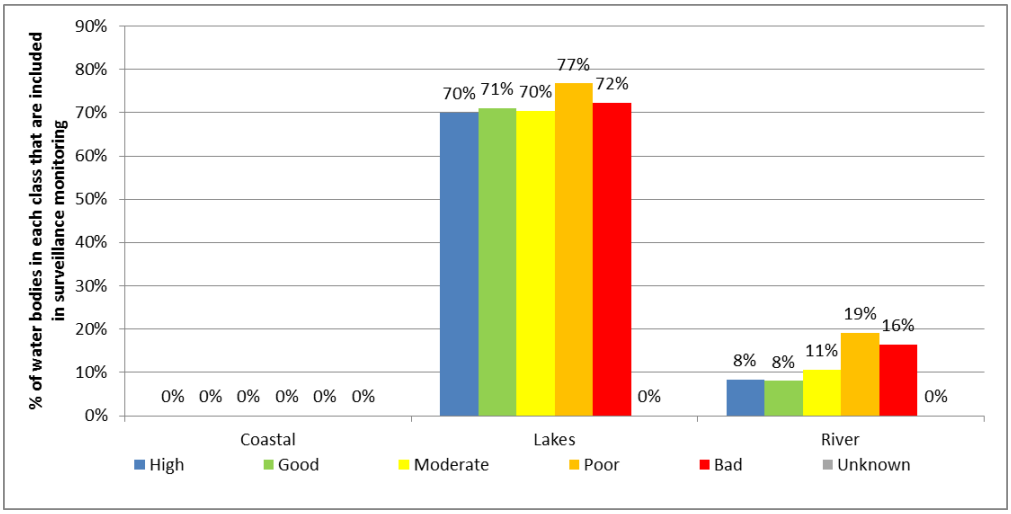
None of the water bodies included in surveillance monitoring of rivers, lakes and coastal waters were monitored for all the required biological, hydromorphological and physicochemical quality elements, which may indicate non-compliance with the WFD.

Figure 3.1 Percentage of water bodies included in surveillance and operational monitoring in Denmark for the first RBMPs and second RBMPs. Note no differentiation is made between water bodies included in ecological and/or chemical monitoring



Source: WISE electronic reports. Denmark subsequently noted that for the first RBMPs all lake monitoring sites served the purposes of both surveillance monitoring and operational monitoring. The same approach was taken for all coastal monitoring sites also for the second RBMPs. See Table 3.1 for numbers of surveillance and operational monitoring sites in lakes and coastal waters provided by Denmark.

Figure 3.2 Proportion of water bodies included in surveillance monitoring in Denmark shown for each ecological status/potential class.



Source: WISE electronic reports. Note: Denmark subsequently noted that for the first RBMPs all lake monitoring sites served the purposes of both surveillance monitoring and operational monitoring. The same approach was taken for all coastal monitoring sites also for the second RBMPs. See Table 3.1 for numbers of surveillance and operational monitoring sites in lakes and coastal waters provided by Denmark.

There were significant changes in the delineation of surface water bodies in Denmark from the first to the second RBMPs with a decrease of 49% and 28% in the number of river water bodies and coastal water bodies respectively. For lake water bodies, there was an increase of 23% overall.

For the second RBMPs, coastal water bodies were identified in all 4 RBDs. According to the WISE reporting, 91 % were included in operational monitoring, but none of these were in the Bornholm RBD. For the second RBMPs, 9 % of river water bodies were included in surveillance monitoring and 70 % in operational monitoring. 58 % of lake water bodies were in surveillance monitoring and 22 % in operational monitoring.

Bearing in mind the significant decreases in the numbers of water bodies delineated from the first to the second RBMPs 5 % of river water bodies were in surveillance monitoring for the first RBMPs compared to 9 % for the second. Overall there was a significant increase in the proportion of river water bodies included in operational monitoring (14 % for the first RBMPs, 70 % for the second), an increase in coastal water bodies (72 % for the first, 91 % for the second) and a decrease in lake water bodies (37 % for the first RBMPs, 22 % for the second).

Operational monitoring of surface water bodies

The biological quality element predominantly used in Denmark for the operational monitoring of coastal waters was phytoplankton (82 % of water bodies included in operational monitoring) followed by angiosperms (74 %) and benthic invertebrates (49 %). Phytoplankton was also the predominant biological quality element used in the operational monitoring of lakes (98 %), where macrophytes (38 %) and fish (0.5 %) were also used. In the operational monitoring of rivers, benthic invertebrates were used in 96 % of water bodies included in operational monitoring, fish in 36 % and macrophytes in 2 %.

In coastal water and rivers, a large proportion of water bodies at less than good ecological status/potential are included in operational monitoring, 91 % and 94 %, respectively. For lakes this was only 27 %.

Transboundary surface water body monitoring

Denmark did not report any transboundary surface or groundwater bodies nor any monitoring sites that are part of international monitoring networks.

3.1.2. Ecological Status/potential of surface water

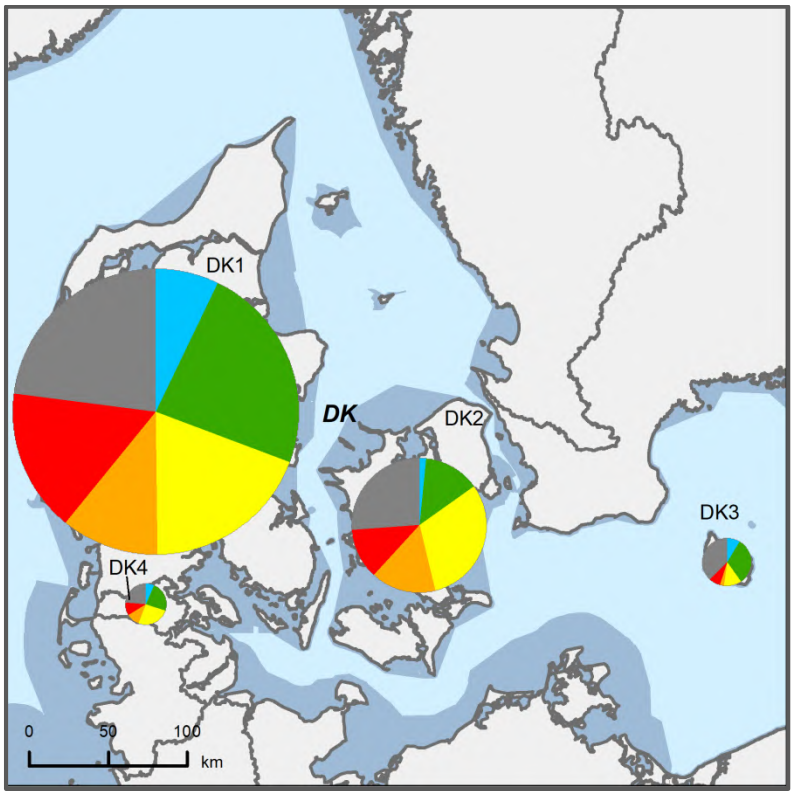
The ecological status/potential of surface water bodies in Denmark for the second RBMPs is illustrated in Map 3.1.

Figure 3.3 compares the ecological status of surface water bodies in Denmark for the first RBMPs with that for the second RBMPs and that expected by 2015. It indicates an overall deterioration in ecological status from the first to the second RBMPs. Denmark has since suggested that this deterioration may be a result of the changes in delineation of waterbodies and the use of more quality elements in the classification of status in the second RBMPs. Therefore, any comparison between the two RBMPs needs to be taken with care.

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

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

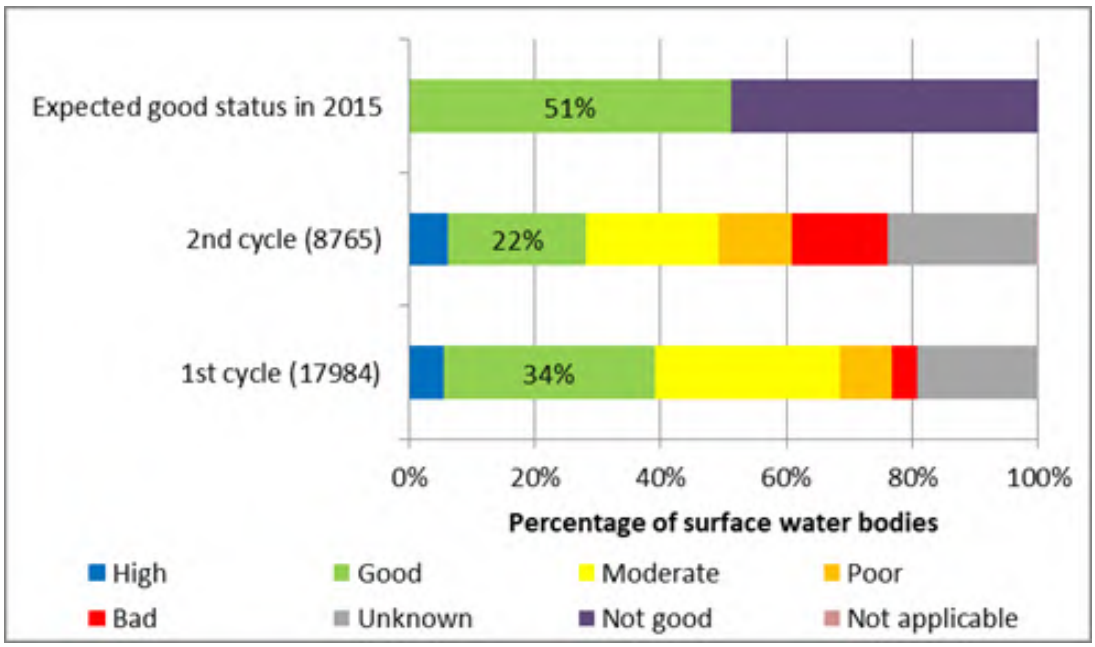
Note: Standard colours based on WFD Annex V, Article 1(4)(2)(i)



Source: WISE, Eurostat (country borders)

High
Good
Moderate
Poor
Bad
Unknown
RBDs
Countries outside the European Union

Figure 3.3 ***Ecological status or potential of surface water bodies in Denmark for the second RBMPs, for the first RBMPs and expected in 2015. The number in the parenthesis is the number of surface water bodies in each cycle. Note the period of the assessment of status for the second RBMPs was 1993 to 2014. The year of the assessment of status for first RBMPs is not known***



Source: WISE electronic reports

Figure 3.4 Expected date of achievement of good ecological status/potential of surface water bodies in Denmark. The number in the parenthesis is the number of water bodies in each category[23]

Source: WISE electronic reports

The large majority of water bodies in all water categories are in less than good status/potential, and quite a high proportion are in poor or even bad status/potential. There are also still several water bodies with unknown ecological status/potential, in particular for artificial and heavily modified rivers. It should be noted, however, that the big differences in delineation of water bodies and the changes in number of quality elements used in the classification make any quantitative comparison very difficult.

The overall picture indicates a deterioration in status/potential since the revised first RBMPs (Figure 3.3) with 5-20 % more water bodies in less than good status/potential in the second RBMPs, except coastal waters in the Zealand RBD, which has a slight improvement, while rivers in the Zealand RBD and coastal waters in the Jutland and Funen RBD and the International (Vidaa-Krusaa) RBD show no change. A more detailed analysis included in the RBMPs estimates that there is a general improvement for lakes and coastal waters, and no change for rivers.

In the first RBMPs, 19 % of surface water bodies in Denmark were reported to have unknown ecological status/potential and this increased to 24 % in the second. Many heavily modified

[23] Denmark subsequently clarified that for coastal waters 2 water bodies were reported as expected to be in good ecological status by 2015 and 48 water bodies are expected in good status by 2021 unless delayed because of natural conditions. For rivers, 55 % of water bodies were reported as expected to be in good ecological status by 2015 (which corresponds to 4306 water bodies), further 21 % expected in good status by 2021 and further 24 % in good status by 2027.

and artificial water bodies (30-60 %) were reported with unknown ecological status in most RBDs. For natural water bodies, relatively few water bodies were reported with unknown ecological status (15-25%); this is an improvement since the revised first RBMPs, when the proportion of natural water bodies with unknown ecological status was much higher.

The ecological status changes from the first to the second RBMPs have been described in the second RBMPs. Water bodies that have been re-delineated and those that had unknown status in the first RBMPs have not been compared. Results for biological quality elements that have only been classified in the second RBMPs could also not be included in the comparisons.

The comparisons show that the large majority (60-80 %) of all classified water bodies have the same status in the first and second RBMPs, which is explained by the short time between the publication of the first RBMP and the second RBMP.

The changes from the first to the second RBMPs for rivers are quite different in the different RBDs: for the Jutland and Funen RBD, the same proportion of water bodies (16 %) has improved or deteriorated; for the Zealand RBD, only 10 % have improved, while 20 % have deteriorated; while for the Vidaa-Krusaa RBD, 27 % have improved and 13 % have deteriorated.

The changes for lakes are quite similar in the different RBDs with more water bodies improved than deteriorated: for the Jutland and Funen RBD, 21 % have improved, while 10 % have deteriorated; for the Zealand RBD, 24 % have improved, while 9 % have deteriorated; while for the Vidaa-Krusaa RBD, 23 % has improved and 15 % has deteriorated.

The changes for coastal waters show improvements in all the RBDs: 16 % in the Jutland and Funen RBD, 33 % in the Zealand RBD, except in the Vidaa-Krusaa RBD, where there were no changes, and in the Jutland and Funen RBD, where 3 % have deteriorated.

As stated above, any comparison between the two cycles needs to be taken with care, due to the significant re-delineation of surface water bodies that took place and to the use of a larger number of biological quality elements in the second RBMPs. The supporting quality elements are not classified in any water bodies in the two cycles.

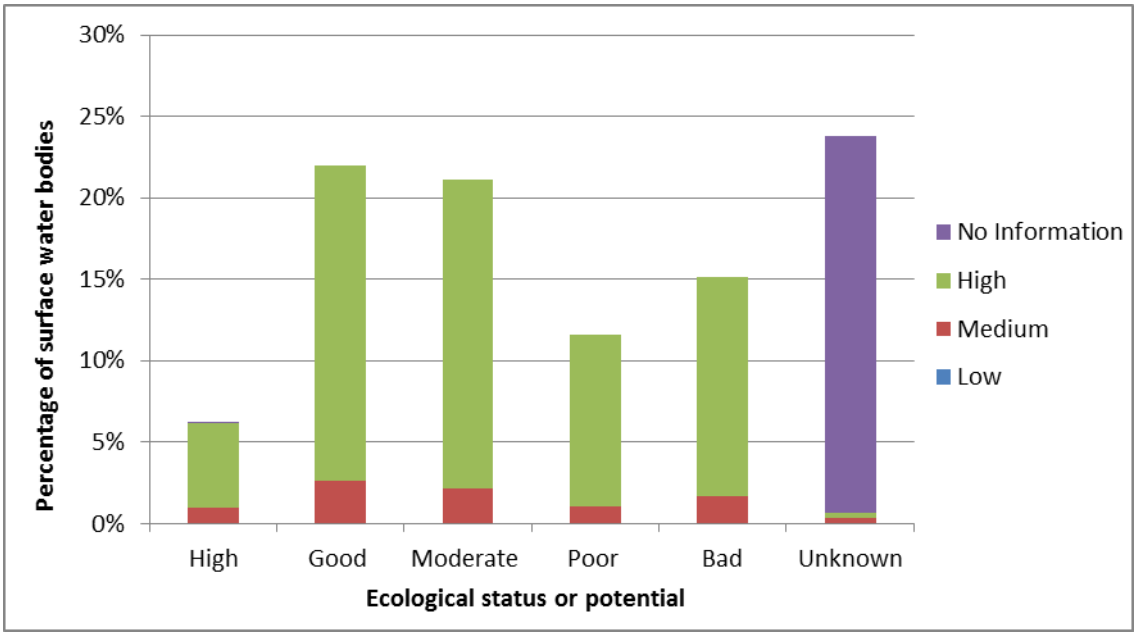
Confidence in ecological status assessment

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

Overall the confidence in the classification of surface water bodies increased from the first to the second RBMPs: 2 % were classified with high confidence in the first RBMPs and 68 % in

the second. The confidence in classification is high for all coastal water bodies and for the large majority of rivers and lakes where the overall ecological status/potential is classified. There are no water bodies classified with low confidence. This is a major improvement compared to the first RBMPs, in which there was no information on confidence for more than 95 % of the river and lake water bodies.

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



Source: WISE electronic reports

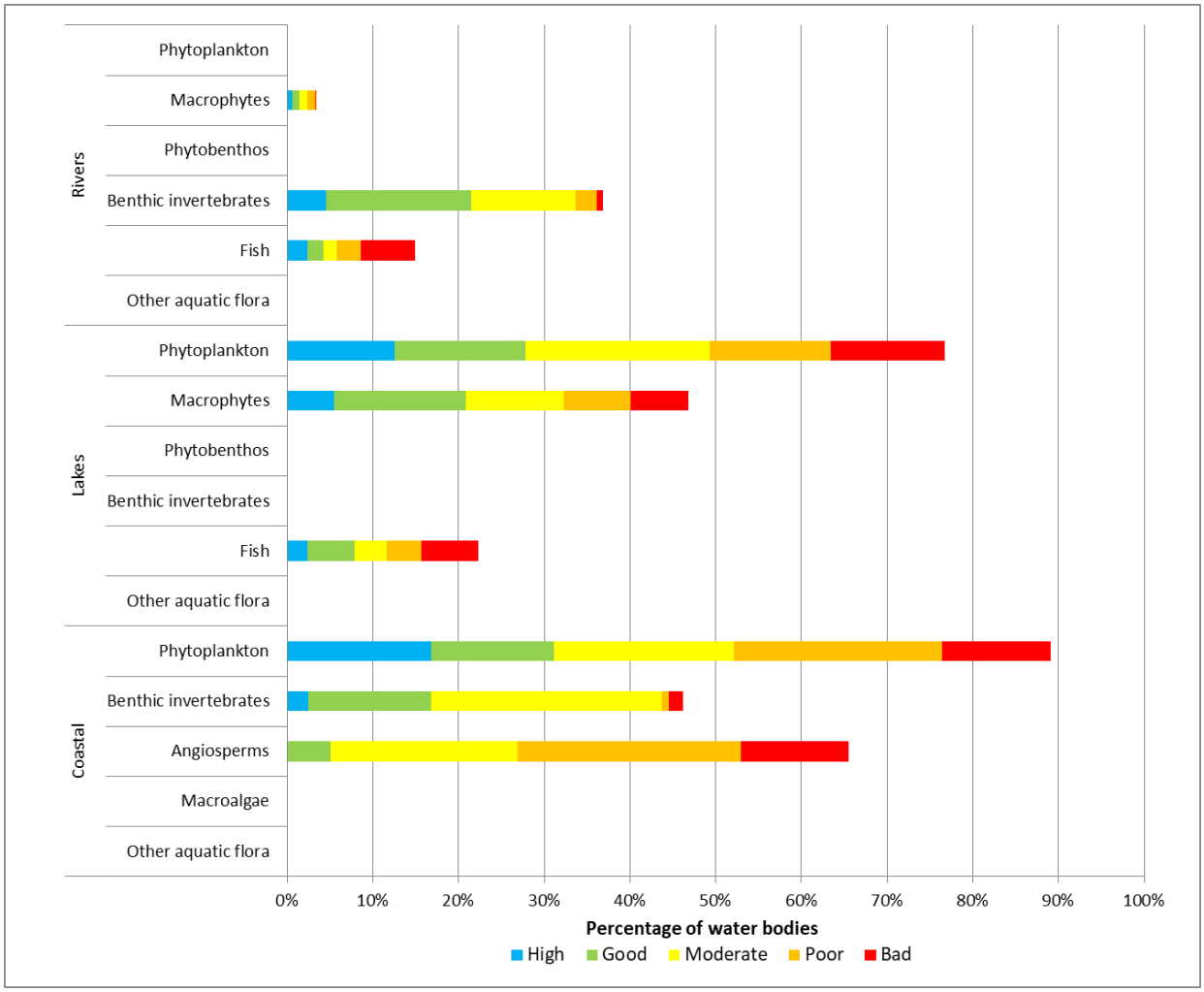
Classification of ecological status at the quality element level

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

Figure 3.7 compares the classification of biological quality elements in terms of ecological status/potential for the two cycles. 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.

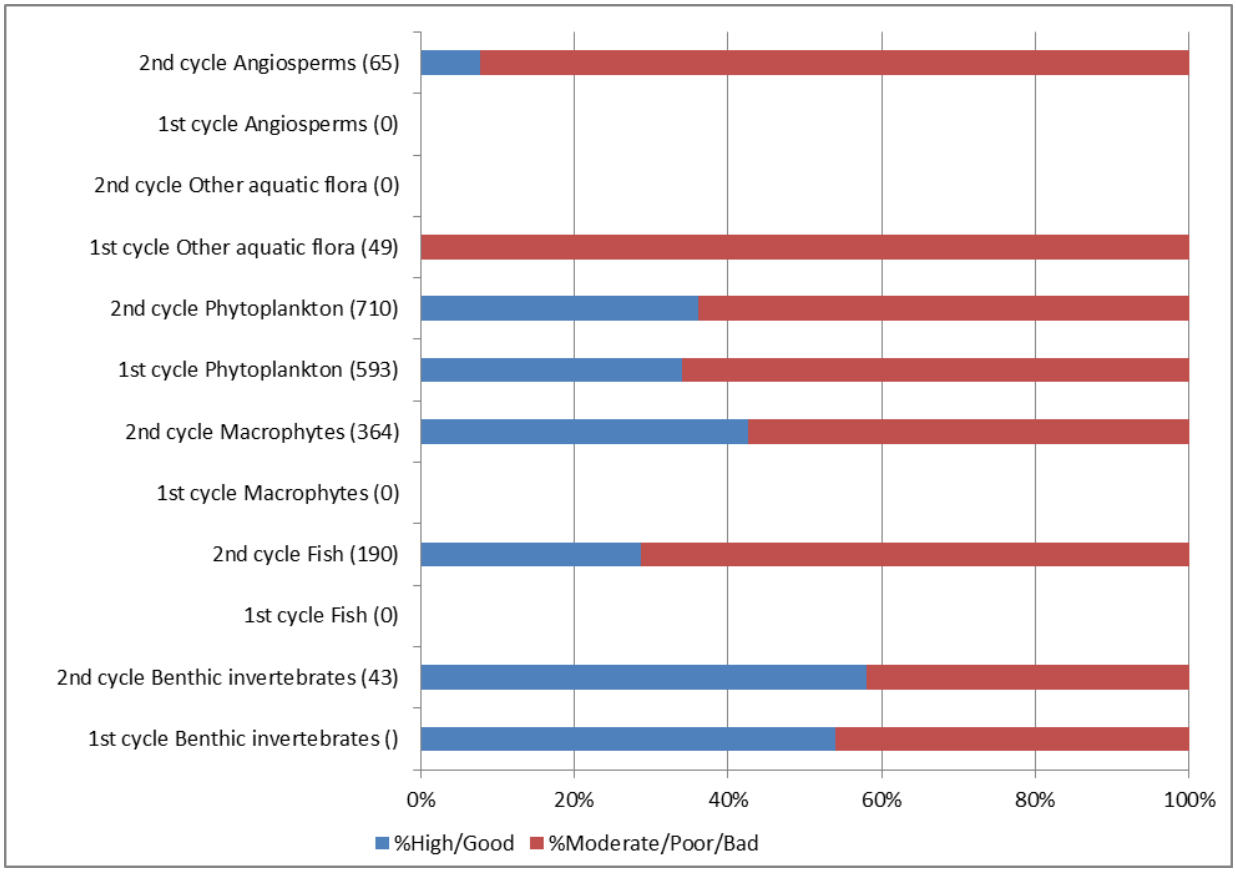
Figure 3.8 illustrates the basis of the classification of ecological status/potential of rivers and lakes in Denmark for the second RBMPs.

