EUROPEAN
COMMISSION

Brussels, 4.2.2025
SWD(2025) 34 final

COMMISSION STAFF WORKING DOCUMENT

Third River Basin Management Plans
Second Flood Hazard and Risk Maps and Second Flood Risk Management Plans
Member State: Denmark

Accompanying the document

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)

Third River Basin Management Plans
Second Flood Risk Management Plans

{COM(2025) 2 final} - {SWD(2025) 13 final} - {SWD(2025) 14 final} -
{SWD(2025) 15 final} - {SWD(2025) 16 final} - {SWD(2025) 17 final} -
{SWD(2025) 18 final} - {SWD(2025) 19 final} - {SWD(2025) 20 final} -
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