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



Source: WISE electronic reports

Figure 3.7 ***Comparison of ecological status/potential in Denmark according to classified biological quality elements in surface water bodies from the first to the second RBMPs. The number in brackets provides the number of surface water bodies with status[24]***

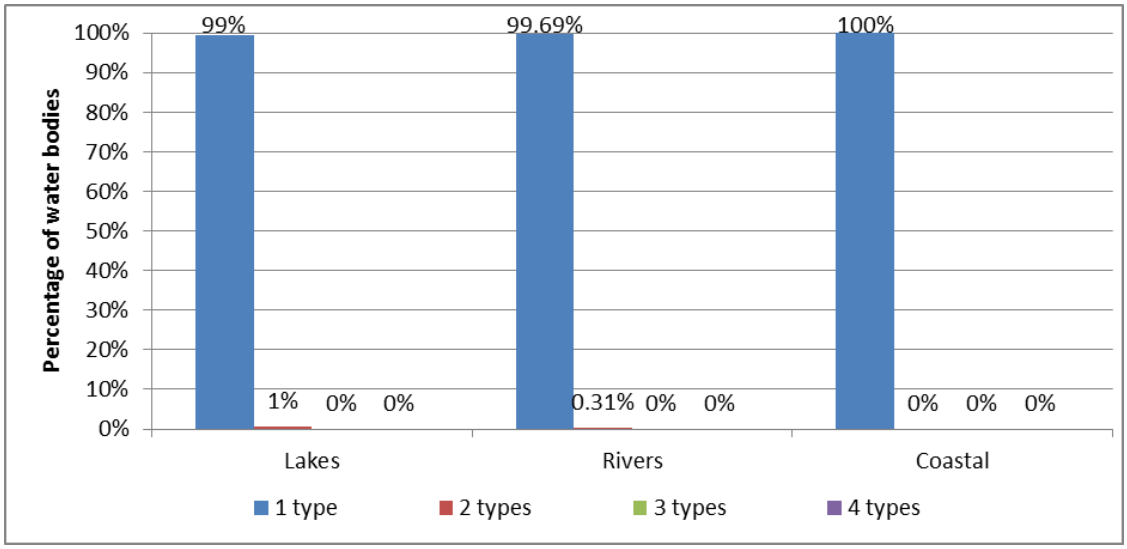


Source: WISE electronic reports. .

[24] Note that comparison between the first and the second RBMP should be taken with care regarding the re-delineation of water bodies.

Figure 3.8 ***The classification of the ecological status or potential of rivers, lakes and coastal waters in Denmark using one, two, three or four types of quality element***

Note: The four types are: biological; hydromorphological, general physicochemical and River Basin Specific Pollutants



Source: WISE electronic reports

Supporting physicochemical quality elements are not classified [25](Figure 3.8) and classification of status relies on biological quality elements (Figure 3.6 and Figure 3.7). This is in particular the case for the nutrients (phosphorus and nitrogen) in rivers. Diffuse pollution from agriculture and nutrient pollution (which includes both phosphorus and nitrogen) were not reported as a significant pressure or impact in rivers[26].

The change in status/potential from the first to the second RBMPs at the quality element level was reported to be unknown for the large majority of water bodies, but was reported for approximately one third of lakes water bodies in all the RBDs for phytoplankton and for a few coastal water bodies in the Jutland and Funen RBD and the Zealand RBD for phytoplankton and angiosperms. Two thirds show improvement and one third show deterioration. All these changes were reported to be real and not due to changes in delineation or in methodologies.

Assessment methods and classification of biological quality elements

Reference conditions and class boundaries are developed for most biological quality elements in all national types. New assessment methods have been developed since the first RBMPs, for

[25] Denmark has subsequently informed that physico-chemical elements are being monitored in rivers, lakes and coastal waters, but assessment methods for classification have not yet been developed.

[26] Denmark subsequently stated that nitrogen is not considered a pressure for rivers since the residence time is short.

macrophytes and fish in rivers and lakes. The remaining gaps are phytobenthos in rivers[27], benthic invertebrates and phytobenthos in lakes

The sensitivity to impacts of the various existing methods is consistent for all the relevant impacts in Denmark (nutrients, organic, acidification, hydromorphological) for the various biological quality elements, except for nutrients (including phosphorus) in rivers, for which there is no sensitive biological quality element method developed[28].

Transitional waters have not been delineated in Denmark, so there are no biological quality element methods for that water category. Denmark has provided the Commission in 2009 with the technical explanation for not designating transitional waters.

Examination of the RBMPs showed that reference conditions are missing for the following biological quality elements in river types: benthic algae in all river types, benthic invertebrates and macrophytes for the soft-bottom river type, macrophytes in small rivers. There are projects to develop a new index for benthic algae in all river types and macrophytes in small rivers. There is no explanation on the reason why benthic algae are missing. For macrophytes, the current index is considered not applicable in small rivers and for benthic invertebrates the current index is not applicable in soft-bottom rivers, according to experts from Aarhus University. There is a plan to develop a new index for benthic invertebrates and macrophytes in soft-bottom rivers.

Reference conditions are missing for benthic algae and benthic invertebrates in all lake types. A classification system for these biological quality elements in lakes was under development, but it has not been used for classification of ecological status in lakes for the second RBMPs. Phytoplankton class boundaries are missing for humic lake types[29]. No justifications are found in the plans nor in relevant background documents to explain these gaps[30].

For coastal waters, reference conditions are missing for macroalgae, for which no justification was found[31].

[27] Denmark subsequently stated that a research institution has been requested to provide the scientific basis for the preparation of a phytobenthos index in rivers.

[28] Denmark subsequently stated that nitrogen is not considered a pressure for rivers since the residence time is short. A research institution has been requested to work on phosphorus pressure for rivers.

[29] Denmark subsequently stated that phytopolankton class boundaries have been developed for five lake types.

[30] Denmark subsequently clarified that for humic lake types chlorophyll class boundaries are used as a proxy for phytoplankton class boundaries, except for type five lakes where phytoplankton class boundaries are available.

[31] Denmark subsequently stated that an assessment method which includes both angiosperms and macroalgae is under development. It is expected to be ready for the third RBMP.

Intercalibration of biological quality element methods

A minority of national types are linked to common intercalibration types in all RBDs. Some national types overlap several intercalibration types, and it is unclear which class boundaries are used. This is particularly difficult for river types, as the Danish river typology does not include geology as a typology factor. Some national types do not match any common intercalibration type, so information on class boundaries has not been reported.

Phytoplankton, macrophytes and fish biological quality elements in lakes are intercalibrated through two types that are linked to the common intercalibration types L-CB1 and L-CB2. The other nine national types have not been intercalibrated.

Some biological quality elements in rivers (with the exception of benthic algae) have been intercalibrated in all the three national types that are linked to the common intercalibration types in the Central Baltic Geographic Intercalibration Group. However, these three national types overlap two of these common intercalibration types, which have highly different geology and it is not clear which of the intercalibrated class boundaries are used for classification of rivers. Two national types with soft-bottom (small and medium sized rivers, type 1 and 2) have not been intercalibrated.

Biological quality elements (with the exception of macroalgae) in coastal waters are intercalibrated for the six national types that are linked to the common intercalibration types in North East Atlantic Geographic Intercalibration Group and Baltic Geographic Intercalibration Group. The other 11 national types, mostly fjords, have not been intercalibrated for any biological quality element.

No information on particular methods was found in the RBMPs. There was a general statement in the RBMPs that the results of the intercalibration must be translated so that the national types obtain the same level of protection as the intercalibrated types. This work has been done by national experts[32].

Assessment methods for hydromorphological quality elements

Morphological conditions of rivers were reported to be assessed in terms of ecological status/potential reported and their classification boundaries are related to the class boundaries for the sensitive biological quality elements. Hydrological/tidal regime in all 3 categories and river continuity are not assessed in terms of ecological status/potential. It should be noted that

[32] Denmark has later informed that type or site specific reference conditions and results from Decision 2013/480/EU, including high-good and good-moderate class boundaries, have been applied/translated to all national types.

no hydromorphological quality elements were reported to be monitored and none were used in the classification of status/potential in Denmark[33]. However Denmark subsequently clarified that all hydromorphological quality elements are monitored in rivers.

There was no description in the RBMPs of any changes in the assessment of hydromorphological quality elements from the first to the second RBMPs. The only assessment method for the hydromorphological quality elements is a physical index for rivers, which was also available in the first RBMPs. This index seems to be used both as a typology factor, and as a quality element for classification with a good-moderate status threshold of 0.5. For rivers, it is unclear whether the physical index includes all the hydromorphological quality elements required in the WFD, and whether this is consistent with the high-good status and good-moderate status thresholds for benthic fauna or other biological quality elements. For lakes and coastal waters, there are no assessment methods developed for any of the hydromorphological quality elements[34].

Classification methods for general physicochemical quality elements

Three physicochemical quality elements (transparency, oxygenation conditions and nutrient conditions) were assessed in terms of the ecological status/potential of coastal waters; one (nutrient conditions) was used in lakes and one (salinity conditions) also in rivers. The classification boundaries for the assessed quality elements were reported to be related to the class boundaries for the sensitive biological quality elements.

No standards were reported to WISE for any physicochemical quality element, although they are included in a background document.

Information was found in the RBMPs on the good-moderate status boundaries for only one physicochemical quality element in rivers which is ochre (ferrous iron), where the good-moderate status boundary of 0.7 mg/l is said to be correlated with the benthic fauna at good status class. This quality element would only be used for classification in the absence of biological data on benthic fauna.

For lakes, there are good-moderate status boundaries for total phosphorus and total nitrogen for shallow and deep lakes. For phosphorus, the good-moderate status boundary for shallow lakes is 0.080 milligrams per litre and for deep lakes 0.042 milligrams per litre (summer mean values). For nitrogen, the good-moderate status boundaries are 0.95 milligrams per litre for

[33] Denmark subsequently informed that limit values for hydromorphological quality elements in rivers are under development.

[34] Denmark subsequently informed that hydromorphological classification methods for lakes are under development.

shallow lakes and 0.90 milligrams per litre for deep lakes (summer mean values). These boundaries are based on dose-response curves with phytoplankton, using the upper 25th percentile of lakes that are in good status in terms of chlorophyll a to set the good-moderate status boundary value for the nutrients. This approach provides quite relaxed boundaries.

For coastal waters, three physicochemical quality elements have recently been developed with good-moderate status boundaries that intend to support the biological quality elements. These are light conditions (transparency) supporting angiosperms, oxygen conditions in deep waters supporting benthic fauna and inorganic nitrogen supporting phytoplankton in nitrogen-limited waters. The boundaries appear to be appropriate to support good status, at least for oxygen and nitrogen. The transparency conditions quality element is difficult to judge, due to a special model used to set the boundaries. However, none of these have been used for classification in any of the coastal waters in the second RBMPs[35], according to the information reported to WISE.

Large gaps remain for rivers, in particular for nutrients (phosphorus and nitrogen), turbidity, temperature and oxygen. For lakes, the most serious gaps are for transparency and oxygen in deep waters of deep lakes. Acidification parameters are less relevant in most Danish rivers and lakes, as they have moderate or high alkalinity and are not vulnerable to acidification.

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

The selection of River Basin Specific Pollutants is based on monitoring results, screening of pollutants in the aquatic environment, and information on the use of substances.

Environmental Quality Standard values were reported for water for 10 River Basin Specific Pollutants in Denmark as a whole: nine in rivers and three in lakes; as well as two in biota in coastal waters[36]. The standards have been derived in accordance with the 2011 Technical Guidance Document No 27.[37]

Use of monitoring results for classification

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

[35] Denmark informed that some hydromorphological and physiochemical parameters are being monitored, but specific assessment methods for classification are not operationalised. Those parameters are included as descriptors and drivers in the model for coastal waters and for definition of the reference condition for biological quality elements and in the derivation of good ecological status.

[36] Denmark informed that the total number and the number for rivers are apparently a reporting error: EQS values have been established for 15 River Basin Specific Pollutants, which corresponds to those monitored (see section on monitoring above). The correct figure for rivers is 12.

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

Overwhelmingly the results from monitoring have been used in the classification of ecological status/potential of quality elements. Expert judgment was used for phytoplankton for some coastal water bodies in particular in the Bornholm RBD where the one water body had not been directly monitored. Benthic invertebrates and phytobenthos were not used in the classification of lakes, phytobenthos was not used in rivers[38], and macroalgae were not used in coastal waters. Hydromorphological and physicochemical quality elements were not used in the classification of any surface water body[39]. River Basin Specific Pollutants were used but only in a few river and lake water bodies (<0.5% in each).

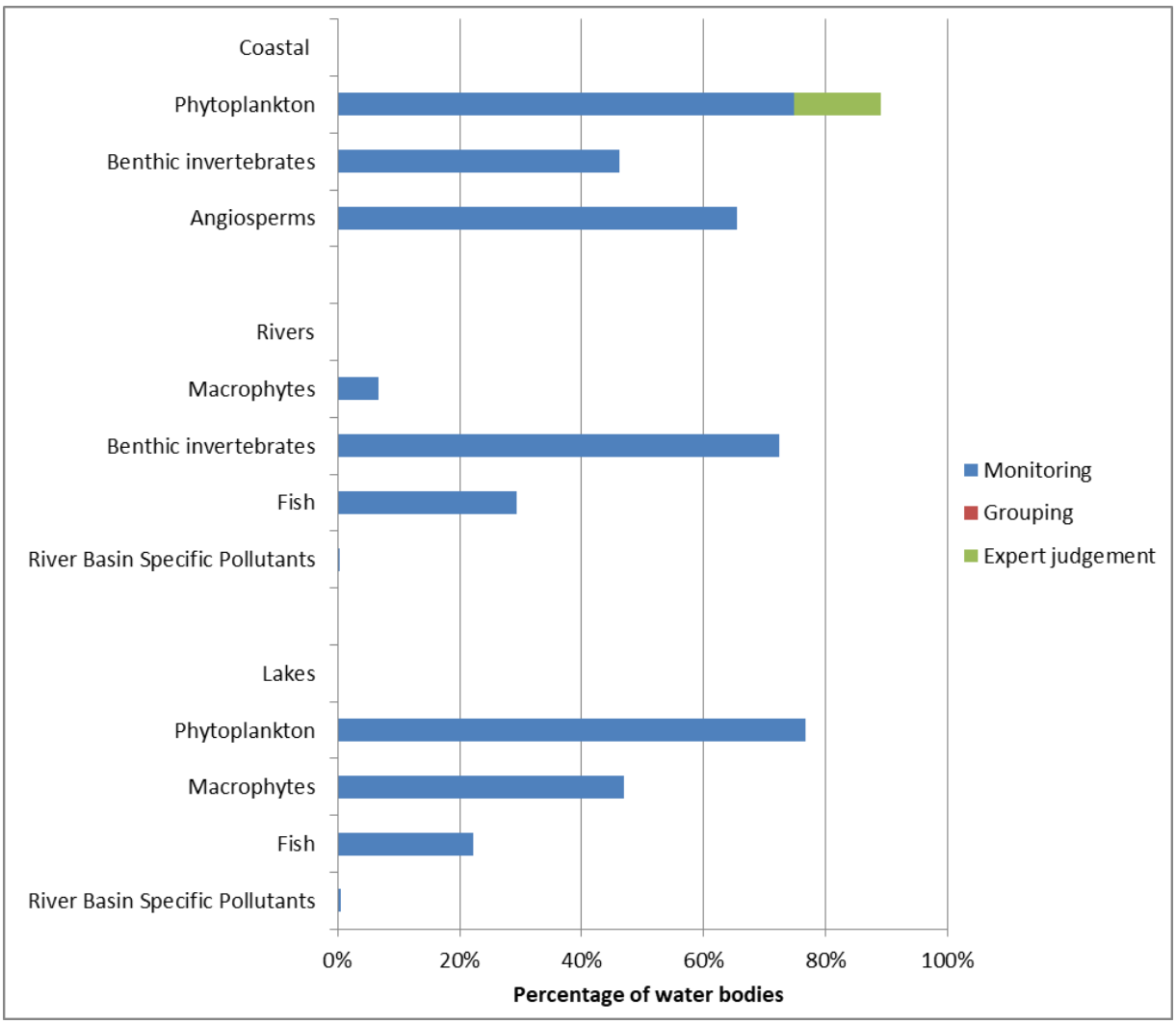
Denmark reported that grouping of water bodies has been used for the classification of water bodies with no monitoring sites. However, this is inconsistent with other reported information, which indicated that there were no water bodies classified based on grouping.[40]

[38] Denmark subsequently stated that a research institution has been requested to provide the scientific basis for the preparation of a phytobenthos index in rivers.

[39] Denmark subsequently stated that for coastal waters and lakes, some hydromorphological and general physiochemical parameters are being monitored, but specific assessment methods for classification are not operationalised. Those parameters are included as descriptors and drivers in the model for coastal waters and for definition of the reference conditions for biological quality elements, and derivation of good ecological status. For rivers, limit values for hydromorphological quality elements are under development.

[40] Denmark have subsequently clarified that grouping was used for 17 coastal water bodies in the Jutland, Zealand and Bornholm RBDs, instead of expert judgement as reported by mistake in WISE.

Figure 3.9 Basis of the classification of ecological status/potential in Denmark



Source: WISE electronic reports. Denmark subsequently clarified that coastal waters that were classified based on grouping were reported in WISE as based on expert judgement.

For rivers, it is reported that some water bodies are classified based on grouping, and therefore the number of classified water bodies for biological quality elements is higher than the number of water bodies monitored. But Denmark has indicated in Annex 0 that it is not possible to report the surface water bodies which have been monitored and used in grouping due to aggregation of river water bodies from first to second RBMPs. River water bodies grouped cannot be individually identified, including those that have been monitored.

The RBMPs indicate that only monitored water bodies are classified for rivers and lakes. Both recent (2008-2013) and older monitoring data are used if they are considered by the national WFD Authority (Danish Environmental Protection Agency) still to be relevant for classification of the current ecological status. Thus, there is no information explaining why the number of classified water bodies for different biological quality elements in rivers is reported

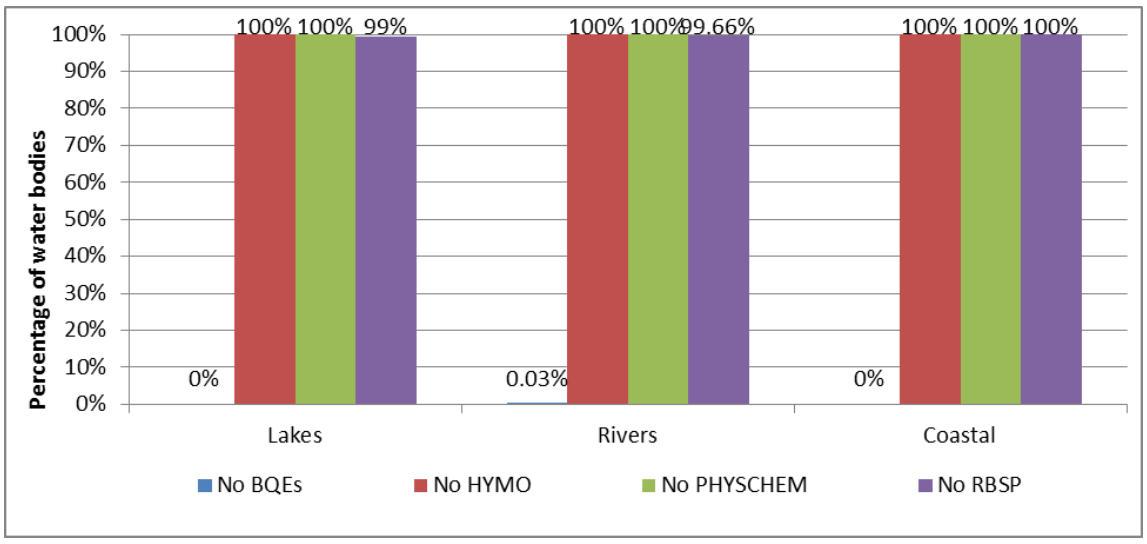
in WISE to be a bit higher than the number monitored for the same biological quality element. For lakes, there is no such discrepancy as the number of water bodies monitored and classified is the same for each biological quality element. For coastal waters, a small percentage (around 15 %) has been reported as being classified based on expert judgement for phytoplankton (but were in reality based on grouping, as explained subsequently by Denmark). According to the RBMPs, the status classification is based on data between 2007 and 2013. For the other biological quality elements (angiosperms and benthic invertebrates), the number of monitored and classified water bodies is the same.

For River Basin Specific Pollutants, the number of monitored and classified water bodies is the same for rivers and lakes (very low proportion of all water bodies), while for coastal waters, some water bodies are monitored, but none are classified, according to the WISE electronic reporting. The reason for the lack of classification of River Basin Specific Pollutants in coastal waters is that these are monitored in sediments, fish or mussels, while the Environmental Quality Standards have only been developed for water.

Overall classification of ecological status

Figure 3.10 shows the percentage of river, lake and coastal water bodies where no quality elements of different types (biological and different supporting elements) were used in the classification of ecological status, reflecting the reliance on biological quality elements.

Figure 3.10 ***The percentage of coastal, river and lake water bodies in Denmark 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 reports

The one-out, all-out principle has been used in all RBDs, but has not included the supporting quality elements, (except for lakes where it also applies to nutrient), which is not compliant with Annex V, 1.4.2 of the Water Framework Directive.

3.2. Main changes in implementation and compliance since first RBMPs

The first RBMPs for Denmark were adopted on 21 December 2011 and reported to the Commission on 22 December 2012. For legal reasons the first plans were declared invalid by the Danish Authorities in the spring of 2013, the RBMPs were resubmitted to a consultation process and the revised RBMPs for the first planning period were adopted in October 2014. The terms "original RBMPs" and "revised RBMPs" are used throughout this assessment, when referring to the original first RBMPs adopted in 2011 and to the revised first RBMPs adopted in 2014 respectively.

The large majority of water bodies were in less than good ecological status in the first RBMPs and are still in less than good ecological status in the second RBMPs, with the exception of rivers and lakes in the Bornholm RBD where only 34-40% are in less than good status (unknowns excluded).

However, the change in overall ecological status cannot be reliably compared from the first to the second RBMPs due to several reasons: a) the total number of water bodies has changed significantly from the first to the second RBMPs, primarily due to a major re-delineation of river water bodies, with a decrease of 50% in the number of river water bodies, b) the number and proportion of water bodies with unknown status/potential has changed, c) the status has been assessed with more biological quality elements in the second RBMPs than in the first. Comparison of water bodies which have not been re-delineated and which have been classified with the same quality elements in both the first and second RBMPs is more reliable.

The change in status/potential at the quality element level has been reported as "unknown" for almost all water bodies, but information is given for approximately one third of lake water bodies in all the RBDs for phytoplankton and for a few coastal water bodies in the Jutland and Funen RBD and the Zealand RBD for phytoplankton and angiosperms. The changes go in both directions, with two thirds showing improvement and one third showing deterioration. The changes were reported to be consistent, and not due to changes in delineation or methodologies.

New methods for some biological quality elements since the first RBMPs have been reported for macrophytes and fish in rivers. The reference conditions and class boundaries have been set

for more biological quality elements than in the revised first RBMPs, as macrophytes and fish in rivers have been included, and for all national types in all water categories.

The number of surveillance sites in lakes increased from the first to the second RBMPs. Conversely, no surveillance sites were reported for coastal waters for the second RBMPs and 243 sites were used for surveillance monitoring for the first. However, Denmark subsequently clarified that for the second RBMPs, no distinction is made between operational and surveillance monitoring in coastal waters, therefore monitoring for both purpose is based on the 781 sites that were reported. Overall, there were only small changes in the numbers of surveillance sites in rivers from the first to the second RBMPs.

Phytobenthos was not monitored in rivers and lakes for the first RBMPs and this was still the case for the second RBMPs. All biological quality elements were said to be monitored in coastal waters for the first RBMPs, but macroalgae were not included for the second RBMPs[41].

It was reported that some physicochemical and hydromorphological quality elements were monitored in some water categories for the first RBMPs, while for the second none were reported to be monitored in any water body. However, this is a reporting mistake, as many of these supporting quality elements are monitored, according to the national monitoring programme.

Bearing in mind the significant decreases in the numbers of river water bodies delineated from the first to the second RBMPs, 5 % of river water bodies were in surveillance monitoring for the first RBMPs compared to 9 % for the second. Overall there was a significant increase in the proportion of river water bodies included in operational monitoring (14 % for the first RBMPs, 70 % for the second), an increase in coastal water bodies (72 % for the first and 91 % for the second) and a decrease in the proportion of lake water bodies (37 % for the first RBMPs and 22 % for the second).

3.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendations:

[41] Denmark subsequently informed that macroalgae were monitored in the second RBMPs and that an assessment method which includes both angiosperms and macroalgae is under development and is expected to be ready for use for the 3rd RBMPs.

- *The ecological status classification system is weakly developed, and a large proportion of the biological quality elements are missing. The Danish classification methods are only developed for benthic fauna in rivers, chlorophyll in lakes, and angiosperm depth limit and benthic fauna (fjords) or chlorophyll (open coast).*

- *Denmark needs to extend its classification system for lakes and coastal waters to address hydromorphological quality elements. For rivers, class boundaries given for continuity, flow and morphological variation of river banks need to be developed.*

- *The assessment of ecological status was reported with "no info on confidence" for 95% of all water bodies. It also seems like fewer methods are available now compared to what was reported in 2007. This needs to be clarified.*

Assessment: New methods for macrophytes and fish in rivers and lakes have been developed and intercalibrated. The remaining gaps are phytobenthos in rivers, benthic invertebrates and phytobenthos in lakes, and macroalgae in coastal waters. Assessment methods for benthic invertebrates in lakes and phytobenthos in rivers and lakes are under development. Hydromorphological quality elements have not been included in the classification of ecological status in the second RBMPs[42]. Large gaps remain for physicochemical quality elements, in particular for nutrients in rivers as no standards were reported and as there is no biological quality element sensitive to nutrients. Demark has reported the confidence in the second RBMPs ecological status assessments. Overall, the confidence in the classification of surface water bodies increased from the first to the second RBMPs: 2 % were classified with high confidence for the first RBMPs and 68% for the second.

These recommendations are partially fulfilled.

- Recommendation: *Denmark needs to further extend the monitoring programme to include all biological, physical-chemical and hydromorphological quality elements as relevant, for all water categories (rivers, lakes, coastal waters) and ensure there is adequate monitoring of groundwaters to enable assessment of status, pressures and trends. The reported monitoring system is a new one (NOVANA) and not the one used for the first RBMPs. Although it is new, it appears to not yet be WFD compliant.*

[42] Denmark informed that for coastal waters, some hydromorphological and physiochemical parameters are being monitored but specific assessment methods for classification are not operational.

Assessment: Most of the gaps in monitoring identified in the first RBMPs are still present in the second RBMPs, such as phytobenthos in rivers. Denmark also reported that most of the physicochemical and hydromorphological quality elements are monitored, however, there are still major gaps and potential non-compliance issues, e.g. for nutrients in rivers (including both phosphorus and nitrogen).

In conclusion: there has been some progress[43], but the recommendation is partially fulfilled.

- Recommendation: *Surveillance monitoring stations for lakes need to be established and reported, and the types of quality elements monitored per station need to be reported.*

  Assessment: Surveillance sites were reported for lakes for the second RBMPs, although not all required biological quality elements were monitored (phytobenthos and benthic invertebrates are still missing). There are also some gaps in the monitoring of physico-chemical quality elements.

  In conclusion, there has been some progress on this recommendation, but there are still major shortcomings in the monitoring of lakes. The recommendation is partially fulfilled.

- Recommendation: *The identification of River Basin Specific Pollutants needs to be more transparent, with clear information on how pollutants were selected, how and where they were monitored, 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 combating chemical pollution from River Basin Specific Pollutants and that adequate measures are put in place. Denmark needs to provide clearer reporting on the methodologies used to set the Environmental Quality Standards values for national specific pollutants.*

  Assessment: The selection of River Basin Specific Pollutants is based on monitoring results, screening of pollutants in the aquatic environment, monitoring of emissions from major sources and information on the use of substances. Denmark has reported information on the monitoring of River Basin Specific Pollutants in coastal waters, lakes and rivers. Biota is monitored for two substances in coastal waters. However, the substances are not monitored at the minimum frequency recommended in the WFD,

[43] Denmark informed that regarding both quality elements/parameters and numbers of monitoring stations, the monitoring programme in the second RBMPs is more comprehensive than the monitoring programme in the first RBMPs.

and deviations are not fully explained. The CIS technical guidance has been used to set the Environmental Quality Standards for the pollutants and the analytical methods used are in line with Article 4(1) of QA/QC Directive (2009/90/EC)[44]. Exceedances of Environmental Quality Standards have been used in the classification of single pollutants. However, very few water bodies are monitored and classified for River Basin Specific Pollutants and it is not clear how these results have been combined with the results for the biological quality elements in assessing the overall ecological status/potential of water bodies.

There has been some progress but the recommendation is partially fulfilled.

- Recommendation: *Denmark needs to be more transparent on the use of grouping of water bodies for monitoring and classification.*

  Assessment: It has been reported that grouping of water bodies has been used in extrapolating the assessment and classification of ecological status from monitored water bodies to those water bodies with no monitoring sites. Although it was reported that grouping was not the basis for the classification of any water body in Denmark, it has been clarified that this contradictory reporting is due to wrong reporting in WISE, with expert judgement having been selected instead of grouping.

  However, there is no information on how the grouping was done, which means that this recommendation has not been fulfilled.

- Recommendation: *Denmark needs to improve the certainty of its ecological status assessment.*

  Assessment: The confidence in classification is high for all coastal water bodies and for the large majority of rivers and lakes where the overall ecological status is classified. There are no water bodies classified with low confidence. This is a major improvement compared to the first RBMPs, in which there was no information on confidence for more than 95% of the river and lake water bodies.

  This recommendation is fulfilled.

[44] 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

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

4.1. Assessment of implementation and compliance with WFD requirements in 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 have to 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 programme of measures.

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

Figure 4.1 summarises the proportion of sites used for the monitoring of 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. More detailed information can be found on the website of the European Environment Agency[45].

Very small proportions of monitoring sites are monitored for chemical status compared to those monitored for ecological status.Denmark has assigned the monitoring purpose (chemical status) to 217 sites in 134 surface water bodies (1.51 % of total sites monitored in Denmark as a whole).

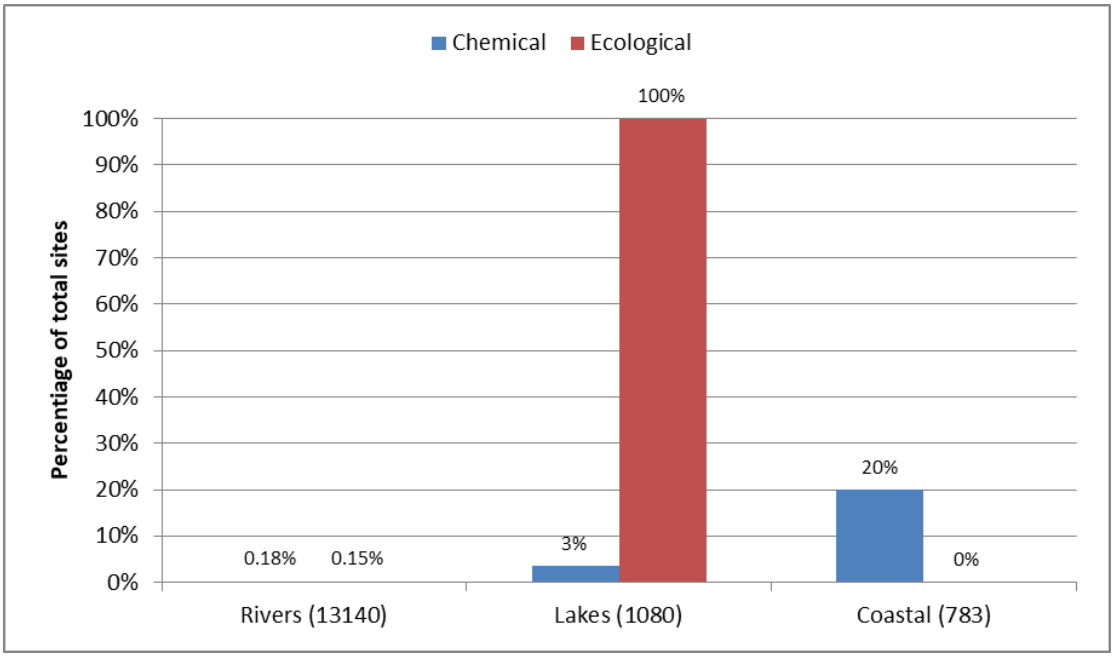
For the second RBMPs, for surface water bodies across three RBDs (Jutland and Funen, Zealand and International (Vidå-Kruså)) in Denmark, there appears to be a lower proportion of sites monitored for Priority Substances under operational monitoring (one site – 0.01% of total sites monitored across the whole of Denmark) than under surveillance monitoring (35 sites –

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

0.2% of total sites monitored across the whole of Denmark). In terms of water bodies monitored, the percentages are 0.01 and 0.4 % for operational and surveillance monitoring, respectively. The Bornholm RBMP had no information on monitoring purpose for lakes and rivers and the International (Vidå-Kruså) RBMP had no information for rivers.

The RBMPs provided no justification for the very low number of sites assigned to operational and surveillance monitoring.

Figure 4.1 ***Proportion of sites used for monitoring of chemical status and, for comparison, ecological status, in Denmark. The number in parenthesis next to the category is the total number of monitoring sites irrespective of their purpose. Note no data for territorial waters[46].***



Source: WISE electronic reporting

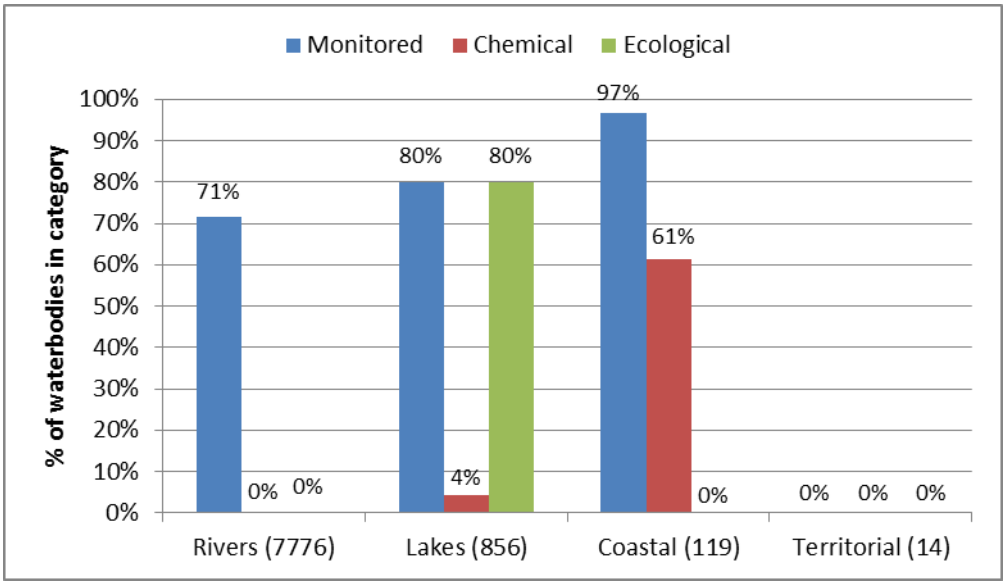
Figure 4.2 summarises the proportion of water bodies monitored for chemical status in surface waters for the second RBMP. In this figure, no distinction is made between sites used for surveillance and/or operational purposes. Also given is the proportion of water bodies monitored for any purpose and,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

Very small proportions of surface water bodies are monitored for chemical status with the exception of coastal waters where 60 % were monitored for this purpose (Figure 4.2).

[46] Denmark subsequently identified that there is an error in the reporting of the purpose of monitoring sites and that for river water bodies 13136 (just under 100%) of monitoring sites were monitored for ecological status. 625 (80%) monitoring sites were also monitored for ecological purposes in coastal waters.

Water bodies failing to achieve good chemical status were found in all RBDs except Bornholm RBD, where all waterbodies were at good status. All water bodies failing to achieve good chemical status were reported to be monitored in the Jutland and Funen, Zealand and International (Vidå-Kruså) RBDs, except for one lake water body in the Jutland and Funen RBD. Denmark clarified that all water bodies failing to achieve good chemical status were monitored.

Figure 4.2 Proportion of total water bodies in each category which are monitored, monitored for chemical status and monitored for ecological status, in Denmark. The number in parenthesis next to the category is the total number of water bodies in that category[47]



Source: WISE electronic reporting

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 number 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

[47] Denmark subsequently clarified that in the 1st cycle territorial waters were reported as coastal water bodies whereas in the 2nd cycle they were reported separately.

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

According to WISE, priority substances are not monitored in water in coastal and territorial water bodies in any of the four RBDs, and no monitoring in water was performed in lakes and rivers in the Bornholm and International (Vidå-Kruså) RBDs. In the other two RBDs, only four priority substances are reported to be monitored in water for status assessment in lakes, and 13 in rivers. About 95 % of lake water bodies were not monitored for any priority substances. Less than 3 % river water bodies were monitored for six or more Priority Substances. The spatial coverage of water monitoring therefore appears to be limited.

Denmark subsequently clarified that overall 19 priority substances were monitored in a matrix for which a standard exist.[48]

In coastal waters, mercury and hexachlorobenzene are reported to be monitored in biota for status assessment[49]. Neither of these are monitored in biota in territorial waters and only one (mercury) is monitored in surface freshwaters. Benzo(a)pyrene, and fluoranthene are also monitored in biota in coastal and territorial waters.

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.

For water column monitoring, the four Priority Substances in lakes and the 13 in rivers are monitored 12 times per year and at least once per cycle. This is in accordance with the

[48] Denmark subsequently highlighted that it has monitored more priority substances in more water bodies in sediment and biota (for example, in lakes, pollutants were primarily monitored in sediments). However this monitoring was not reported (and so it is not described here), because no standard was established for these substances in the corresponding matrix, despite the requirement to do so. Therefore the monitoring performed in these matrices could not be used to assess status.

[49] Denmark subsequently highlighted that hexachlorobutadiene is not used in Denmark, hence it is expected to not being discharged and therefore not monitored in biota.

recommended minimum frequency for surveillance monitoring but not for operational monitoring.

Monitoring of Priority Substances in biota is undertaken once per year and at least once per cycle for status assessment. This is lower than the recommended minimum frequency. Denmark subsequently clarified that greater intervals have been chosen on the basis of technical knowledge and expert judgement, but no detail was provided.

Monitoring for 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[50] 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

No monitoring of sediments was reported to WISE. Denmark reported monitoring in biota for trend assessment for four priority substances. All four are monitored in coastal waters, and only one in lakes and rivers.

Nine other substances are reported to be monitored in water for trend assessment in rivers only.

Frequencies

In water, the reported frequency is 12 times per year and once per cycle. Monitoring of Priority Substances in biota in coastal waters was once per year and between once and three times per cycle for trend assessment. The monitoring frequencies are not always in line with the recommended minimum frequency. Denmark has subsequently clarified that greater intervals have been chosen on the basis of technical knowledge and expert judgment, but no detail was provided.

Monitoring of Priority Substances that are discharged in each RBD.

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

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 river basin management plan 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.

Denmark reported that 19 of the 41 Priority Substances were included in the inventories in each RBD. The RBMPs reported that the Priority Substances not included on the inventories are those that are not used in Denmark or that screening has shown that they do not occur in significant quantities.

Seven of the 19 priority substances in inventories were discharged in each RBD. In the Jutland and Funen and Zealand RBDs, all of the priority substances discharged were monitored. In the international RBD one Priority Substance (mercury) that was discharged was monitored, and in the Bornholm RBD none were monitored. [51]

Performances of analytical methods used

In Denmark, for the RBDs, for 14, two and four Priority Substances in the Jutland and Funen and Zealand, Bornholm and International (Vidå-Kruså) RBDs, respectively, the analytical methods used meet the minimum performance criteria laid down in Article 4(1) of the QA/QC Directive (2009/90/EC)[52] for the strictest standard applied. For the remainder, information has not been provided on the analytical method used.

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

[51] Denmark subsequently clarified that all substances discharged were monitored, but it is not clear whether these were monitored in a matrix for which a standard exist, ie whether the monitoring performed can actually be used for status assessment.

[52] 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

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 on which monitoring took place in the surface water bodies within a group that is used to extrapolate results to non-monitored surface water bodies within the same group. For Denmark, the assessment of chemical status was undertaken between 2007 and 2012.

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

Map 4.1 Chemical status of surface water bodies in Denmark based on the most recently 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

The chemical status of surface waters in Denmark for the first and second RBMPs is given in Table 4.1.

Table 4.1 Chemical status of surface water bodies in Denmark for the first and second RBMPs. Note: the number in parenthesis next to the water category is the number of water bodies. Note: Chemical status assessment is based on the standards laid down in EQS Directive 2008/105/EC (version in force on 13 January 2009). Some Member States did not implement the Directive in the first RBMPs as the transposition deadline was in July 2010, after the adoption of the first RBMPs

Category	Good		Failing to achieve good		Unknown	
	Number	%	Number	%	Number	%
second RBMP						
Rivers (7776)	7	0.09%	16	0%	7753	99%
Lakes (856)	3	0.40%	34	4%	819	96%
Coastal (119)	58	49%	12	10%	49	41%
Territorial (14)	4	29%			10	71%
Total (8765)	72	0.8%	62	0.7%	8631	98.5%
first RBMP						
Rivers (15127)			56	0.40%	15071	99.60%
Lakes (696)	21	3.00%			675	97%
Coastal (165)			28	17 %	137	83%
Total (15988)	21	0.5%	84	0.1%	15883	99.3%

Source: WISE electronic reporting

As described in Section 2.1.1 of this report, there has been a significant re-delineation of water bodies in Denmark between the two cycles and therefore a comparison of status between the two cycles should be treated with some caution.[53]

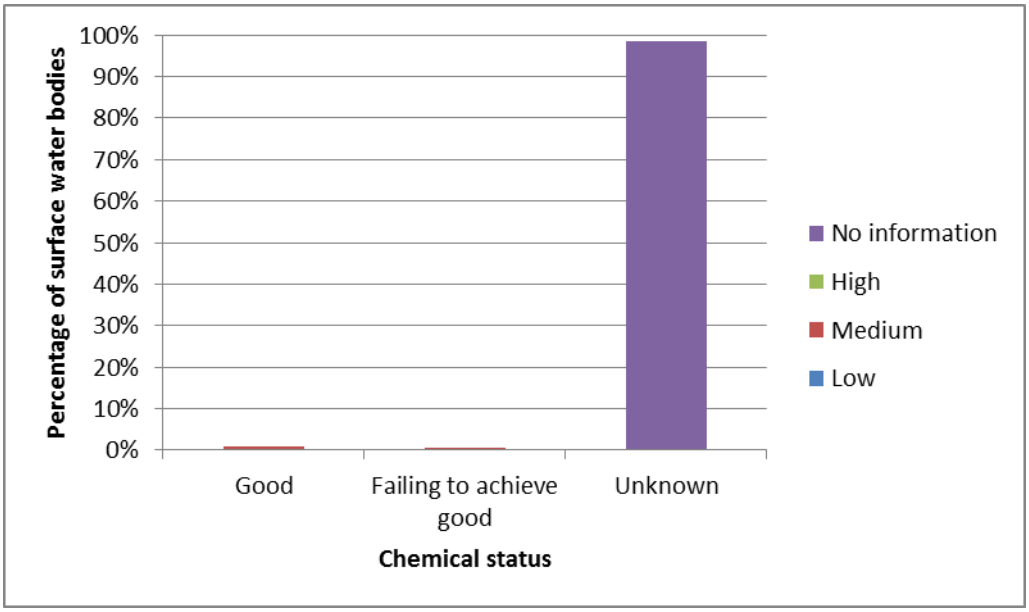
Between the two RBMPs, there was a small increase in the proportion of surface water bodies with good chemical status from 0.5 to 0.8 % but also a small increase in the proportion failing to achieve good chemical status from 0.1 to 0.7 %. However, the proportion with unknown chemical status decreased a small amount from 99.3 to 98.5 %. This pattern generally occurred across all RBDs.

Chemical status assessment is based on monitoring with no use of grouping or expert judgement. Water bodies without monitoring data are classified as unknown.

[53] Denmark also highlighted that the proportions of water bodies at good status and failing to achieve good status in the two RBMPs cannot be compared due to fundamental differences in the approach to the assessment of chemical status.

Figure 4.3 shows the confidence in the classification of chemical status for the second RBMP. The water bodies classified are associated to a medium level of confidence. The RBMPs included a methodology for the assessment of confidence and precision. Confidence in the classification of chemical status for the first RBMPs was not reported. The one-out-all-out principle was reported in the RBMPs to have been used.

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



Source: WISE electronic reporting

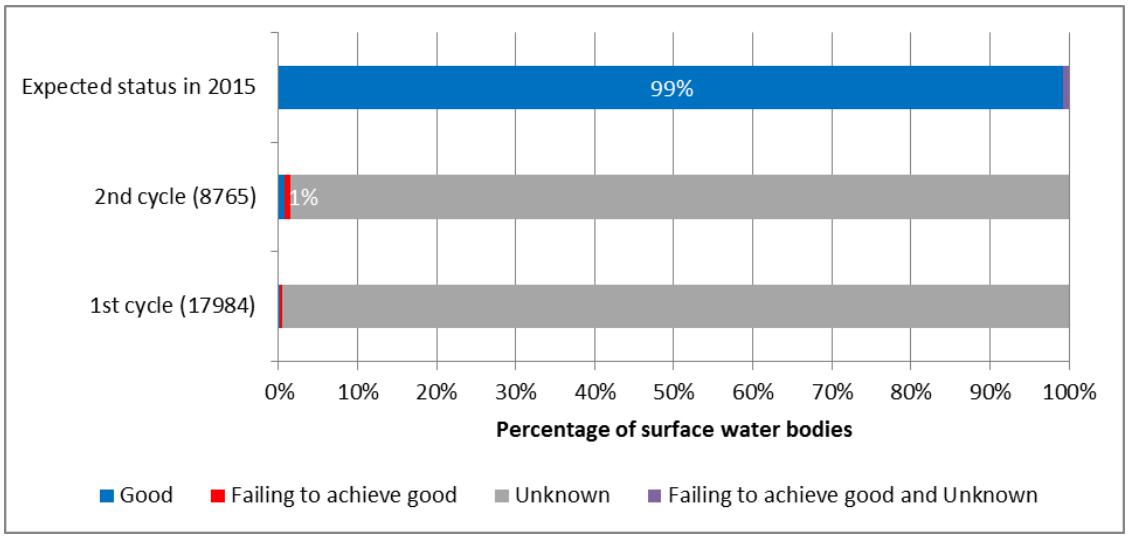
Figure 4.4 presents the chemical status of surface water bodies in Denmark for the first RBMP, that for the second RBMP (based on the most recent assessment of status) and that expected by 2015. Denmark highlighted that the chemical status for the first and second RBMPs cannot be compared due to due to fundamental differences in the approach to the assessment of chemical status between the two cycles[54].

The assessment of chemical status for the second RBMP was expected to be based on the standards laid down in the EQS Directive 2008/105/EC (version in force on 13 January 2009[55]). Some Member States did not implement the Directive in the first RBMPs as the transposition deadline was in July 2010, after the adoption of the first RBMPs.

[54] Cf chapter 4 of the RBMPs.

[55] Please note that following Directive 2013/39/EU, which amended the Environmental Quality Standards Directive, introduced a less stringent annual average environmental quality standard for naphthalene in

Figure 4.4 ***Chemical status of surface water bodies in Denmark 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. Note the period of the assessment of status for the second RBMP was 2007 to 2012. The year of the assessment of status for first RBMP is not known***



Source: WISE electronic reporting

More information on the chemical status in each RBD and water category can be found on the website of the European Environment Agency[56].

Directive 2013/39/EU amended the EQS Directive. In particular, it sets more stringent environmental quality standards for seven substances[57]. Member States were required to indicate if the new standard caused the status of the surface water body to appear to deteriorate. Denmark has stated that the new standard did not cause the status of the surface water body to appear to deteriorate for any surface water body in the four RBDs. 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 Denmark is shown in Figure 4.5. The numbers were reported as cumulative numbers. Good chemical status of surface water bodies is expected to be achieved

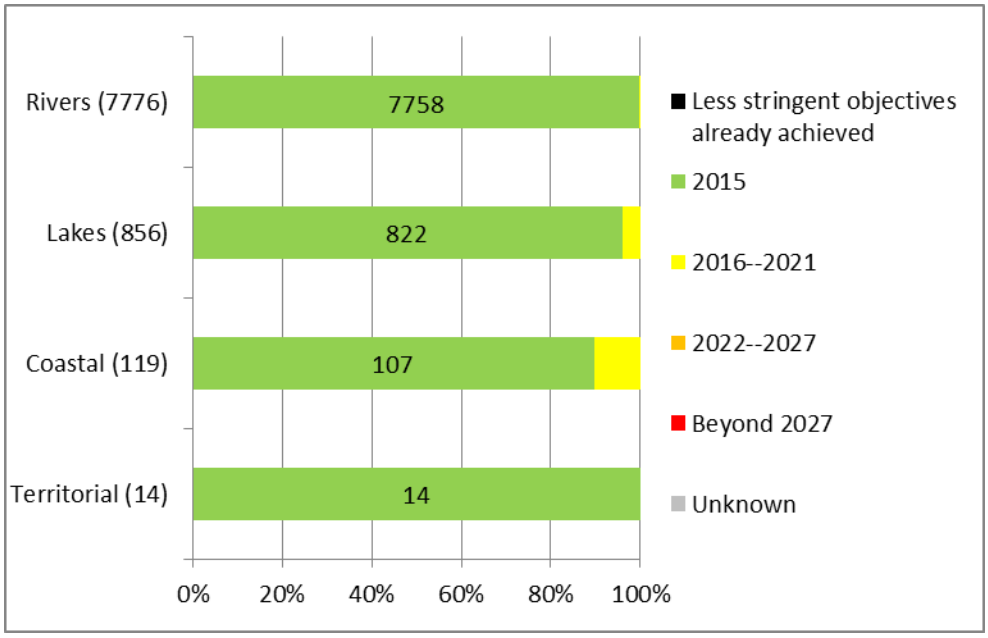
transitional and coastal waters. This less stringent environmental quality standard should be taken into account for the determination of surface water chemical status by the 2015 deadline laid down in Article 4 of the WFD.

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

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

by the end of the second planning cycle (2021) in all of the RBDs. Given the reported status at the beginning of the second cycle, there is significant progress to be made during the second cycle.

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



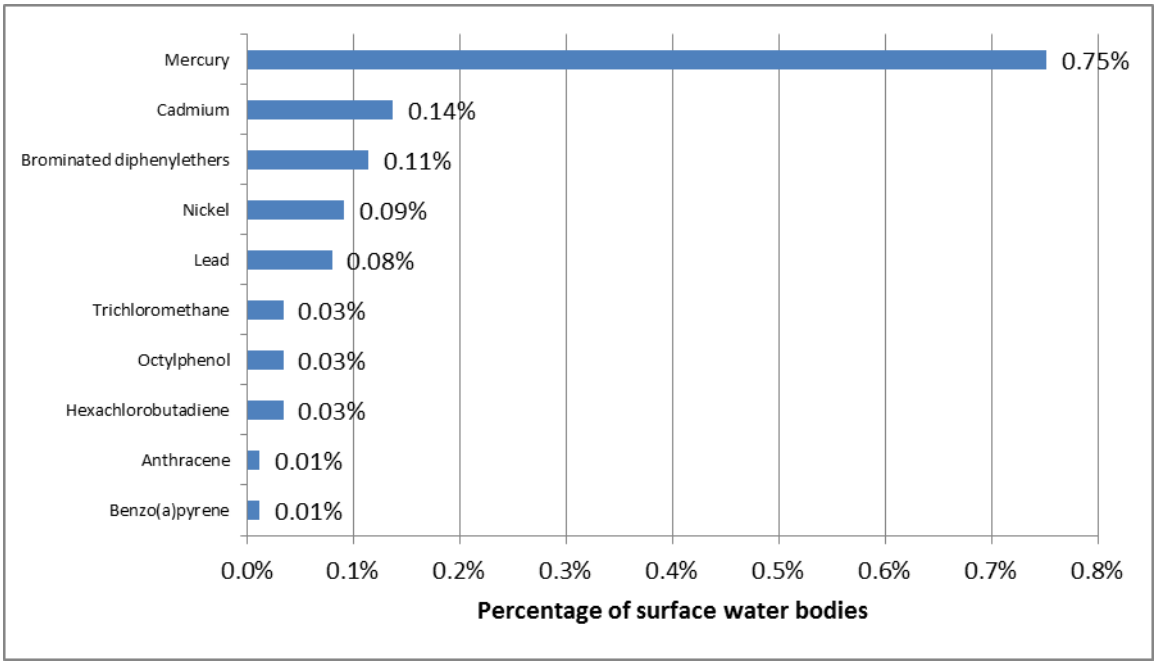
Source: WISE electronic reporting

Priority substances causing the failure of good chemical status

Member States were expected to report exceedances for individual substances on the basis of the revised, more stringent standards from Directive 2013/39/EU.

10 individual or groups of Priority Substances were reported to be causing failure to achieve good chemical status in surface water bodies in Denmark. Those most commonly causing failure, in terms of the proportion of water bodies, are shown in Figure 4.6. The substance causing the greatest proportion to fail good chemical status in the second RBMP was mercury and its compounds (0.75 % of all surface water bodies) across all surface water categories in the Jutland and Funen, Zealand and International (Vidå-Kruså) RBDs. There was no reported information for the Bornholm RBD. Brominated diphenylethers is also of note causing 0.11 % of the failures to meet good chemical status. However, the real extent of substances causing failure in Denmark is unknown because 98 % of surface waters have not been monitored and assessed for chemical status.

Figure 4.6 The Priority Substances most commonly causing failure to achieve good chemical status in surface water bodies in Denmark



Source: WISE electronic reporting

According to WISE, average environmental quality standards were reported to have been exceeded for a limited range of Priority Substances in the Jutland and Funen RBD (five substances), and the Zealand RBD (three substances). No exceedance was reported for the Bornholm RBD or International (Vidå-Kruså) RBDs.[58] There were no reported exceedances of maximum allowable concentration environmental quality standards.

Ubiquitous persistent, bioaccumulative and toxic Priority Substances

According to article 8(a) of the EQS Directive[59], eight priority substances and groups of priority substances are behaving like ubiquitous, persistent, bioaccumulative and toxic substances[60]. 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 States have the possibility to present the information related to chemical status separately for these substances.

[58] Denmark subsequently provided the following information : « Annual average environmental quality standards were reported to have been exceeded for a limited range of Priority Substances in the Jutland and Funen RBD (seven substances), the Zealand RBD (six substances) and the International Zealand RBD (one substance). »

[59] Amended by Directive 2013/39/EU

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

The influence of ubiquitous, persistent, bioaccumulative and toxic substances on the chemical status of monitored surface water bodies in Denmark is limited. While mercury caused failure to achieve good status in 0.75% of surface water bodies, it was only solely responsible for failure in 0.4%; mainly lake water bodies. However, the true extent of the influence of these substances is not known because of the very high proportion of water bodies not monitored and assigned unknown chemical status[61].

This is illustrated in the 2018 State of Water report of the European Environment Agency[62].

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

Not all of the Priority Substances monitored were used in the assessment of chemical status. Benzo(a)pyrene and fluoranthene are used in the status assessment and monitored in all 4 RBDs. In addition the following 11 Priority Substances are used in the status assessment and monitored only in the Jutland and Funen and Zealand RBDs; naphthalene, di(2-ethylhexyl)phthalate (DEHP), hexachlorobenzene, diuron, atrazine, lead and its compounds, mercury and its compounds, nickel and its compounds, cadmium and its compounds, isoproturon, and tributyltin-cation.

In the Jutland and Funen and Zealand RBDs, 4-nonylphenol, and simazine are monitored, but not used in the assessment of chemical status[63].

Lead, mercury, nickel, cadmium are monitored but not used in the assessment of chemical status in the Bornholm and International (Vidå-Kruså) RBDs.[64]

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.

[61] Denmark subsequently clarified that in the Jutland and Funen and Zealand RBDs, 4-nonylphenol, and simazine are monitored, and used in the assessment of chemical status.

[62] 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

[63] Denmark subsequently clarified that this was the case for brominated diphenylethers also.

[64] Denmark subsequently clarified that mercury and its compounds is used in the status assessment and monitored in all RBDs but Bornholm

In total eight of the 41 standards from the Directive were used in the assessment of chemical status in the Jutland and Funen and Zealand RBDs[65]. Alternative standards were applied for 6 Priority Substances. For the remaining Priority Substances, the RBMPs reported that the Priority Substances are not monitored because they are not used in Denmark or that screening has shown that they do not occur in significant quantities.

For the Bornholm and International (Vidå-Kruså) RBDs, standards for 39 and 37 Priority Substances[66] respectively were not used in the assessment of chemical status and there was no available information regarding the standards used. For two substances in the Bornholm RBD and four substances in the International (Vidå-Kruså) RBD alternative standards were used[67].

The Jutland and Funen and Zealand RBDs reported that alternative and/or additional standards had been applied for two substances in water and in biota for four substances (hexachlorobenzene, fluoranthene, benz(a)pyrene and brominated diphenylethers).[68]

There is therefore considerable uncertainty about the environmental quality standards for a large number of Priority Substances used as the basis for the assessment of chemical status. Denmark subsequently clarified that the assessment is undertaken on the basis of the Priority Substances listed in the table, and for all of which an EQS is laid down in Danish legislation (see Annex 2 to Bekendtgørelse (Statutory Order) No 1625 of 19/12/2017) for the relevant matrix transposing the standards established in the EQS Directive and/or established nationally for an alternative matrix.

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 in the Bornholm and International (Vidå-Kruså) RBDs in Denmark; however, mixing zones have been designated in the Jutland and Funen and Zealand RBDs. Information reported to WISE indicates that the methodology for the

[65] Denmark subsequently clarified that this was the case for 19 substances.
[66] Denmark subsequently clarified this was the case for 32 and 35 substances respectively.
[67] Denmark clarified these were biota standards.
[68] Denmark clarified that this must be a reporting error as no alternative standard has been used.

designation of mixing zones follows the tiered approach as laid down in the 'Technical Background Document on Identification of Mixing Zones'[69]. It is also stated that measures have been implemented with a view to reducing the extent of the mixing zones in the future.

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;
>
> (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 four RBDs in Denmark.

Water quality parameters that affect the bioavailability of metals have been taken into account when assessing monitoring results against relevant environmental quality standards in all of the four RBDs in Denmark.

4.2. Main changes in implementation and compliance since first cycle

The scale and extent of Priority Substance monitoring was not systematically reported in the first RBMPs. In the second RBMP, the scale and extent of Priority Substance monitoring for status assessment remains restricted to a few substances in few water bodies in all categories. Denmark subsequently clarified that overall 19 priority substances were monitored in a matrix for which a standard exist.

It is difficult to compare the chemical status between the two cycles due to the re-delineation of water bodies and change in assessment methods, nevertheless the changes have been minimal with a large majority of sites in unknown status (98.5 % reduced from 99.3 % in the first cycle).

Information on Priority Substances causing failure of good chemical status for the first cycle was not systematically reported making comparison with the second cycle difficult. However,

[69] https://circabc.europa.eu/sd/a/78ce94bb-6f1c-4379-87ac-88a18967c4c3/Technical%2520Background%2520Document%2520on%2520the%2520Identification%2520of%2520Mixing%2520Zones.doc+&cd=1&hl=en&ct=clnk&gl=uk

collated information in the compliance assessment of the first RBMPs indicated that 'heavy metals aggregated' and mercury were responsible for the majority of the environmental quality standard failures. No Priority Substances causing improvement in chemical status from failing to achieve good chemical status to good were reported for Denmark.

4.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and first Programme of Measures requested actions on the following:

- Recommendation: *Denmark needs to be more transparent on the use of grouping of water bodies for monitoring and classification.*

  Assessment: With respect to chemical status, Denmark reports that all surface water bodies classified have been assessed on the basis of monitoring without the use of expert judgement or grouping. Surface water bodies not monitored for chemical status were reported as unknown status. Very high percentages of surface water bodies are not monitored (97.4 to 99.5 %). Denmark has fulfilled the requirements of this recommendation.

- Recommendation: *Denmark will need to provide data on the chemical status of a much higher proportion of its water bodies, if necessary by monitoring more extensively. The apparent omission of data on hexachlorobutadiene should be addressed. Denmark needs to specify exactly which industrial pollutants are causing failure of the chemical status objective. Groundwater monitoring and methodologies should all be made WFD compliant. Measures to ensure good chemical status of groundwater should be established considering all WFD aspects, not only drinking water use. Trend assessments and reversals should be carried out in the second RBMP cycle.*

  Assessment: With respect to chemical status, the scale and extent of the monitoring of Priority Substances for status assessment is very restricted in terms of number of Priority Substances monitored and number of monitoring sites and water bodies monitored. Denmark subsequently clarified that overall 19 priority substances were monitored in a matrix for which a standard exist.

  With respect to the proportion of surface water bodies classified, overall in Denmark between the two cycles the proportion with unknown chemical status decreased a small amount from 99.3 to 98.5 %. Denmark has reported the nine Priority Substances causing the failure of the small proportion of surface water bodies classified as failing to achieve good chemical status.

Denmark subsequently clarified that hexachlorobutadiene is not discharged and therefore not monitored in biota. It is however not clear how status was assessed for hexachlorobutadiene, given that no biota monitoring data was available.

Overall, almost no progress has been made with the recommendation and it is not fulfilled.

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

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

5.1.1. Monitoring of quantitative status in groundwater

The total number of groundwater bodies in Denmark is 402 (Table 2.3). 291 groundwater bodies (72 %) are not subject to monitoring for quantitative status (Table 5.1). Grouping was applied in all RBDs according to a national approach. The groundwater bodies in Denmark are divided by relative depth into three types: shallow groundwater bodies, regional groundwater bodies and deep groundwater bodies. The typology does not reflect the physical depth of the aquifer, only the relation to surface water:

1. The shallow groundwater body is in direct contact with an ecosystem (watercourses, lakes or wetlands) and a surface area less than 250 km². It consists of sand or limestone.
2. The regional groundwater body is in direct contact with an ecosystem (watercourses, lakes or wetlands) and a surface area larger than 250 km². It consists of sand or limestone.
3. Deep groundwater bodies have no contact with aquatic or terrestrial ecosystems (watercourses, lakes or wetlands).

As reported in WISE, all groundwater bodies changed since the first RBMP. The number of groundwater bodies increased by 4 % from 385 in the first RBMP to 402 in the second RBMP but the total groundwater body area decreased by about 28 %.

The number of monitored groundwater bodies increased slightly in absolute numbers, from 120 out of a total of 385 groundwater bodies in the first RBMP to 124 out of a total of 402 groundwater bodies in the second RBMP. However, the number of monitoring sites for quantitative status is listed in Table 5.2 and shows a significant increase of almost 50%, from 634 in the first RBMP to 943 in the second RBMP. The number of monitoring sites and their purpose is listed in Table 5.3.

All 402 groundwater bodies are identified as drinking water protected areas.

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

RBD	Total ground-water bodies directly monitored	Monitoring Purpose									
		CHE – Chemi-cal status	DRI – Ground-water abstracti on site for human consum-tion	DWD - Drinking water - WFD Annex IV.1.i	IND – Ground-water abstract-tion site for industria l supply	NID - Nutrient sensitive area under the Nitrates Directive - WFD Annex IV.1.iv	OPE – Operatio -nal monitor-ing	QUA – Quantita -tive status	SOE - EIONET State of Environ-ment monitor-ing	SUR – Surveil-lance monitor-ing	TRE - Chemica l trend assess-ment
DK1	178	178	153	153	16	71	30	81	76	76	148
DK2	95	95	83	83	7	37	17	37	40	40	81
DK3	8	8	8	8		4	1	4	4	4	5
DK4	3	3	2	2	0	2	1	2	2	2	1

Source: WISE electronic reporting[70]

Table 5.2 Proportion of groundwater bodies in Denmark monitored for quantitative status

RBD	No of groundwater bodies with quantitative monitoring	Total No. groundwater bodies	% of total groundwater bodies monitored for quantitative status
DK1	81	241	33.60%
DK2	37	136	27.21%
DK3	4	19	21.05%
DK4	2	6	33.33%

Source: WISE electronic reporting

Table 5.3 Number of groundwater monitoring sites in Denmark and their purpose

RBD	Total ground-water monitor-ing sites	Monitoring Purpose									
		CHE – Chemi-cal status	DRI – Ground-water abstract-tion site for human consump-tion	DWD – Drink-ing water - WFD Annex IV.1.i	IND – Ground-water abstract-tion site for indust-rial supply	NID - Nutrient sensitive area under the Nitrates Directive - WFD Annex IV.1.iv	OPE – Operatio -nal monitor-ing	QUA – Quanti-tative status	SOE - EIONE T State of Environ-ment monito-ring	SUR – Surveil-ance monitor-ing	TRE – Chemi-cal trend assess-ment
DK1	6977	6977	3960	3960	46	726	170	696	875	875	4487
DK2	4834	4834	2993	2993	25	238	64	221	338	338	3131
DK3	154	154	110	110		16	5	15	18	18	112
DK4	44	44	21	21		11	2	11	13	13	28

Source: WISE electronic reporting.

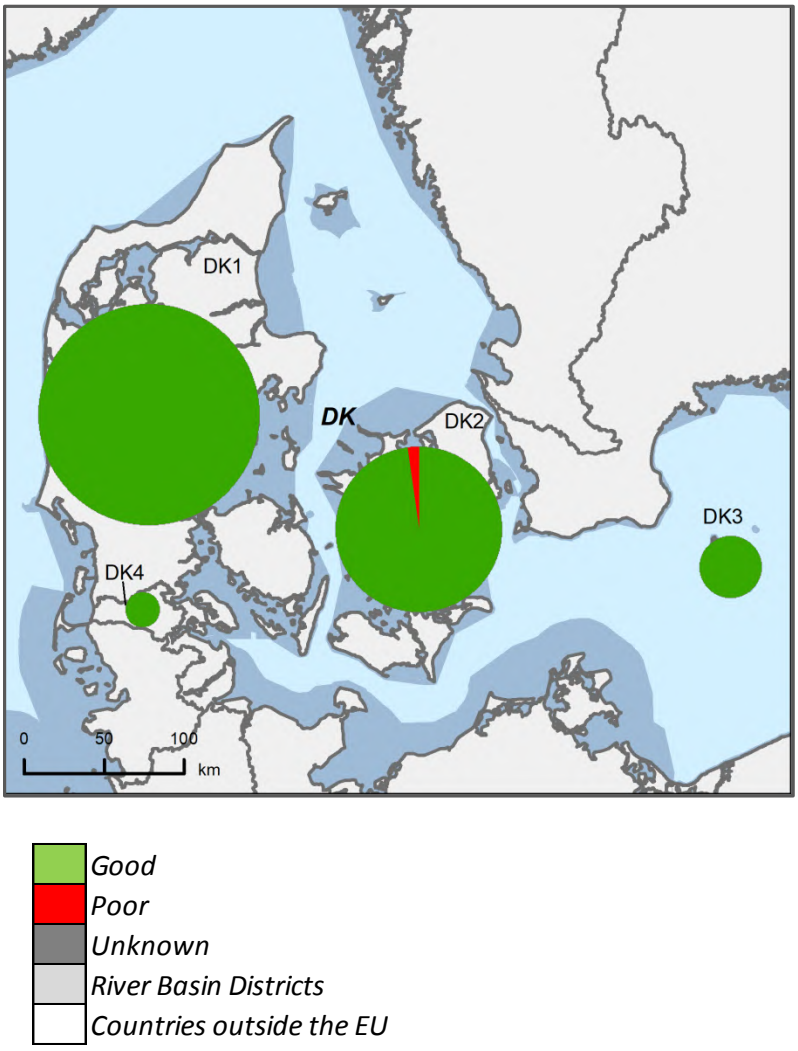
[70] Denmark subsequently clarified that no specific nutrient sensitive areas have been designated. The Nitrates Action Programme is applied throughout the whole national territory."

5.1.2. Assessment and classification of quantitative status for groundwater

Map 5.1 displays the most recently assessed quantitative status of groundwater bodies. It shows that 399 of 402 groundwater bodies (99 %) were in good quantitative status and three (1 %) were failing good status (Figure 5.1). In terms of area, this means that about 2.3% were failing good quantitative status.

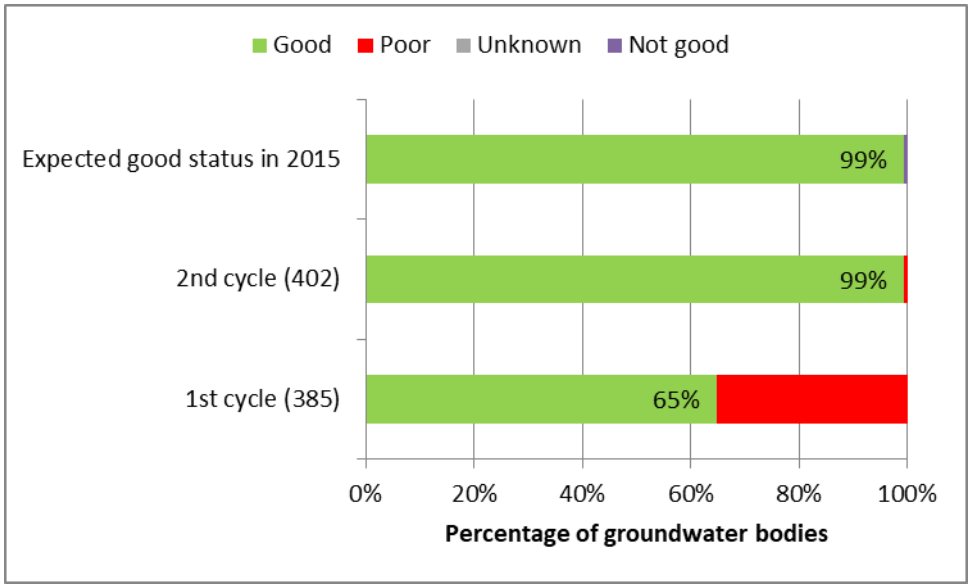
Figure 5.2 shows that there is overall medium confidence in status classification. All groundwater bodies had and still have a known status, in the first and in the second RBMP.

Map 5.1 Map of the most recently assessed quantitative status of groundwater bodies



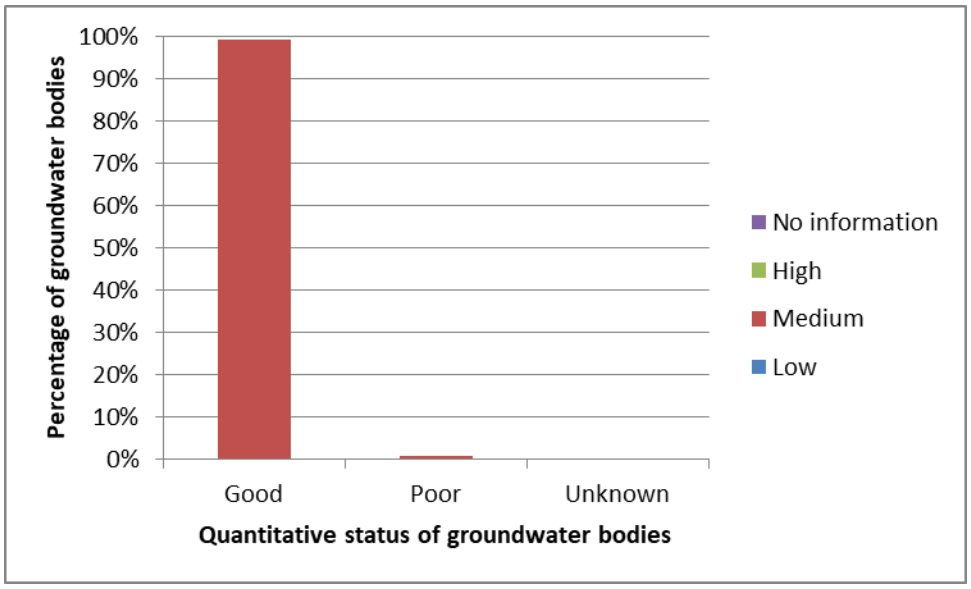
Note: Standard colours based on WFD Annex V, Article 2(2)(4).
Source: WISE, Eurostat (country borders)

Figure 5.1 ***Quantitative status of groundwater bodies in Denmark for the second RBMP, for the first RBMP and expected in 2015. The number in the parenthesis is the number of groundwater bodies for each cycle. NB - the period of the assessment of status for the second RBMP was 2004 to 2010. 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 Denmark based on the most recent assessment of status***



Source: WISE electronic reporting

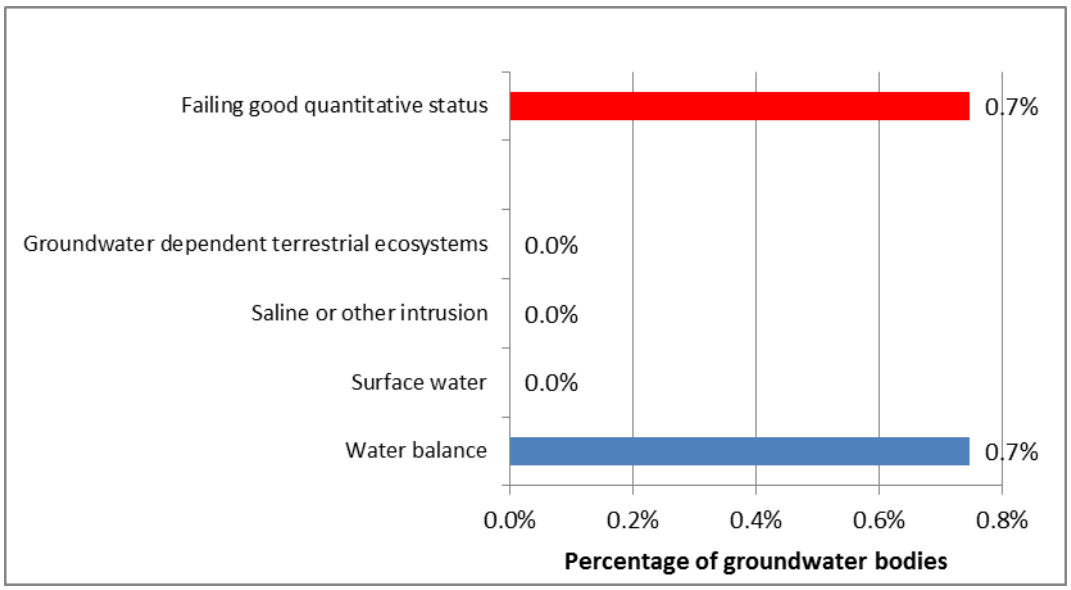
The total number of groundwater bodies failing good quantitative status decreased significantly from 135 (35 %) out of 385 groundwater bodies in the first RBMP to three (1 %) out of 402 groundwater bodies in the second RBMP. In terms of groundwater body area, this means that

in the first RBMP about 42 % of the area failed good status and in the second cycle this is down to 2 %. It has to be considered, however, that the total groundwater body area decreased by about 28 % and all groundwater bodies have been re-delineated since the first RBMP.

In each RBD, water balance was assessed by comparing annual average groundwater abstraction against the 'available groundwater resource' for every groundwater body.

The reasons for the failure of good quantitative status of groundwater bodies are shown in Figure 5.3. All three groundwater bodies are failing good status due to failing the water balance test: this means that the long-term annual average rate of groundwater abstraction is exceeding the available groundwater resource.

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



Source: WISE electronic reporting

Notes:

'Water balance' = long-term annual average rate of abstraction exceeds the available groundwater resource which may result in a decrease of groundwater levels.

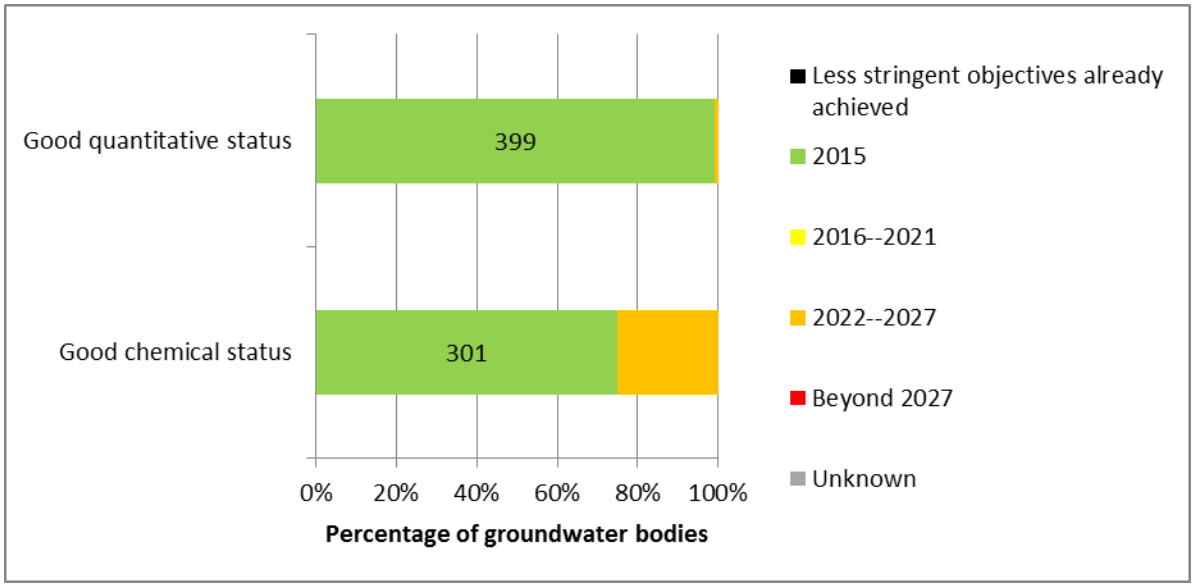
'Surface water' = Failure to achieve Environmental Objectives (Article 4 WFD) for associated surface water bodies resulting from anthropogenic water level alteration or change in flow conditions; significant diminution of the status of surface waters resulting from anthropogenic water level alteration or change in flow conditions.

'Groundwater dependent terrestrial ecosystems' = Significant damage to groundwater dependent terrestrial ecosystems resulting from an anthropogenic water level alteration.

'Saline or other intrusion' = Regional saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.

The expected date of achievement of good quantitative status in Denmark is shown in Figure 5.4 and it is reported that the groundwater bodies that are currently in poor status, are expected to be in good quantitative status by 2027.

Figure 5.4 Expected date of achievement of good quantitative and good chemical status of groundwater bodies in Denmark. 402 groundwater bodies delineated for the second RBMP



Source: WISE electronic reporting

In all four RBDs, the criterion of 'available groundwater resource' has been partially applied in accordance with WFD Article 2(27)[71]. In all RBDs, saline intrusion was considered in status assessment but diminution of the status of groundwater associated surface waters and damage to groundwater dependent terrestrial ecosystems have not been considered at all; however, there is also no risk related to these ecosystems.

In total, three groundwater bodies (1 %) are at risk of failing good quantitative status, related to actual or potential legitimate uses or functions of groundwater.

[71] Denmark subsequently clarified that the available groundwater resource has been addressed in two different ways, a balance approach and an ecological flow approach. According to the water balance approach, groundwater bodies will fail the criteria of good quantitative status if long-term abstraction exceeds 30% of the long-term groundwater recharge. According to the ecological flow approach, groundwater bodies will fail the criteria of good quantitative status if the abstraction may lead to failure to achieve the environmental objectives specified under WFD Article 4 for associated surface water bodies resulting from anthropogenic water level alteration or change in flow conditions. Investigations of impacts on associated surface waters have been performed with respect to surface water courses. The two criteria have been considered for the assessment of quantitative status for all 402 groundwater bodies.

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

In total 206 out of 402 groundwater bodies were identified to be associated with aquatic ecosystems. Groundwater associated surface waters have not been considered in status assessment and there is no risk of failure related to these ecosystems.

The impact of groundwater on surface water courses is assessed by using a new model that establishes the relationship between a number of water flow parameters and the biological quality elements. Based on the model, the impact of water abstractions on the ecological condition in the surface waters and then the impact on groundwater status are calculated. The model is only used to calculate the impacts of water abstractions related to aquatic macroinvertebrates and fish; the model is not sufficiently robust when it comes to the biological quality element for plants.

252 out of 402 groundwater bodies are linked with groundwater dependent terrestrial ecosystems. Groundwater dependent terrestrial ecosystems have not been considered in status assessment and there is no risk of failure related to these ecosystems. The needs of terrestrial ecosystems have not been considered in status assessment although they exist.

It is noted that there is no knowledge about the impacts of water abstraction on groundwater dependent terrestrial ecosystems. It is stated in the RBMPs that the Danish Environmental Protection Agency (previously “styrelsen for vand- og Naturforvalting, now “Miljøstyrelsen”) will initiate projects in order to obtain further knowledge in this area.

5.2. Main changes in implementation and compliance since the first cycle

There is a summary of changes or updates in all RBMPs assessed. As reported in WISE, all groundwater bodies have been re-delineated which makes direct comparisons with the first RBMP on groundwater body level impossible. In total, the number of groundwater bodies increased by 4 %, from 385 in the first RBMP to 402 in the second RBMP, but the total groundwater body area decreased by about 28 %.

The number of monitored groundwater bodies increased slightly, from 120 out of a total of 385 groundwater bodies in the first cycle to 124 out of a total of 402 groundwater bodies in the second RBMP. The number of monitoring sites for quantitative status increased significantly, by almost 50 %, from 634 in the first cycle to 943 in the second RBMP.

All groundwater bodies have been re-delineated which makes direct comparisons at the level of groundwater body impossible. The assessment method also changed. The total groundwater body area failing good quantitative status decreased significantly from 42 % to 2 %.

Explanations of the criteria used in the assessments of groundwater quantitative status for the first RBMP were quite simple, but not applied in a uniform manner throughout the country. This resulted in poor quantitative status for many groundwater bodies indicating non-sustainable groundwater abstraction.

The quantitative status is now assessed on the basis of 1) groundwater water balance, 2) groundwater impacts on surface water and 3) intrusion of saline or other substances into the groundwater. The water balance is calculated differently compared to the first RBMP. Water balance in the first RBMP was assessed by a screening criterion of the maximum abstraction/exploitation of groundwater, which should not exceed 35 % of the natural recharge of groundwater. This criterion was now changed to 30 %. Any aquifer exceeding this criterion is subject to an in-depth assessment based on local data and knowledge.

The impact of groundwater on surface water is assessed by using a new model that establishes the relationship between a number of water flow parameters and the biological quality elements.

5.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendations:
    - *The basis for assessing quantitative status in groundwater bodies is weak.*
    - *Denmark needs to further extend the monitoring programme to include all biological, physical-chemical and hydromorphological quality elements as relevant, for all water categories (rivers, lakes, coastal waters) and ensure there is adequate monitoring of groundwater to enable assessment of status, pressures and trends. The reported monitoring system is a new one (NOVANA) and not the one used for developing the 1st RBMPs. Although it is new, it does not yet appear to be WFD compliant. There is no operational monitoring of drinking water protected areas (groundwater).*
    - *Denmark needs to be more transparent on the use of grouping of water bodies for monitoring and classification.*

Assessment: The total groundwater body area decreased by 27 % and in parallel, the number of monitoring sites for quantitative status increased significantly, by almost 50 %, from 634 in the first RBMP to 943 in the second RBMP. The number of monitored groundwater bodies for quantitative status increased slightly, from 120 out of 385 groundwater bodies in the first RBMP to 124 out of a total of 402 groundwater bodies in the second RBMP. The use of grouping in the monitoring of groundwater status is unclear. These recommendations are partially fulfilled.

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

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

6.1.1. Monitoring of chemical status in groundwater

The total number of groundwater bodies in Denmark is 402 (Table 2.3). In total, 280 groundwater bodies (70 %) are not subject to surveillance monitoring (Table 5.1) and only half of the 101 groundwater bodies at risk (25 %) (mainly in the Jutland and Funen and Zealand RBDs) are subject to operational monitoring. Grouping was applied in all RBDs according to a national approach, considering similar geology and hydrogeology though not reported in WISE. The groundwater bodies in Denmark are divided by relative depth into three types: shallow groundwater bodies, regional groundwater bodies and deep groundwater bodies. The typology does not reflect the physical depth of the aquifer, only the relation to surface water:

1. The shallow groundwater body is in direct contact with an ecosystem (watercourses, lake or wetlands) and a surface area less than 250 km². It consists of sand or limestone.

2. The regional groundwater body is in direct contact with an ecosystem (watercourses, lake or wetlands) and a surface area larger than 250 km². It consists of sand or limestone.

3. Deep groundwater bodies have no contact with aquatic or terrestrial ecosystems (watercourses, lake or wetlands).

All groundwater bodies changed since the first RBMP. The number of groundwater bodies increased by 4 % from 385 in the first cycle to 402 in the second RBMP but the total groundwater body area decreased by about 28 %.

The number of groundwater bodies with surveillance monitoring remained the same for the first and second RBMP with 122 groundwater bodies. The number of monitoring sites is listed in Table 14 and almost doubled from 636 in the first cycle to 1244 in the second RBMP. The number of operational monitoring sites has decreased significantly since the first RBMP, from 636 (in 122 groundwater bodies) to 241 (in 49 groundwater bodies). For chemical trend assessment, 7758 sites in 235 groundwater bodies were used.

Not all substances causing risk of deterioration in chemical status are subject to monitoring. According to the WISE electronic reports, with the exception of nitrate, none of the WFD core parameters (ammonium, electrical conductivity, oxygen and pH) are monitored[72].

The reasons for including substances in operational monitoring are that these substances are causing risk of failure or they are Groundwater Directive[73] Annex II substances; BTEX-substances are also measured.

6.1.2. Assessment and classification of chemical status in groundwater

Map 6.1 and Figure 6.1 display the most recently assessed chemical status of groundwater bodies. It shows that 178 out of 402 groundwater bodies (44 %) were of good chemical status, 101 groundwater bodies (25 %) are failing good status and 123 groundwater bodies (31 %) are of unknown status. In terms of area, this means that about 20 % are failing good chemical status. Figure 6.2 shows the confidence in status classifications. The number of groundwater bodies with unknown status increased from 0 in the first cycle to 123 in the second RBMP, representing about 2 % of the total groundwater body area.

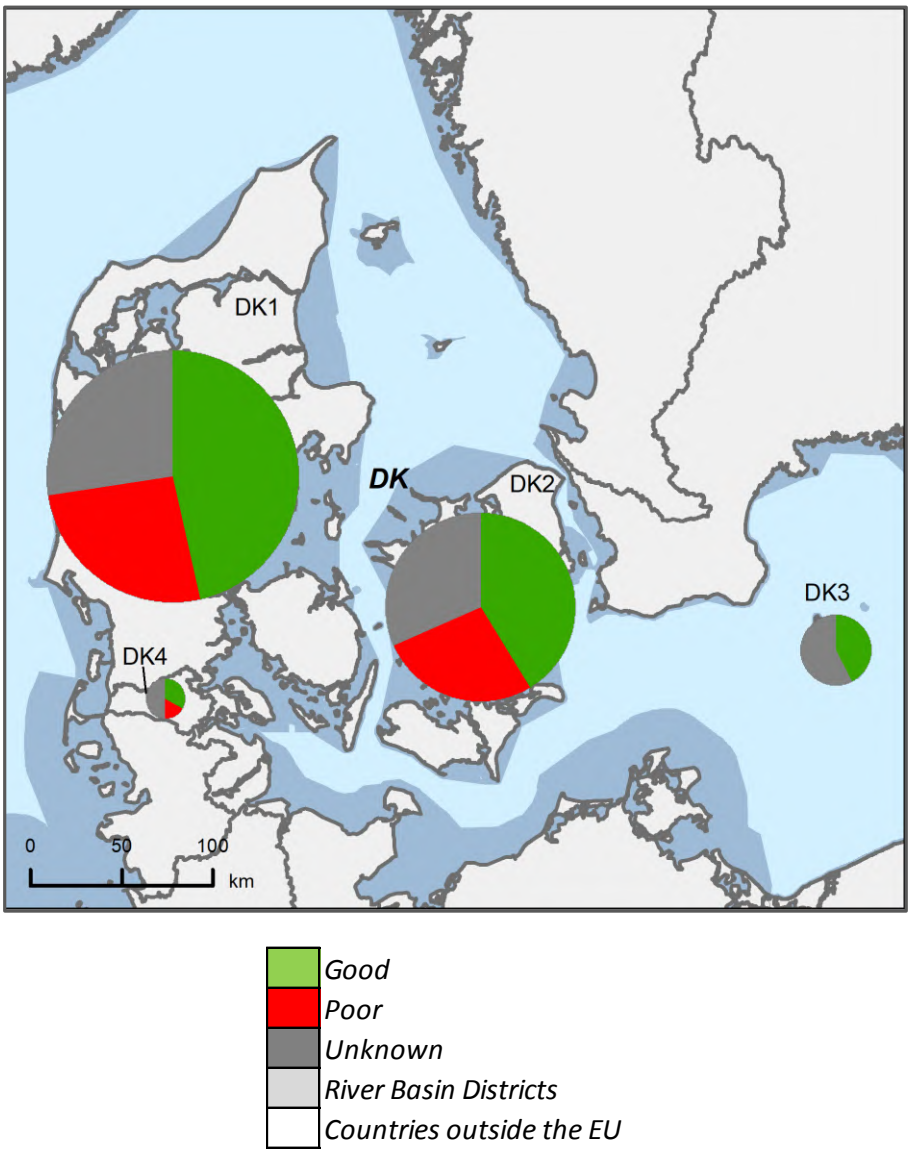
The total number of groundwater bodies failing good chemical status decreased since the first RBMP from 164 (43 %) to 101 (25 %) groundwater bodies (see Figure 6.1) (from 53 % to approximately 20 % of the total groundwater body area). Due to the significant revision of all groundwater bodies (splitting, merging and re-delineation) and the reduction of the total groundwater body area by about 28 %, it is difficult to compare the results of the first and the second RBMP.

The reasons for the failure of good chemical status of groundwater bodies are shown in Figure 6.3. For all 101 groundwater bodies, the general assessment was that the chemical status for the groundwater body as a whole failed good chemical status. This assessment considers the significant environmental risk from pollutants across a groundwater body and a significant impairment of the ability to support human uses.

[72] Denmark subsequently clarified, that in fact, all WFD core substances are being monitored.

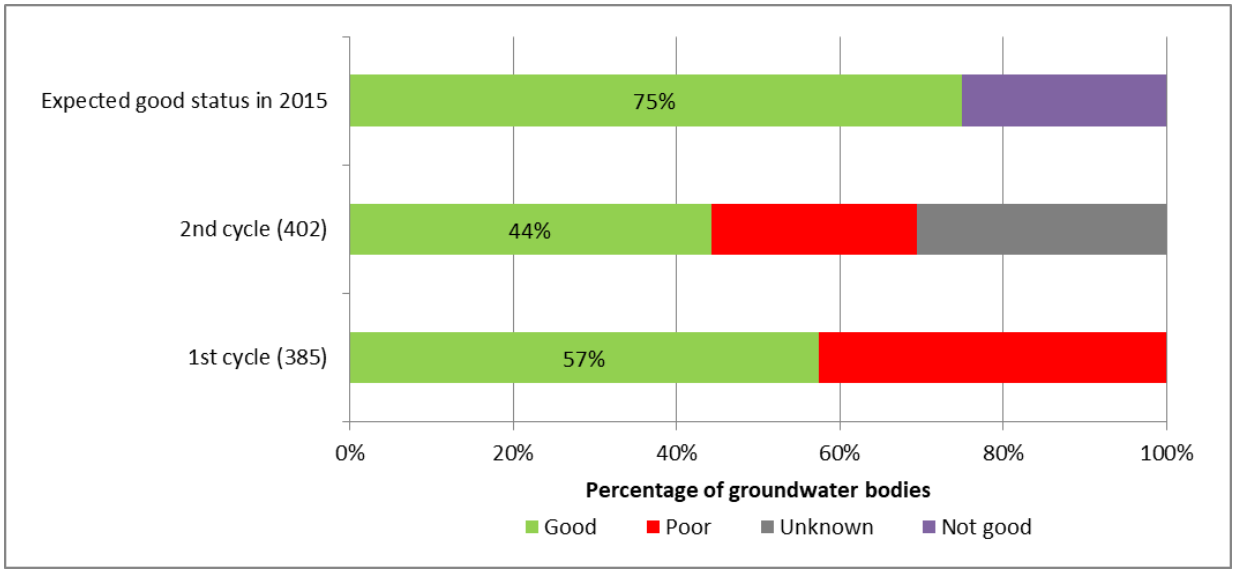
[73] Groundwater Directive (GWD): Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration.

Map 6.1 ***Map of the most recently assessed chemical status of groundwater bodies in Denmark***



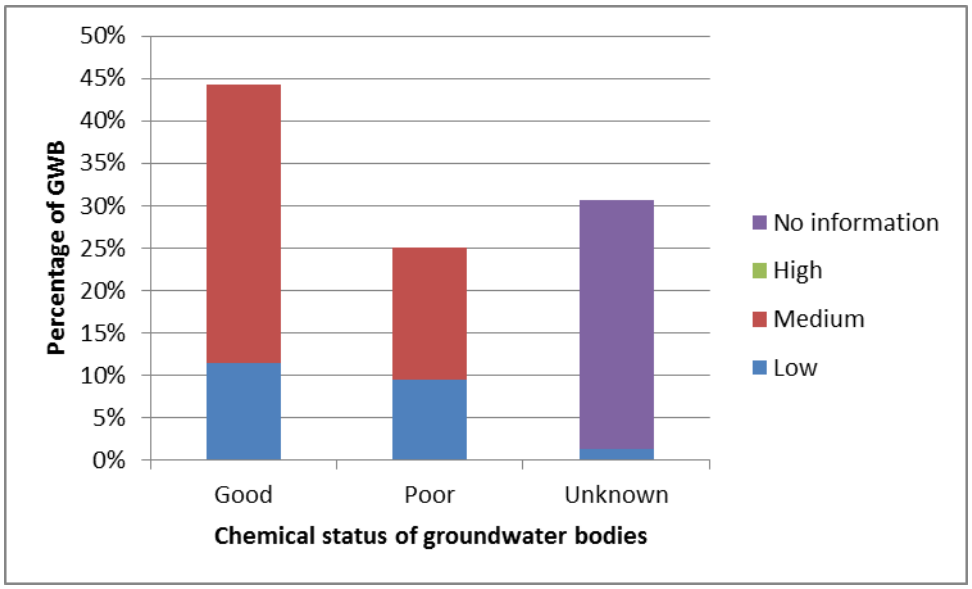
Note: Standard colours based on WFD Annex V, Article 2(4)(5).
Source: WISE, Eurostat (country borders)

Figure 6.1 ***Chemical status of groundwater bodies in Denmark for the second RBMP, for the first cycle and expected in 2015. The number in the parenthesis is the number of groundwater bodies for both cycles. NB - the period of the assessment of status for the second cycle was 2000 to 2013. The year of the assessment of status for the first RBMP is not known.***



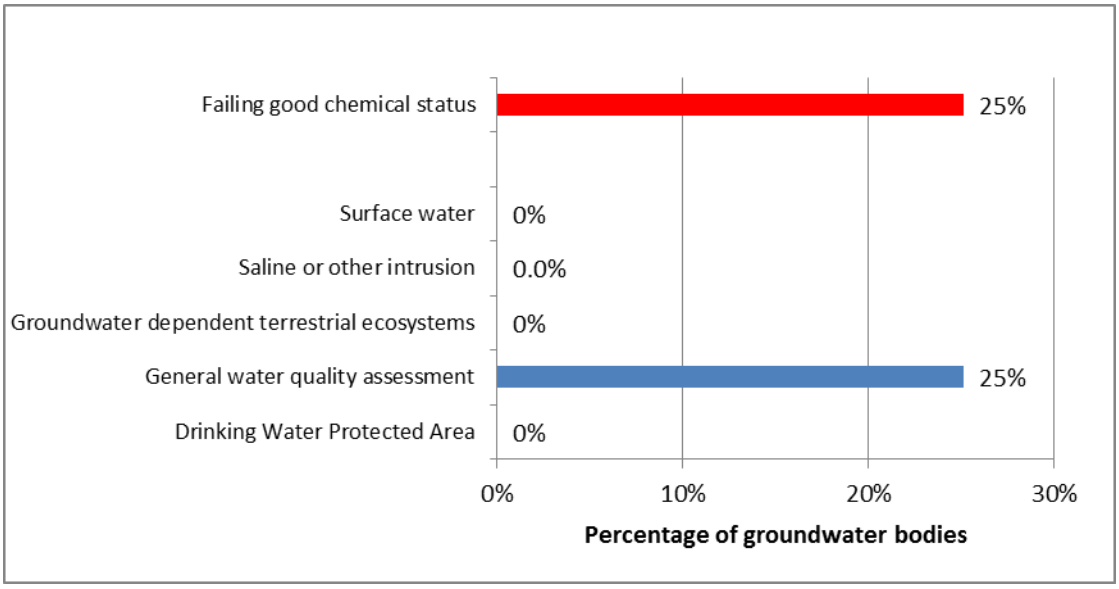
Source: WISE electronic reports

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



Source: WISE electronic reports

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



Source: WISE electronic reports

Notes:

'Surface water' = Failure to achieve Environmental Objectives (Article 4 WFD) in associated surface water bodies or significant diminution of the ecological or chemical status of such surface water bodies.

'Groundwater dependent terrestrial ecosystems' = Significant damage to terrestrial ecosystems which depend directly on the groundwater body.

'Saline or other intrusion' = Regional saline or other intrusions resulting from anthropogenically induced sustained changes in flow direction.

'Drinking Water Protected Area' = Deterioration in quality of waters for human consumption.

'General water quality assessment' = Significant impairment of human uses; significant environmental risk from pollutants across the groundwater body.

The calculation of the extent of exceedance of a groundwater quality standard or a groundwater threshold value is based, in all four RBDs, on the number of monitoring sites in the groundwater body. In all RBDs, the aggregation method for assessing groundwater chemical status is described. There are monitoring points for 375 groundwater bodies (402 groundwater bodies altogether). For the period of 2000–2013, monitoring has been performed at least once in 284 groundwater bodies. Each monitoring point in each groundwater body is monitored, and threshold values must not be exceeded for any of the substances in more than 20% of the monitoring points. If data from at least five monitoring points are used, none of the monitoring points can contribute to more than 20 % of the status determination[74]. If data exist from five or less monitoring points, the status is considered as uncertain. Trend analyses have been performed independently from status assessments.

[74] Denmark subsequently clarified that status analyses have also been performed for groundwater bodies with fewer than 5 monitoring points

In all four RBDs groundwater threshold values have been established for all pollutants or indicators of pollution causing a risk of failure of good chemical status. The RBMPs and background documents did provide indication that the Groundwater Directive[75] Annex II substances have been considered. In all four RBDs, natural background levels have been considered in the groundwater threshold value establishment.

A trend methodology is available and assessments have been performed in all RBDs. A trend reversal assessment methodology is not available.

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

In total, 206 out of 402 groundwater bodies were identified as being associated with aquatic ecosystems. Groundwater associated surface waters have not been considered in the assessment of chemical status assessment, and there is no risk of failure of chemical status related to these ecosystems.

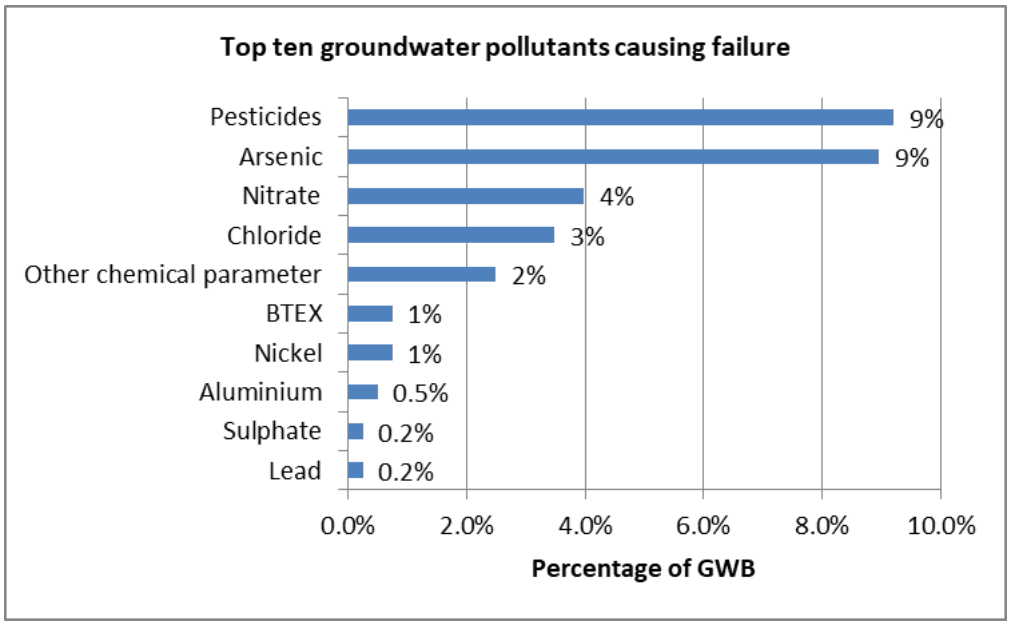
252 out of 402 groundwater bodies are linked with groundwater dependent terrestrial ecosystems. Groundwater dependent terrestrial ecosystems have not been considered in status assessment and there is no risk assessment performed related to failure for these ecosystems.

Groundwater associated aquatic ecosystems and groundwater dependent terrestrial ecosystems have not been considered in the establishment of groundwater threshold values. Consequently they are currently not linked to a risk.

Figure 6.4 shows the pollutants causing failure of status and Figure 6.5 shows the five pollutants with upward trends in groundwater bodies in Denmark. Figure 6.6 shows the percentage of groundwater bodies at risk of failing good chemical status and good quantitative status.

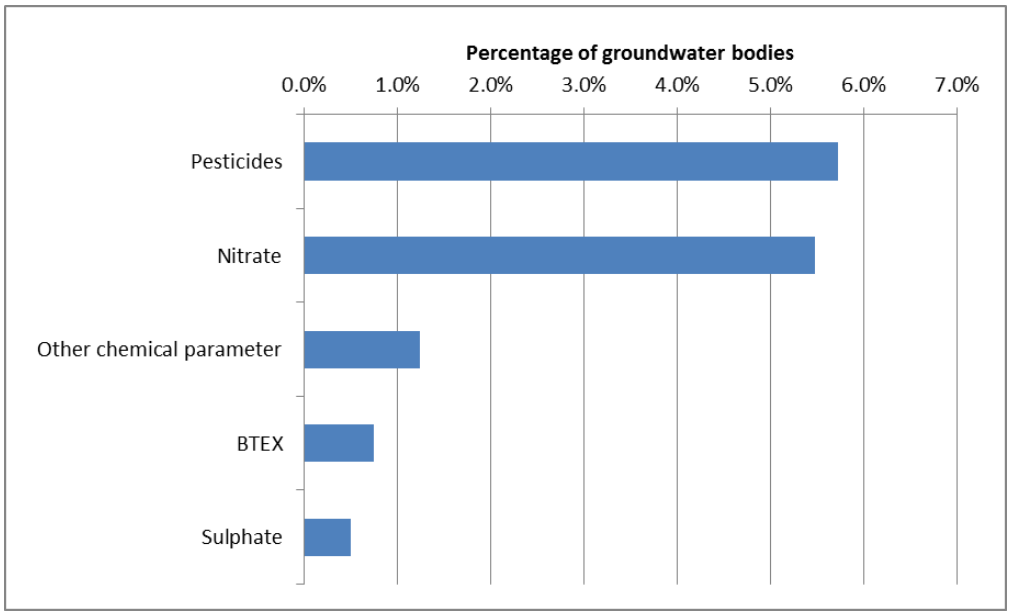
[75] Groundwater Directive (GWD): Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration.

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



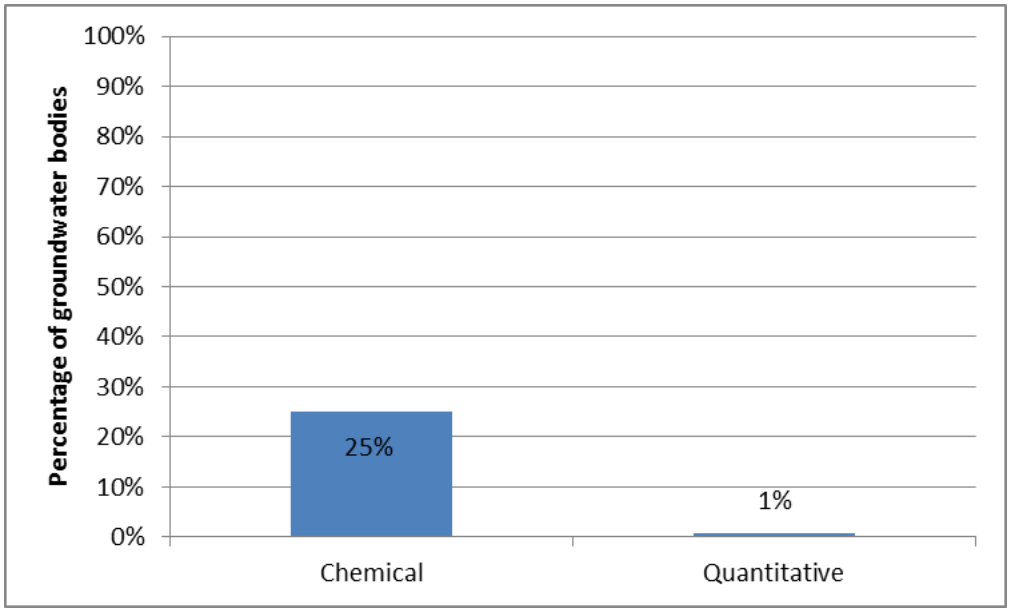
Source: WISE electronic reports

Figure 6.5 ***Top pollutants with upward trends in groundwater bodies in Denmark***



Source: WISE electronic reports

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



Source: WISE electronic reports

6.2. Main changes in implementation and compliance since the first cycle

No summary of changes or updates were found in any RBMPs assessed for this topic.

All groundwater bodies had been re-delineated which makes direct comparisons with the first RBMP not possible. In total, the number of groundwater bodies increased by 4 % from 385 in the first cycle to 402 in the second RBMP but the total groundwater body area decreased by about 27 %. The re-delineation has been done due to updated mapping of the groundwater location, the boundaries and the proximity/connection to surface water bodies. A groundwater body is defined as an administrative unit, delineated by one or several groundwater-reservoirs/aquifers, based on hydraulic contact and the boundaries of their areal extension. Due to the significant revision of all groundwater bodies (splitting, merging and re-delineation) and the reduction of the total groundwater body area by about 27 %, it is difficult to compare the results of the first and the second RBMP.

The monitoring situation did not improve. The total number of groundwater bodies with surveillance monitoring remained the same with 122 groundwater bodies and the number of monitoring sites almost doubled. The number of groundwater bodies with operational monitoring was significantly reduced from 122 to 49 groundwater bodies, which is half of the total number of groundwater bodies at risk, and also the number of monitoring sites decreased significantly. Grouping for monitoring purposes was applied but it is not fully clear whether all groundwater bodies without monitoring are part of groups of groundwater bodies which are

subject to monitoring. The status situation improved significantly with a decrease of the groundwater body area failing good chemical status from 52.7 % to 19.6 % of the total groundwater body area. About 31 % of the groundwater bodies are without a clear status and these groundwater bodies are representing about 2 % of the total groundwater body area.

6.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Denmark needs to further extend the monitoring programme to include all biological, physical-chemical and hydromorphological quality elements as relevant, for all water categories (rivers, lakes, coastal waters) and ensure there is adequate monitoring of groundwater to enable assessment of status, pressures and trends.*

  Assessment: In total, 7085 monitoring sites are dedicated to monitoring of drinking water protected areas in 284 groundwater bodies and for chemical trend assessment 7758 sites in 235 groundwater bodies are established. The fact that monitoring of groundwater status does not cover all groundwater bodies could be due to their re-delineation. Monitoring is not complete, not all substances causing risk are covered by monitoring. Denmark subsequently clarified, that in fact, all WFD core substances are being monitored. This recommendation has partially been fulfilled.

- Recommendation: *Denmark needs to be more transparent on the use of grouping of water bodies for monitoring and classification.*

  Assessment: This recommendation cannot be fully assessed from the information available in WISE reporting and the RBMPs, as it does not describe clearly how grouping has been applied.

- Recommendation: *Denmark will need to provide data on the chemical status of a much higher proportion of its water bodies, if necessary by monitoring more extensively. The apparent omission of data on hexachlorobutadiene should be addressed. Denmark needs to specify exactly which industrial pollutants are causing failure of the chemical status objective. Groundwater monitoring and methodologies should all be made WFD compliant. Measures to ensure good chemical status of groundwater should be established considering all WFD aspects, not only drinking water use. Trend assessments and reversals should be carried out in the second RBMP cycle.*

- Assessment: Groundwater dependent/associated aquatic/terrestrial ecosystems have not been considered in groundwater chemical risk and status assessment although they exist. Denmark noted that a project is initiated to map the chemical link between groundwater and the associated aquatic and terrestrial ecosystems. A considerable 30% share of groundwater bodies has no clear status. A trend methodology is available and assessments have been performed in all river basin districts. A trend reversal assessment methodology is not available. Denmark subsequently clarified that hexachlorobutadiene was not monitored because it was not discharged. This recommendation has been partially fulfilled.

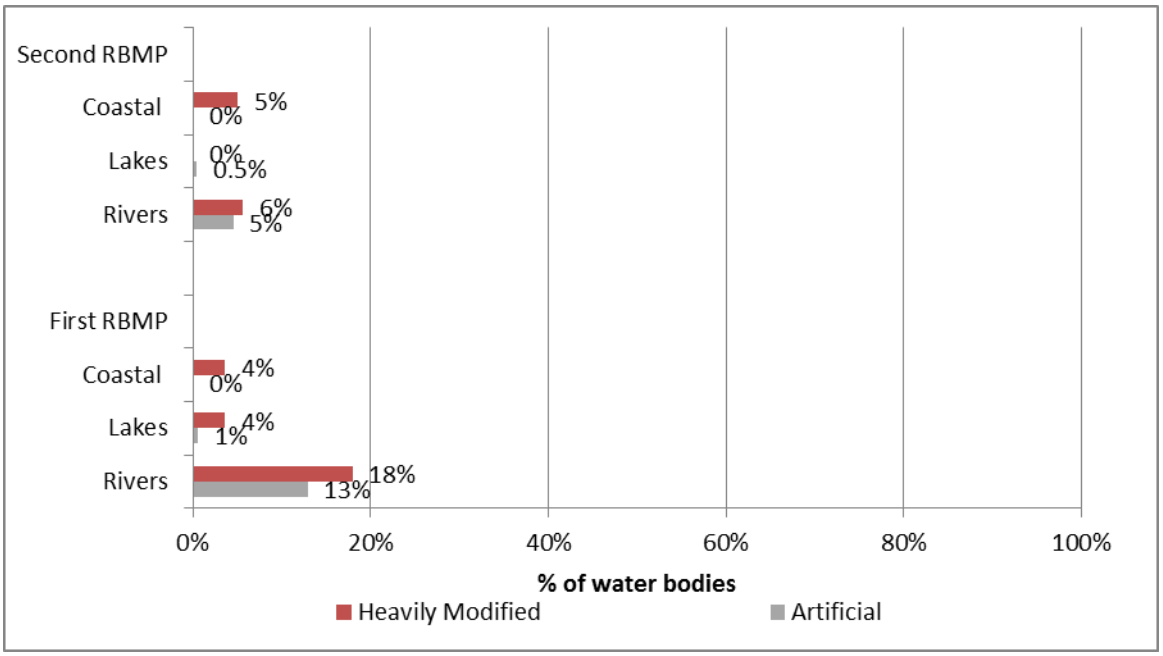
Topic7 Designation of Heavily Modified and Artificial Water Bodies and definition of Good ecological potential

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

7.1.1. Designation of Heavily Modified and Artificial Water Bodies

In the second RBMPs, 5.1 % of total surface water bodies are designated as heavily modified water bodies and 4.1 % as artificial water bodies. The WFD requires a review of designation every six years. Only minor reductions are noted in the length of river heavily modified water bodies and artificial water bodies between the two cycles and all lake heavily modified water bodies designated in the first cycle have been de-designated. Figure 7.1 shows the proportion of total water bodies in each category in Denmark that has been designated as heavily modified or artificial. Furthermore, no reservoirs were reported.

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



Source: WISE electronic reports

The water uses for which many river water bodies are designated as heavily modified were reported as unknown. Some of the river heavily modified water bodies are designated due to urban development, wider environment and other uses (not listed in WISE).

The main physical alterations of river heavily modified water bodies are channelisation/ straightening/bed stabilisation/bank reinforcement, weirs/dam/reservoirs, land drainage and other alterations (not listed in WISE). Coastal heavily modified water bodies are affected by dredging/channel maintenance and locks.

The criteria for the designation of artificial water bodies and heavily modified water bodies are given in the guidelines for the preparation of the second RBMPs, while the specific designations and the reasons are stated in MiljøGIS[76]. The guideline for the designation of artificial water bodies and heavily modified water bodies is based on the Common Implementation Strategy Guidance document No. 4[77], while it is noted that rules for designating artificial water bodies and heavily modified water bodies are to be found in the law 1606/2013.

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

Good ecological potential for rivers was reported as defined at water body level in all 4 RBDs. It is not defined in the Bornholm RBD, where only two river heavily modified water bodies are designated (<5 km out of total 370 km river stretches). In all four RBMPs it is noted that work on the delineation of rivers with catchments of less than 10 km^2 and the identification of rivers as artificial and heavily modified were to be continued during 2018 and 2019, as part of the *Food and Agriculture Package* (2015). As a result, the environmental goals could change for some rivers.

The approach reported for good ecological potential definition is the Common Implementation Strategy Guidance approach (approach based on biological quality elements as illustrated in Common Implementation Strategy Guidance No. 4). Also good ecological potential is reportedly defined in terms of biology. The biological quality element for which biological values have been derived to define maximum ecological potential and good ecological potential are phytoplantkton, angiosperms, macrophytes, benthic invertebrates and fish. A comparison between good ecological potential and good ecological status has been made in the RBDs where good ecological potential was reported as defined.

Biological quality element assessment methods sensitive to altered habitats due to morphological changes are only reported for rivers, and in specific for macrophytes, benthic invertebrates and fish.

[76] http://miljoegis.mim.dk/cbkort?profile=vandrammedirektiv2-2016
[77] https://circabc.europa.eu/sd/a/f9b057f4-4a91-46a3-b69a-e23b4cada8ef/Guidance%20No%204%20-%20heavily%20modified%20water%20bodies%20-%20HMWB%20(WG%202.2).pdf

Good ecological potential is determined according to the same principles as good ecological status and the starting point are the values of the water body (watercourse, lake or coastal water) to which the heavily modified water bodies are most similar.

Good ecological potential is determined individually for the biological quality elements depending on how much the biological effect will be due to the physical change and the hydromorphological effect. After having determined the closest comparable water body, the hydromorphological conditions/measures needed are determined, which are required to obtain the best possible physical and chemical conditions without significantly affecting the water use that caused the designation of the heavily modified water bodies.

The estimation of biological values of biological quality elements for assessing status in general (and not only maximum ecological potential and good ecological potential) is based on available data, monitoring and, in some cases, modelling.

Mitigation measures for defining good ecological potential have been reported in two RBDs (Jutland and Funen and Zealand). These include: bypass channels, reconnection of meander bends or side arms, removal of structures, restoration of modified bed structure and retention basins. No mitigation measures can be selected for the International (Vidå-Kruså) and Bornholm RBD, because mitigation measures have not been used for water bodies which have been defined as at good ecological potential in the RBD. It cannot be concluded, however, from the information found whether the existing level of mitigation is sufficient for achieving good ecological potential.[78]

The ecological changes expected due to the mitigation measures are described in a qualitative way and with reference to the effects of physical/hydromorphological measures in general (not only for heavily modified water bodies). The associated benefits are described in general terms as “improved conditions” of the water courses.

7.2. Main changes in implementation and compliance since the first cycle

The number of river heavily modified water bodies and artificial water bodies has substantially decreased from the first to the second RBMPs but only a minor reduction is noted in the length of river heavily modified water bodies and artificial water bodies between the two cycles. Changes are mainly due to the re-delineation of water bodies (adjustment in number of water bodies as some have been combined, which has resulted in fewer water bodies in general) as

[78] Danish authorities have clarified that it is expected that good ecological potential/status will be achieved in the river water bodies where these are implemented. Furthermore, it is expected that mitigation measures in the form of removal of barriers will result in good ecological status/potential in more river water bodies than the one where the mitigation measure has been implemented but the amount has not been quantified.

well as a new guidelines document for the designation of heavily modified water bodies developed since the first RBMPs. The guidelines do not explicitly explain modifications in the method, but it is noted that in order to clarify whether a water body can be designated as heavily modified water bodies, the first RBMPs (2009-2015) are to be used as basis.

All lake heavily modified water bodies designated in the first cycle have been de-designated in the second cycle. In the RBMP of Jutland and Funen, it is explained that lakes which were earlier designated as heavily modified water bodies or artificial water bodies are no longer designated, because it is estimated that the physical modification does not prevent the lakes from achieving good ecological status.

The RBMPs also note that further changes to the extent of designations may take place until the end of 2019, as a result of the *Food and Agriculture Package* (2015). A qualification of the delineation of water courses and a qualification of watercourses to be designated as artificial water bodies and heavily modified water bodies will take place. The water councils shall be involved in this work.

Concerning the definition of good ecological potential, the approach reported is the Common Implementation Strategy Guidance approach, whereas in the first RBMPs, it was indicated that the Prague approach was used. Certain improvements have been made since the first cycle, mainly related to the inclusion of more quality elements in the assessment (e.g. for rivers, beside macroinvertebrates, now also macrophytes and fish are included; for lakes, beside chlorophyll used in the first cycle, phytoplankton, macrophytes and fish have been added); however, this is an overall improvement in assessing status of all water bodies (including natural ones), not for the definition of good ecological potential in particular.

Mitigation measures for defining good ecological potential have been reported in two RBDs (Jutland and Funen and Zealand) in the second RBMPs, whereas in the first RBMPs, mitigation measures were not defined in any RBD.

7.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Denmark needs to ensure that the correct procedures to establish good ecological potential are carried out, and are clearly described in the RBMP. The mitigation measures methodology has been used to define good ecological potential, but it seems from the RBMPs that steps one and two have not been used, in spite of national guidance requiring this.*

Assessment: The method for defining good ecological potential was more clearly explained than in the first cycle. The approach used is the Common Implementation Strategy Guidance approach and not the Prague approach which was reported in the first RBMPs. Furthermore, improvements have been made since the first cycle, mainly related to the inclusion of more quality elements in the assessment. The mitigation measures for two out of four RBDs (Jutland and Funen and Zealand) have been defined, while for the International (Vidå-Kruså) RBD, no mitigation measures have been used for water bodies which have been defined as at good ecological potential in the district. It cannot be concluded, however, from the information found whether the existing level of mitigation is sufficient for achieving good ecological potential[79].

This recommendation has been partially fulfilled.

[79] However, the Danish authorities have clarified that it is considered that the existing level of mitigation is expected to be sufficient for achieving GEP.

Topic 8 Environmental objectives and exemptions

8.1. Assessment of implementation and compliance with WFD requirements in 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[80]), groundwaters (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 waters and quantitative and chemical status in groundwater have been reported in all RBDs, although for some water bodies the date for the achievement of the objectives is unknown[81].

Member States are also required to specify additional environmental objectives and standards in Protected Areas where these are required to ensure the requirements of the associated Directive are met. An assessment of such additional objectives for Denmark is provided in Chapter 15 of this report.

Assessments of the current status of surface and groundwater bodies in Denmark 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) and status of surface and groundwater bodies associated with Protected Areas (Chapter 15).

For the second RBMPs, 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 Denmark elsewhere in this report: for ecological status/potential of surface

[80] 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.

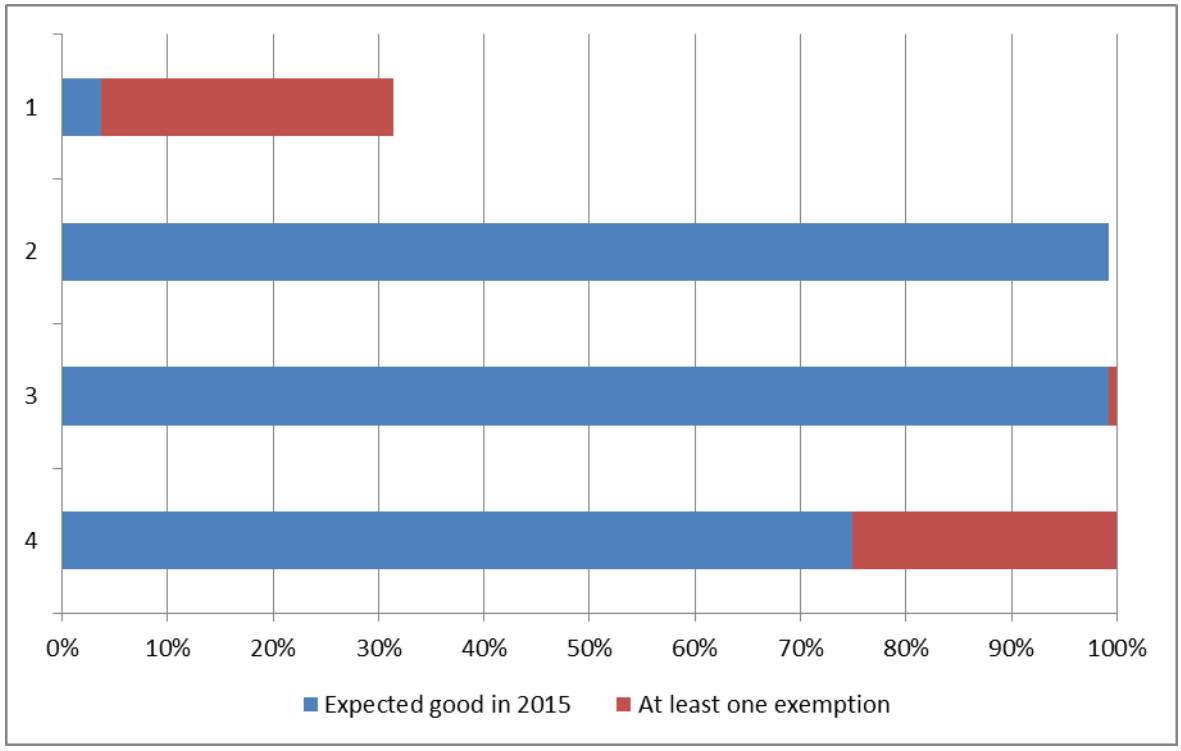
[81] This does not apply to groundwater. There are no groundwater bodies in any districts for which the date for achievement has not been specified. All groundwater bodies with unknown chemical status are expected to be in good status in 2015.

waters (Chapter 3); chemical status of surface waters (Chapter 4); quantitative status of groundwater bodies (Chapter 5) and 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 and the use of at least one exemption in Denmark for the four main sets of environmental objectives.

Figure 8.1 ***Water bodies in Denmark 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***



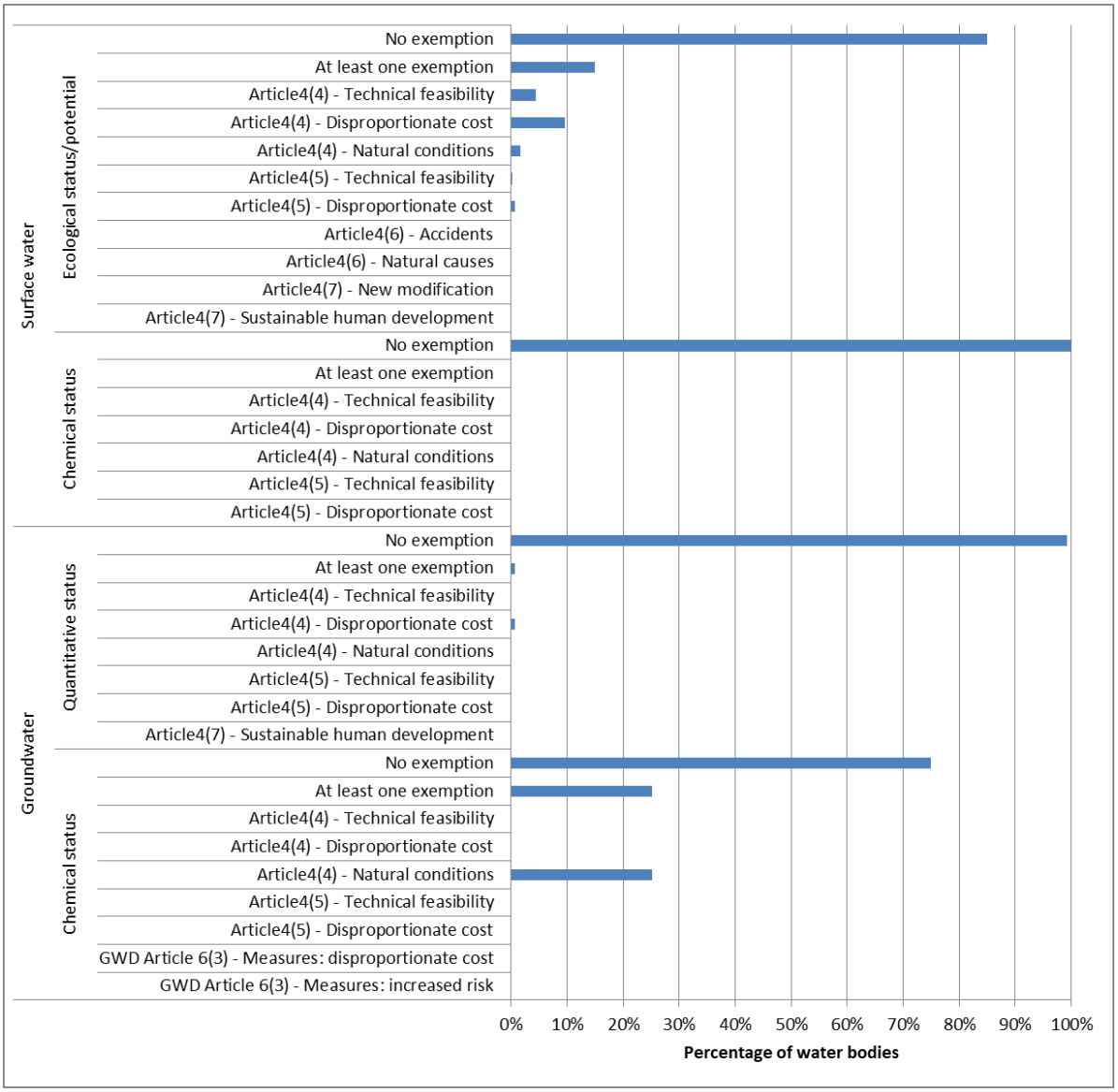
Source: WISE electronic reports. For some water bodies the date for achievement of good status is unknown.

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 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 objective in Denmark.

Figure 8.2 ***Type of exemptions applied to surface water and groundwater bodies for the second RBMP in Denmark. Note: Ecological status and groundwater quantitative status exemptions were reported at the water body level. Chemical exemptions for groundwater were reported at the level of each pollutant causing failure of good chemical status***



Source: WISE electronic reports.

Table 8.1 Pressure responsible for pollutants in Denmark 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) - Natural conditions	Article 4(4) - Technical feasibility	Article 4(5) - Technical feasibility
1.5 - Point - Contaminated sites or abandoned industrial sites	NR	NR	NR	NR
2.2 - Diffuse - Agricultural	NR	NR	NR	NR
2.7 - Diffuse - Atmospheric deposition	NR	NR	NR	NR
8 - Anthropogenic pressure - Unknown	NR	NR	NR	NR

2.NR = Not reported to WISE. No data was provided.

Application of Article 4(4)

Article 4(4) was applied in the first cycle and has also been applied in the second cycle. The justification in surface water is related, as previously, to technical feasibility, natural conditions and disproportionate costs. For groundwater, disproportionate costs and natural conditions were reported as being used as justifications. Technical feasibility refers to no information on the cause of the problem so the solution cannot be identified in all RBDs. Disproportionate costs are justified by Cost-Effectiveness Analysis.

Article 4(4) exemptions in Denmark are not reported to WISE at the pressure and driver level (Table 8.1). Impacts causing the exemptions are related to altered habitats due to morphological changes (includes connectivity) and nutrient pollution in all RBDs. Chemical pollution as an impact was reported in the Jutland and Funen, Bornholm and International (Vidå-Kruså) RBDs. Elevated temperatures are an issue in the Jutland and Funen RBD.

Application of Article 4(5)

Article 4(5) was not applied in the first RBMP but has been applied in the second for surface water. Article 4(5) was applied for 27 lakes in Jutland and Funen RBD and for eight lakes in Zealand RBD. There is a lack of reported methodologies on exemptions. Article 4(5) exemptions in Denmark are also not reported to WISE at the pressure and driver level (Table 8.1). The impacts reported are nutrient pollution.

Application of Article 4(6)

Article 4(6) has not been applied, though the Jutland and Funen RBMP does describe potential future use.

Application of Article 4(7)

Article 4(7) has not been applied, though the Jutland and Funen RBMP does describe potential future use.

Application of Article 6(3) GWD

No exemptions according to Article 6(3) of the Groundwater Directive[82] have been applied.

8.2. Main changes in implementation and compliance since first cycle

Article 4(5) was not applied in the first cycle but has been applied in the second cycle for surface waters.

8.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *A large number of exemptions have been applied in this first cycle of RBMPs. While the WFD does provide for exemptions, there are specific criteria that must be fulfilled for their use to be justified. The application of exemptions needs to be more transparent and the reasons for the exemptions should be clearly justified in the plans. Denmark 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 reasons for exemptions were reported at the water body level. Justifications for exemptions were reported in WISE. However, whether there are clear criteria that have been developed for the application of "technical unfeasibility", "disproportionate costs" and "natural conditions" cannot be assessed due to the lack of reported methodological documents for the application of exemptions in surface and groundwater bodies. The number of exemptions applied was reported to decrease. The recommendation is partially fulfilled[83].

[82] 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

[83] Denmark subsequently clarified that the methodologies for application of exemptions are described in "http://mst.dk/media/121345/retningslinjer-vandomraadeplaner-for-anden-planperiode.pdf", section 4.8. The document was published together with the RBMPs. Further the process for application of art. 4(7) is described in "http://mst.dk/media/133301/bilag-1-vejledning-4-juli-2017.pdf", section 7 and 8. The guidance document for the Program of Measures was published in July 2017.

- Recommendation: *Only little improvement in the water status is expected by 2015 and the objectives for subsequent planning deadlines are not always clear. Objectives should be clearly indicated and transparent in order to be able to reach good status of waters in a reasonable timeframe.*

  Assessment: It has been clearly stated at the water body level when objectives will be achieved (e.g. 2021, 2027, beyond). No information on 2021 is provided for groundwater. The recommendation is partially fulfilled[84].

- Recommendation: *Denmark has indicated there may be new physical modifications in forthcoming RBMPs, falling within the scope of Article 4(7). If this is the case, 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: No Article 4(7) exemptions were reported to be applied in Denmark - only the potential for future use in the Jutland and Funen RBMP. Therefore the fulfilment of this recommendation cannot be assessed.

[84] Denmark subsequently clarified that all groundwater bodies were expected to be in good chemical status in 2015, except for the ones that are identified to be in poor status, and where status is expected to be achieved not later than 2017.

Topic 9 Programme of measures

The aim of this chapter is to provide an overview of the Programme of Measures 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 Programme of Measures, which target the same pressure or purpose. The individual measures included in the Programme of Measure (being part of the RBMP) are grouped into Key Types of Measure for the purpose of reporting. The same individual measure can be part of more than 1 Key Type of Measure because it may be multi-purpose, but also because the Key Types of Measure are not completely independent silos. Key Types of Measure 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 Key Type of Measure may be 1 national measure but it would typically comprise more than 1 national measure. The 25 predefined Key Types of Measure are listed in the WFD Reporting Guidance 2016.

The Key Types of Measure 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 WFD requirements in second cycle

9.1.1. General issues

An indication as to whether or not measures have been fully implemented and made operational is when they have been reported as being planned to tackle significant pressures (at the Key Types of Measure level). Significant pressures are also reported at the water body level. It would therefore be expected that there would be measures planned in the RBMP to tackle all significant pressures. All listed significant pressures causing failure of objectives in groundwater and surface water in all four RBDs are covered by operational KTMs, except “Anthropogenic pressure – Unknown” in the International (Vidå-Kruså) RBD. Moreover, in all except the Bornholm RBD surface water, additional KTMs have been reported for significant pressures that have been reported as causing failure of objectives. All are for chemical

substances (including Priority Substances): for groundwater, a total of 11 in the Jutland and Funen RBD; 10 in the Zealand RBD, six in the Bornholm RBD and three in the International (Vidå-Kruså) RBD; and for surface water: six in the Jutland and Funen RBD, six in the Zealand RBD, and one in the International (Vidå-Kruså) RBD. It is not clear therefore if these are relevant or will be made operational in the future.

Examples of substances to be covered by these additional KTMs for groundwater are:

- Aluminium and its compounds,
- Lead and its compounds,
- Nickel and its compounds,
- Arsenic and its compounds,
- Cadmium and its compounds,
- Nitrate,
- Chloride,
- Sulphate,
- Other chemical parameter,
- BTEX etc.

Examples of substances to be covered by these additional KTMs for surface water are:

- Anthracene,
- Lead and its compounds,
- Mercury and its compounds,
- Nickel and its compounds,
- Brominated diphenylethers
- Total Benzo(g,h,i)-perylene + Indeno(1,2,3-cd)-pyrene,
- Benzo(a)pyrene,
- Di(2-ethylhexyl)phthalate (DEHP) etc.

No data has been reported on the number of national basic measures associated with reported KTMs, but a total of 18 national supplementary measures have been mapped against 8 predefined KTMs and one KTM defined by Denmark (Table 9.1).

Links to documents on Article 11(3)(c-k) basic measures are provided in WISE. The inventory of national basic measures provided in WISE lists supplementary measures only.

Whilst KTMs are listed as having been mapped against national measures for all four RBDs (including one KTM developed by Denmark for the Jutland and Funen RBD) (but no details provided to WISE for basic measures – see above), there is no information on KTMs tackling significant pressures. Denmark has subsequently clarified that basic measures are listed in Annex 4 of the RBMP.

No data has been reported for KTMs used to tackle River Basin Specific Pollutants causing failure of objectives (although operational KTMs for some chemical substances were reported in WISE, and significant pressures causing failure of objectives were listed in WISE).

No data has been reported for KTMs used to tackle Priority Substances causing failure of objectives (although operational KTMs for some Priority Substances were reported in WISE, and significant pressures causing failure of objectives were listed in WISE). Some explanation of this was provided by Denmark in their WISE reporting. Denmark subsequently clarified that Priority Substances are covered by the Programmes of Measures and newly identified Priority Substances will be covered by preliminary Programmes of Measures running from 2018-2021.

The pressures are listed for groundwater and surface water in all RBDs (very similar to those listed in WISE and gap analyses have been conducted for all (Table 9.2). In the RBMP specific targets have been laid out to specific measures (for instance wetlands, afforestation and watercourse restorations) to be executed within the period. Also this programme is specific to all surface water bodies in Denmark.

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. A combination of a qualitative and quantitative cost-effectiveness analysis has been carried out in all four RBDs for supporting the selection of measures proposed under the second cycle Programme of Measures. Cost-effectiveness analysis seems to have been carried out also in the first cycle as indicated in the Catalogue of measures, which included information on costs and effects of individual measures.

Links to several documents have been provided for each RBD.

A critical factor in the success of the implementation of the Programme of Measures is the availability of funding to support the investments required[85]. Denmark has both an

[85] Denmark subsequently reported that cost are estimated for all measures in the Programme of Measures in the RBMP

implementation plan concerning the second cycle and a finance plan addressing the different measures. For instance a precise funding is planned for the wetland scheme for all the years ahead in the second cycle.

Denmark reported that a clear financial commitment (e.g. approved budget or financial mechanism by the Parliament, Ministry of Finance or other financial responsible authority) was secured for the implementation of the Programme of Measures in all four RBDs. This includes the sector Agriculture in all four RBDs, and Aquaculture in the Jutland and Funen RBD only. Other sectors such as industry, urban, transport, hydropower, energy, recreation and flood protection have been reported not relevant in any of the RBDs. Aquaculture was reported not to be relevant in the Zealand, Bornholm and International (Vidå-Kruså) RBDs.

There was no joint consultation carried out on the RBMPs and Marine Strategy in Denmark, but the preparation of RBMP and Programme of Measures have been co-ordinated with the implementation of the Marine Strategy Framework Directive[86] in all four RBDs. 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 objective in coastal and marine environments has been considered in all four RBDs, but it was concluded that no additional measures were required.

National measures relevant to the Marine Strategy Framework Directive have been reported as KTM 1 – "Construction or upgrades of wastewater treatment plants", KTM 2 – "Reduce nutrient pollution from agriculture", KTM 23 – "Natural water retention measures" in the Jutland and Funen, Zealand and International (Vidå-Kruså) RBDs; and KTM 2 - "Reduce nutrient pollution from agriculture" in the Bornholm RBD only. All are indicated as "Supplementary measures" but only KTM 2 seems to have measures specifically reported as relevant to the Marine Strategy Framework Directive (all others indicated as zero number of measures).

Links or references to documents are labelled "not applicable" for all four RBDs.

Denmark carried out a joint consultation of its RBMPs and the Floods Directive Flood Risk Management Plans. In the electronic reporting to WISE Denmark has reported that the objectives and requirements of the Floods Directive have not been considered in the second RBMP and Programme of Measures. However, Denmark reported that specific 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 been included in the

[86] 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

Programme of Measures. The design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, have been adapted to take into account WFD environmental objectives. Clear financial commitment has been reported as "not applicable" in all RBDs in Denmark. WFD Article 9(4) has not been applied to impoundment for flood protection.

Links to the same document (RBMP for Jutland and Funen) have been provided for all RBDs.

9.1.2. Measures related to other significant pressures

No information has been reported electronically to WISE in relation to "other significant pressures"[87].

9.1.3. Mapping of national measures to Key Types of Measure

It was expected that Member States would be able to report their Programme of Measures by associating their national measures with predefined KTMs. KTMs 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 Key Types of Measure in Denmark. Also shown is the number of RBDs for which the KTM has been reported.

Table 9.1 Mapping of the types of national measures to KTMs in Denmark

KTM	National basic measures	National supplementary measures	Number of RBDs where reported
KTM1 - Construction or upgrades of wastewater treatment plants	NR	1	3
KTM10 - Water pricing policy measures for the implementation of the recovery of cost of water services from industry	NR	1	4
KTM13 - Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc)	NR	1	4
KTM14 - Research, improvement of knowledge base reducing uncertainty	NR	1	4

[87] Denmark subsequently clarified that information is available in the RBMPs on other significant pressures. However, these documents have also not been included in the electronic reporting.

KTM	National basic measures	National supplementary measures	Number of RBDs where reported
KTM2 - Reduce nutrient pollution from agriculture	NR	6	4
KTM23 - Natural water retention measures	NR	1	3
KTM5 - Improving longitudinal continuity (e.g. establishing fish passes, demolishing old dams)	NR	3	4
KTM6 - Improving hydromorphological conditions of water bodies other than longitudinal continuity	NR	3	4
KTM99 - Other KTM reported under Programme of Measures - Ocher plant	NR	1	2
Total number of mapped measures	**NR**	**18**	**4**

Source: Member States reports to WISE
NR = Not reported to WISE. No data was provided.

9.1.4. Pressures for which gaps to be filled to achieve WFD objectives have been reported 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 WFD environmental objectives in terms of all significant pressures on surface waters and groundwaters, 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. Denmark did not report this information in WISE; but subsequently clarified that some information is included in the RBMPs.

Member States were also 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.

Denmark reported Key Types of Measures, but indicators of the gaps and of the key types of measures, and thereby values for the indicators, have not been reported in WISE. Denmark has

not been able to fill in the used methodology in the reporting schema. However, the four RBMPs provide apportionment of significant pressures and gap analysis for all media.

This information was reported at sub-unit level, or at RBDs level if sub-units have not been reported by the Member State, as it has been the case in Denmark.

9.2. Main changes in implementation and compliance since first cycle

There is a shortage of meaningful information so it is not possible to judge whether any progress has been made, other than the indication that “some measures have been completed”; in particular, no gap analyses have been reported.

No summary of progress has been provided in the RBMPs, but major national political decisions have clearly influenced the development of the RBMPs in fundamental ways as described below.

On 22 December 2015 the Danish Parliament signed an agreement on a Food & Agriculture Package which led to a further adjustment of the RBMPs in relation to the proposals that were under public consultation. The agreement included limitations on nitrogen regulations, i.e. the abolition of the 10 metre wide buffer zones, cancellation of the planned additional (required) 60 000 hectares for cash crops, phasing out of restrictive fertiliser standards (with respect to nitrogen usage), adjustment of the ban on tillage, and a future aquaculture growth plan. Altogether, this necessitated the need to recalculate the measures required to reduce the nitrogen losses in the RBMPs. The Food & Agricultural package, including the consolidation of nitrogen calculations, has led to an adjustment of the effort required and the action program for coastal waters (a national series of plans overlapping with the RBMPs); as well as revised application of exemptions. Overall, the consolidation means that the net reduction of nitrogen losses in 2021 has been recalculated to become approx. 13 100 tonnes of nitrogen annually, of which 6 200 tonnes have been postponed to the third planning cycle, although already a provision in the draft RBMPs. The consolidation of nitrogen calculations was based on the work of the inter-ministerial 'Nitrogen Committee' set up by the former government. The consolidation is described in more detail in the technical note on the nitrogen committee's corrections, which can be found on the website of the Ministry of Environment and Food. The agreement will also result in a further adjustment of the delineation of river water bodies and the re-designation of the water courses in 2018/2019.

Denmark subsequently clarified that the Food & Agricultural Package further presented a number of measures to reduce the leaching of nitrogen from the farmland. This includes a targeted catch crop scheme in 2017 and 2018. The targeted catch crop scheme ensures non-deterioration, while still implementing the Food & Agriculture Package. In 2019 a targeted

regulation scheme will be phased in. The scheme will ensure a gradual improvement and will by 2021 deliver a reduction of 3.500 tons nitrogen to coastal waters also meaning a reduced load of nitrogen to groundwater. Further collective measures such as wetlands or afforestation will be introduced towards 2021 and is expected to ensure a reduction of 3.500 tons nitrogen to coastal waters (also impacting groundwater).

The measures presented above are also included in the Danish River Basin Management Plans.

The prioritisation of measures focuses on the sectors (i) contributing most to pressure and impacts, (ii) where legal mechanisms and enforcement are available, (iii) where measures were considered as being most cost effective, (iv) where measures are known from past experience to reduce pressures/improve status, and (v) on sectors that have traditionally been regulated and subject to improvement measures. In practice, this means that the highest priority is given to the agricultural sector and in particular to nitrogen reductions (but see changes outlined above).

9.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and first Programme of Measures requested action on the following:

- Recommendation: *Meaningful information regarding the scope, the timing and the funding of the measures should be included in the Programme of Measures so that the approach to achieve the objectives is clear. All the relevant information on basic and supplementary measures should be included in the summary of the Programme of Measures to ensure transparency on the planned actions for the achievement of the environmental objectives set out in the WFD.*

  Assessment: No information was found initially to suggest this had been done, in particular no gap analyses have been reported. However, the Danish RBMPs were very precise with regards to the proposed number of various measures targeting the different types of water bodies. As an example, the RBMP for Zeeland (Sjælland) specifies that 310 km of rivers will be improved through a series of measures, 31 barriers are to be removed, and 96 sand traps will be established, for a total cost of DKK 73 million. Similarly for other types of water bodies and/or sectors, the scope, funding of the measures, and the targeting of measures to achieve WFD objectives was outlined. The timing however was not specifically described, except that it will take place during the forthcoming 6-year cycle. This recommendation has been partially fulfilled.

Topic 10 Measures related to abstractions and water scarcity

10.1. Assessment of implementation and compliance with the 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 pressures were reported as relevant for Denmark; however a low proportion of groundwater bodies faces water quantity-related problems for achieving good quantitative status of groundwater bodies (2.2 % in the Zealand RBD). This is consistent with the information reported in the first cycle. The Water Exploitation Index + is not calculated, but 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 include a water resource allocation and management plan in all RBDs.

10.1.2. Main uses for water consumption

Data have not been reported for the uses of water consumption, except for those groundwater bodies where quantitative pressure is significant. Water abstraction information has previously been reported to support the European State of the Environment Report in relation to Water Quantity for the RBDs where water quantitative pressures are significant.

10.1.3. Measures related to abstractions and water scarcity

Regarding basic measures (Article 11(3)(e)), in Denmark there is a concession, authorisation and/or permitting regime to control surface and groundwater abstractions and water impoundment; and a register of impoundments exists in all RBDs. Small abstractions require permits and are registered.

Measures on Article 11(3)(c) for efficient and sustainable water use have not been implemented in the previous cycle, and no new measures and/or significant changes are planned for the period of the second cycle.

Measures for the prior authorisation of artificial recharge or augmentation of groundwater bodies (Article 11(3)(f)) have not been implemented in the previous cycle, and no new measures and/or significant changes are planned for the period of the second cycle.

Complementary measures under KTMs for addressing abstraction pressures have not been reported. In general, information is not available in Denmark to report into WISE on the KTMs made operational to tackle significant 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 Programme of Measures for this topic.

Topic 11 Measures related to pollution from agriculture

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

Pressures related to agriculture were clearly identified for surface water and groundwater. Nutrient pollution from diffuse sources is impacting water quality in surface water in all RBDs. Nitrates are reported as a pressure to groundwater, since when conducting the classification of chemical status, nitrates are one of the pressures causing poor chemical status in groundwater bodies. Chemical pollution was reported in the Jutland, Funen and Zealand RBDs. The RBMP has estimated the need for reduction of nitrogen to coastal waters and phosphorus to lakes. The Programme of Measures has measures to reduce the diffuse load of nitrogen to coastal waters and include wetlands, mini wetlands, forestation and targeted nitrogen regulation of agriculture

An assessment of the gap to the achievement of WFD environmental objectives for nutrients has partly been undertaken in all RBDs. In the RBMPs gap analyses are made for coastal waters (nitrogen) and lakes (phosphorus).

KTM 2 – Reduce nutrient pollution from agriculture (supplementary), KTM 13 – Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc.) (supplementary) and KTM 23 – Natural water retention measures (supplementary) are applied in all RBDs.

Mandatory safeguard zones for groundwater have been established and relevant measures have been introduced. This is a mandatory requirement and follows from the Water Supply Act. Each safeguard zone is provided in the MiljøGIS. The basic protection of groundwater resources - and thus drinking water resources - is based on the general environmental regulation in the form of national nitrates action programme and pesticide action plans, national authorisation schemes for the use of pesticides, general harmonised requirements for the spreading of manure, regulation of fertilizer application, rules on establishment of catch crops etc. In addition, the specific regulation in the form of authorisation and approval schemes for a number of activities within each safeguard zone complements this.

The targeted protection efforts for the protection of groundwater in areas with special drinking water interests are carried out through the municipal action plans, in line with the Water Supply Act.

With the parliamentary agreement on Green Growth, 25 meters of protection zones are also laid out around all boreholes for general water supply plants within which there is no cultivation, use of plant protection products or fertiliser. This is implemented by section 21b of the Environmental Protection Act.

Furthermore, the Government and a supporting party in parliament signed an agreement in the Parliament on a *Food and Agriculture Package* on 22 December 2015. This led to an adjustment of the RBMPs in relation to the proposals that were under consultation. The agreement included limitation of nitrogen regulation in the form of abolition of mandatory nine-metre buffer zones, cancellation of the planned additional 60,000 hectare catch crops, adjustment of restrictive fertiliser standards to the level of economical optimum and adjustment of no-tillage regulation. Instead, the package suggested that several of these (earlier) measures enforced through regulation, in the future should be addressed through voluntary measures generally with economic support partially from the Rural Development Programmes and partially nationally funded. The agreement includes a diverse package of measures, initiating a shift in the way environmental regulation of the agricultural sector is carried out: from a general regulation to a more targeted approach.

Implementation of basic measures Article 11(3)(h) for the control of diffuse pollution from agriculture at source are applied with the same rules across the whole RBD. General binding rules to control diffuse pollution from agriculture are applied to nitrates, pesticides and phosphorus.

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

Financing of agricultural measures is secured in all RBDs.

11.2. Main changes in implementation and compliance since first cycle

The introduction by the Danish Government of the Food and Agriculture Package in 2015 has resulted in significant changes regarding the regulation of agriculture with regard to water quality protection. The package contains changes to nitrogen regulation including abolition of mandatory buffer zones along water courses, cancellation of the planned additional 60.000 ha of catch crops, replacement of the previously reduced fertilising limits with new limits that are adjusted to the level of economic optimum and consequently less stringent, and changes to the no-tillage regulation. The package seeks to replace many of the mandatory measures with voluntary measures generally with economic support partially from the Rural Development

Programmes and partially nationally funded. The overall thrust of the package is to move from a general regulation to a more targeted approach.

11.3. Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and Programme of Measures for this topic.

Topic 12 Measures related to pollution from sectors other than agriculture

12.1. Assessment of implementation and compliance with WFD requirements in 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.

KTMs relevant to non-agricultural sources of pressures causing failure of WFD objectives have not been reported in the context of those pressures for any RBDs in Denmark, even though Denmark states that certain basic measures under WFD Article 11(3) are in place that will address chemical pollution.

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 chapter 9 in this report).

Denmark reported implementation of KTM1 (on “Construction or upgrades of wastewater treatment plants”) and KTM13 ("Drinking water protection measures), but not specifically in relation to tackling non-agricultural sources of pressures. Denmark provided some information on basic measures required under Article 11(3)(c to k). Use of an authorisation and/or permitting regime to control waste water point source discharges (corresponding to basic measures under Article 11(3)(g)) was reported for all Danish RBDs for surface and groundwater. A register of waste water discharges (also corresponding to basic measures under Article 11(3)(g)) is available in all RBDs in Denmark for surface and groundwater. There are no thresholds in Denmark below which waste water discharges do not require permits and are not subject to registration. Direct discharges to groundwater are prohibited in all RBDs.

Although Denmark has not reported measures specific to eliminating/reducing pollution from Priority Substances and other substances, it expects some of the basic measures it has reported

to contribute to this, including measures to limit emissions, discharges and losses from point and diffuse sources.

In particular, the RBMPs include comprehensive Programmes of Measures addressing point sources in order to improve water quality in rivers and lakes. The Programmes of Measures include reduced discharges from dense settlements, improvement of small wastewater treatment plants and reduced stormwater overflow. The total cost of the programme is two billion DKK.[88] However, there is no assessment of how effective these measures will be at improving the chemical status of water bodies.

12.2. Main changes in implementation and compliance since first cycle

In the first RBMPs, Priority Substances and other hazardous substances were mentioned, but the description was mainly general and no inventories regarding specific substances were provided. The only substance-specific measures that were included in the first RBMP were further investigations and general permitting regimes.

In the second RBMP, some Priority Substances are listed as significant pressures, but without specific KTMs to address them, although several KTMs are reported as being in place in each RBD, and some, in particular KTM1 and KTM13, are relevant to protection from chemical pollutants.

For three of the four RBMPs (Jutland and Funen, Zealand and International (Vidå-Kruså)), information on Priority Substances in surface waters is provided in WISE. The RBMPs indicate that the measurements have mainly been performed in water; data from sediments and biota are few. Measures in relation to Priority Substances and River Basin Specific Pollutants are described in a broad manner, they are not substance specific. The RBMPs are written in a similar manner, there are no differences between them in structure or content.

For groundwater, information on status is provided on single pollutants (pesticides, nitrate, arsenic, lead, cadmium, chlorine, mercury, nickel, sulphate, chlorinated solvents and BTEX), but no measures relating specifically to them are mentioned. Measures are listed under basic measures for some of these pollutants (e.g. pesticides and nitrates) and others are provided in a general manner.

[88] Denmark provided additional information stating that according to the RBMPs and Executive Order on programmes of measures (bekendtgørelse nr. 1521 af 15/12/17/), section 9, relevant environmental authorities must, within their area, investigate sources of pollutants that prevent the achievement of environmental objectives. If necessary, the relevant authorities, if authorised in the sectoral act concerned, must review notified approvals and permits to comply with applicable environmental quality requirements. Projects are also being launched to obtain further knowledge of pollutants in the aquatic environment.

12.3. Progress with Commission recommendations

The Commission made one recommendation based on the first RBMPs and Programmes of Measures specific to this topic, as follows:

- Recommendation: *The identification of river basin specific pollutants needs to be more transparent, with clear information on how pollutants were selected, how and where they were monitored, 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 combating chemical pollution from river basin specific pollutants and that adequate measures are put in place.***

  Assessment: Although some measures reported by Denmark are relevant to tackling chemical pressures, no substance-specific information on measures is provided, and no indication is given of the likely success of the measures. Moreover, Denmark has not yet identified all the relevant chemical pressures in all RBDs. In that respect, the approach presented cannot be considered to fully address the recommendation.

Topic 13 Measures related to hydromorphology

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

Significant hydromorphological pressures are identified only for rivers in the four RBDs of Denmark. None of the significant hydromorphological pressures (physical alterations and barriers, locks) are assigned to any of the specified sectors according to WISE (instead the sector was reported as "other"). However, in the analysis for the second RBMPs, the most significant physical pressures such as pipelines in watercourses/rivers, barriers, ports and locks have been mapped. It is also noted that there may be barriers which have not yet been registered.

Whilst KTMs relevant to hydromorphological pressures (e.g. KTM5, KTM6) are listed as having been mapped against national measures for all four RBDs, information is not available in Denmark on the KTMs tackling specific significant pressures.[89] In addition, there is no information available on the indicator gap to be filled for significant hydromorphological pressures by 2021 or 2027. However, it was reported that quantitative management objectives in terms of restoring river continuity have been set in all four RBDs.

Nevertheless, based on information from the published RBMPs, it is evident that hydromorphological measures (both supplementary and basic) are planned in the second cycle. These measures focus on the restoration of streams, including opening of pipelines and removing barriers. In addition, there are measures planned against ochre (ochre settles in streams as a rusty layer on the bottom and aquatic vegetation).

On a national level, it is estimated that approximately 6 525 km of rivers/streams out of approximately 19 000 km covered by the planning are not in good status due to poor physical conditions, including the assumption that physical measures from the first RBMPs (completed or under realisation) have the expected effect. Based on this, it has been decided that there should be a significant improvement in physical measures in the second RBMPs. The second cycle Programme of Measures is based on the efforts that emerged from the draft second RBMPs and the continuation of a number of unfinished efforts from the first planning period. It is expected that efforts will overall improve the condition of up to 3 575 km of rivers/streams in this second cycle.

[89] Denmark subsequently informed that, while this was not reported in WISE, relevant supplementary measures and basic measures are reported on in the programme of measures and the RBMP.

In terms of basic measures to tackle hydromorphological pressures, there is an authorisation and/or permitting regime in place to control physical modifications in all RBDs, which covers changes to the riparian area of water bodies according to WFD[90] 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 and Floods Directive[91], drought management and use of Natural Water Retention Measures (NWRM) have been reported as included in the Programme of Measures of all RBDs. The design of new and existing structural measures, such as flood defences, storage dams and tidal barriers, was also reported to have been adapted to take into account WFD objectives in all RBDs.

Ecological flows have been derived partly, i.e. for some relevant water bodies, in the 4 RBDs but the work is still on-going. Concerning implementation, ecological flows which have been derived have not been implemented but there are plans to do so during the second RBMP.

Related to the achievement of ecological flows in the RBMPs (section 4.5, on groundwater), a brief description on how water abstraction is connected to ecological flows was provided with further reference to technical reports. It is noted that environmental objectives for rivers could be assessed by using a new approach provided in a study (GEUS report 2014/74) that has assessed the effects of groundwater abstractions on the ecological state of watercourses using modelling and links biological quality elements to flow. New ecological flow hydrological regime indicators for fish, macrophytes and plants are described in that technical report. Overall, work on making the new methodology operational is still on-going.

13.2. Main changes in implementation and compliance since first cycle

The RBMPs do not directly report on progress made in terms of hydromorphological measures planned since the first cycle, but it is stated that measures proposed in the first cycle will be continued into the second cycle and that measures that emerged from the draft second RBMPs will be added, as described in the previous section.

13.3. Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

[90] 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

[91] 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

- Recommendation: *Denmark needs to ensure that hydromorphological measures are implemented where relevant, in the first RBMP period.*

  Assessment: The RBMPs do not directly report on progress made in terms of hydromorphological measures planned since the first cycle, but it is stated that measures proposed in the first cycle will be continued into the second cycle. Overall, it has been decided that there should be a significant improvement in physical measures in the second RBMPs. The second cycle of Programme of Measures are based on the efforts that emerged from the draft second RBMPs and the continuation of a number of unfinished efforts from the first planning period. It is expected that efforts will overall improve the condition of up to 3 575 km of rivers/streams (which amounts to approximately half of the river km which are not in good status due to poor physical conditions).

  At the same time, ecological flows have been derived only partly and not implemented yet in any RBD. Work on making the new methodology on ecological flows operational is still on-going.

  Therefore, this recommendation is considered to be partially fulfilled.

Topic 14 Economic analysis and water pricing policies

14.1. Assessment of implementation and compliance with the 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, covering drinking water abstraction, treatment and distribution as well as sewage collection and wastewater treatment. Self-services are not included.

It was reported that Article 9(4) is not used.

The contributions of different water services to the cost recovery were not described in WISE.

However, KTM10 - Water pricing policy measures for the implementation of the recovery of cost of water services from industry has been reported to WISE. However, information is available in the economic analysis according to article 5 for the first and second RBMP.

Agriculture pays all construction and operational cost for the abstraction of groundwater (primarily for irrigation). Costs for irrigation are described in the economic analysis. Costs related to the permit for abstraction are also covered by farmers.

The reporting in WISE does not describe how water-pricing policies provide adequate incentives for users to use water resources efficiently, but volumetric charging is in place for households, public actors and economic enterprises connected to the public water supply. However in the economic analysis it is stated that the cost for water services in Denmark are among the highest in Europe, which is a strong incentive for reduction of water use and for improved wastewater treatment. Other than that, there is a tax on conductive water and a tax on emissions of organic substances from wastewater treatment plants. The tax on piped water finances the national groundwater exploration. As part of the tax on piped water there is a tax on water loss in the pipes of more than 10 percent.

No calculations of environmental and resource costs were done for the two identified water services, but in the economic analysis it is stated that revenues exceed the financial costs.

The economic analysis was updated in 2014[92].

[92] https://mst.dk/media/118755/bilag-3-oekonomisk-analyse-vandplaner-ifro-20-12-2013-final.pdf

14.2.Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *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. Cost recovery should be transparently presented for all relevant user sectors, and environment and resource costs shall 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, covering drinking water abstraction, treatment and distribution as well as sewage collection and wastewater treatment. Self-services are not included. It was reported that Article 9(4) is not used.

  The contributions of different water uses and their adequacy - at least for households, industry and agriculture - are not described, but it was reported that households and industry benefit from both water services and contribute to cost recovery.

  Agricultural contributions to cost recovery are not reported (on WISE, this is indicated as "not applicable"); But financial costs for self-abstraction of groundwater for irrigation is paid fully by the user and there is full cost recovery for farmers using public water supply.

  In the economic analysis it is described how water-pricing policies provide incentives for users to use water resources efficiently for water services, and volumetric charging is in place for households, public actors and economic enterprises connected to the public water supply. User charges include users' direct payment for the water supply/wastewater treatment provided, and of green taxes on water supply and discharge of wastewater. Regarding the integration of environmental and resource costs in the costs recovered, it is mentioned that environmental charges exist; however, it was reported in WISE that no calculations of environmental and resource costs were done for the two water services defined.

The Polluter Pays Principle has been taken into account as stated in the economic analysis in the recovery of the costs of water services for the two defined water services and with an admitted need to perform further analysis. For both the Polluter Pays Principle and the environmental and resource costs, the green tax is stated to be applicable, but without providing details.

Summarising, there is only limited progress in terms of the recommendation (some very limited additional information on water users), but significant gaps remain (e.g. the environmental and resource costs,).

Topic 15 Considerations specific to Protected Areas (identification, monitoring, objectives and measures)

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

Denmark identified Protected Areas of all types (except nitrate vulnerable zones designated under the Nitrates Directive and sensitive areas under the Urban Waste Water Treatment Directive in line with their whole territory approach to the implementation of these Directives) associated with surface and groundwater in the second RBMPs.

Table 15.1 Number of Protected Areas of all types in all RBDs in Denmark, associated with surface water categories and groundwater

Protected Area type	Number of Protected Areas Associated with[93]				
	Rivers	Lakes	Transitional	Coastal	Groundwater
Abstraction of water intended for human consumption under Article 7					402
Recreational waters, including areas designated as bathing waters under Directive 76/160/EEC [94]		106		933	
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) [95]	91	77	14	66	
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) [96]	173	98	39	107	
Areas designated for the protection of economically significant aquatic species			13	95	

Source: Member States reports to WISE

An overview of the status assessment of all water bodies associated with Protected Areas is shown in Figure 15.1.

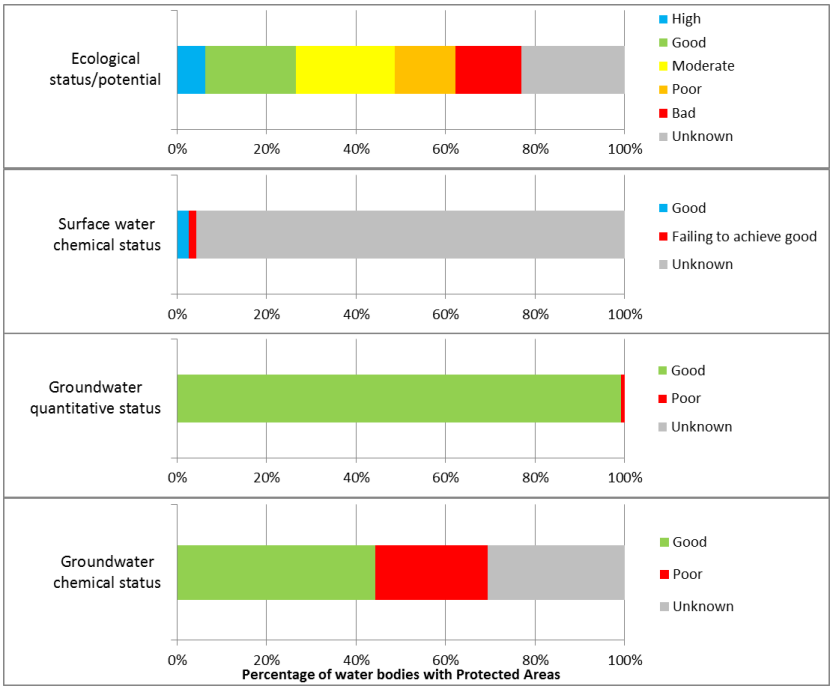
[93] Denmark subsequently informed the Commission that the reported information in WISE was not accurate. This table reflects the updated/corrected data

[94] 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

[95] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

[96] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

Figure 15.1 ***Status of water bodies associated with the Protected Areas report for Denmark. NB - based on status/potential aggregated for all water bodies associated with all Protected Areas.***



Source: WISE electronic reporting

A high proportion of the classifications of ecological status have been assigned high confidence with classification based on the monitoring of biological quality elements and with some use of grouping. The status assessment for chemical status in surface and groundwater states that the assessment is made with either medium or low confidence and, for around 30 % of groundwaterbodies and more than 95 % of surface water bodies, no information is available.

According to the WISE reporting, no additional objectives have been set for Protected Areas designated under Article 7 of the WFD for groundwater. In the RBMPs, additional objectives for groundwater bodies used for public water supply are described in the form of specific threshold values for certain River Basin Specific Pollutants (chloride, sulphate, aluminium, arsenic) and Priority Substances (Pb, Cd, Ni, trichloroethylene and tetrachloroethylene) that are based on quality criteria in the Drinking Water Directive, that has been transposed to Danish law in 2014 (bekendtgørelse nr. 292 af 26. marts 2014).

To enable the achievement of these additional objectives, there are also additional regulations given in action plans and permits for the use of pesticides, as well as harmonised requirements for the spreading of manure. Additional regulations for permits for a variety of human activities are also applied to prevent deterioration of groundwater bodies used for drinking water. There are also safeguard zones of 25 metres around groundwater wells used for public

water supply, where agriculture, pesticides and fertilization are not allowed, according to Article 21 in the Danish Environmental Protection Act. If chloride thresholds are exceeded, this indicates over-abstraction and salt water intrusion and will initiate measures to reduce abstraction. The need for supplementary measures to achieve the objectives will be further investigated towards the 3rd RBMP, including improved mapping of the groundwater bodies and their needs for protection, especially measures that may be needed to prevent deterioration of the chemical status of groundwater concerning nitrate, which could potentially be a problem after the implementation of the Food and Agriculture Package in 2015, allowing more fertilization with nitrogen.[97]

For the surface water Protected Areas related to the Birds and the Habitat Directives, information reported to WISE indicated that good ecological status is sufficient to fulfil the requirements in the parent directives regarding water quality. Consequently, no information on additional measures to meet such objectives was reported in WISE. However, the RBMPs indicate that measures to reduce run-off from polluted soils will be implemented, but they will only be taken in the third RBMP cycle, because there will be a screening done before 2019 to evaluate where such soil pollution is significant in terms of impacting flora and fauna. The second RBMPs include substantial measures on the reduction of nutrient loads and improvement of physical conditions, which are expected to contribute substantially towards obtaining the favourable conservation objective. This recognition for likely future measures implies that it is not likely that the achievement of other WFD objectives will be sufficient to reach the objectives for Protected Areas subject to the further screening and mapping process foreseen before the third RBMPs.

For Protected Areas designated for economically significant species (shellfish), microbiological standards have been set to protect shellfish which are different to those in the repealed Shellfish Directive[98]. These objectives have been met for 50 % of the shellfish Protected Areas in DK1, for 27 % in DK2 and for 50 % in DK4. For DK3 there is no info.

For surface water areas, only monitoring sites related to Habitats Directive related Protected Areas have been reported; none for those related to the Birds Directive, Bathing Water Directive or to shellfish production.

Denmark subsequently informed the Commission that the majority of Habitats Directive Protected Areas are also protected under the Birds Directive so monitoring of these areas

[97] Denmark subsequently informed the Commission that measures have been introduced to compensate for this potential deterioration of the status of groundwater regarding nitrate concentration: particularly the targeted catch crop scheme in 2017 and 2018 is aiming at securing a non-deterioration of groundwater following the decisions in the Food and Agricultural Package.

[98] Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (codified version) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2006.376.01.0014.01.ENG

covers both directives. Birds are covered by an extensive monitoring as part of the National Natura 2000 monitoring scheme which is not reported in WISE[99].

For groundwater bodies, only monitoring sites related to drinking waters have been reported (Table 15.2). For those Protected Area types reported, the monitoring, in terms of the number of monitoring sites compared to the number of Protected Areas looks adequate for Article 7 areas in groundwater. However, for Habitats related areas, monitoring only appears to cover lakes and coastal waters (and not lakes and territorial waters) with low numbers of monitoring sites.

Table 15.2 Number of monitoring sites associated with Protected Areas in Denmark

Protected Area type	Number of monitoring sites associated with Protected Areas in				
	Rivers	Lakes	Coastal	Territorial	Groundwater
Abstraction of water intended for human consumption under Article 7					7084
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)		410	21		

Source: WISE electronic reporting

As expected, no exemptions from additional objectives are applied in the Danish RBMPs for either surface water or groundwater areas because no such objectives have been set.

15.2.Main changes in implementation and compliance since the first cycle

In the first cycle Protected Areas associated with Article 7 (groundwater), Birds, Habitats and shellfish production were reported. In the second cycle, these Protected Areas are supplemented with those associated with the Bathing Waters Directive. In terms of the numbers of Protected Areas reported, comparable numbers of Article 7 (groundwater) and shellfish production areas and many more Birds and Habitats areas were reported in the second cycle.

In the first cycle, monitoring was reported for all of the reported types of Protected Areas plus a programme for Bathing Waters. In the second cycle, the information reported to WISE is

[99] Denmark subsequently clarified that but this was reported through the Reference portal for reporting under Article 12 of the Birds directive and Article 17 of the Habitats Directive.

restricted only to Article 7 (groundwater) and Habitats areas in surface waters[100]. This leads to an apparent significant decrease in the extent of Protected Area monitoring in the second cycle.

With regard to additional objectives, for Natura 2000 (i.e. Birds and Habitats), the high ecological status objectives were reported to have been used as the appropriate WFD objective for these sites in the first cycle. It is unclear whether the high or good status WFD objective is being used. Denmark subsequently clarified that no specific water objectives have been set to protect dependent habitats and species because the achievement of WFD good status is sufficient to achieve favourable conservation status.

No information is provided for groundwater dependent protected areas. In both cycles, the need for a site-by-site favourable condition assessment is indicated as being required but has yet to be implemented. More clarity on the additional objectives for shellfish production areas has been provided in the second cycle compared to the first cycle.

Some additional measures were indicated (though not specified in detail) for Protected Areas associated with the Bathing Waters, Habitats and Birds Directive, and for shellfish production areas in the first cycle. WISE reporting for the second cycle indicates no additional measures though some are referred to in the RBMPs in relation to Habitats areas.

15.3.Progress with Commission recommendations

The Commission recommendations based on the first RBMPs and Programme of Measures requested action on the following:

- Recommendation: *Denmark needs to further extend the monitoring programme to include all biological, physical-chemical and hydromorphological quality elements as relevant, for all water categories (rivers, lakes, coastal waters) and ensure there is adequate monitoring of groundwater to enable assessment of status, pressures and trends. The reported monitoring system is a new one (NOVANA) and not the one used for developing the first RBMPs. Although it is new, it appears to not yet be WFD compliant. There is no operational monitoring of drinking water protected areas (groundwater).*

  Assessment: With respect to the monitoring of drinking water protected areas (groundwater), monitoring sites for this type of Protected Area was reported. This aspect of the recommendation has been fulfilled.

[100] Denmark subsequently clarified that other aspects related to protected areas such as birds and bathing water were monitored under other schemes and are not reported in WISE.

Topic 16 Adaptation to drought and climate change

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

16.1.1. Climate change adaptation

Climate change was considered in all RBDs and the guidance on how to adapt to climate change (Common Implementation Strategy Guidance Document No. 24[101]) was used. In the first cycle, no climate check of the Programme of Measures was carried out. Such a check has now been carried out in the second cycle. Consideration of climate change has taken place for the preferential selection of robust adaptation measures. No specific sub-plans addressing climate change were reported for Denmark. No specific adaptation measures (KTM 24 - "Adaptation to climate change") were reported.

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'[102], droughts were not relevant for Denmark. No exemptions have been applied for the country following Article 4(6) due to prolonged droughts.

Drought Management Plans have not been reported for Denmark; and also in 2012 no such plans were in place (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

In the first cycle, no climate check of the Programme of Measures was carried out. Such a check has now been carried out in the second cycle.

16.3. Progress with Commission recommendations

There were no Commission recommendations based on the first RBMPs and Programme of Measures for this topic.

[101] 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

[102] http://ec.europa.eu/environment/water/quantity/pdf/Assessment%20WSD.pdf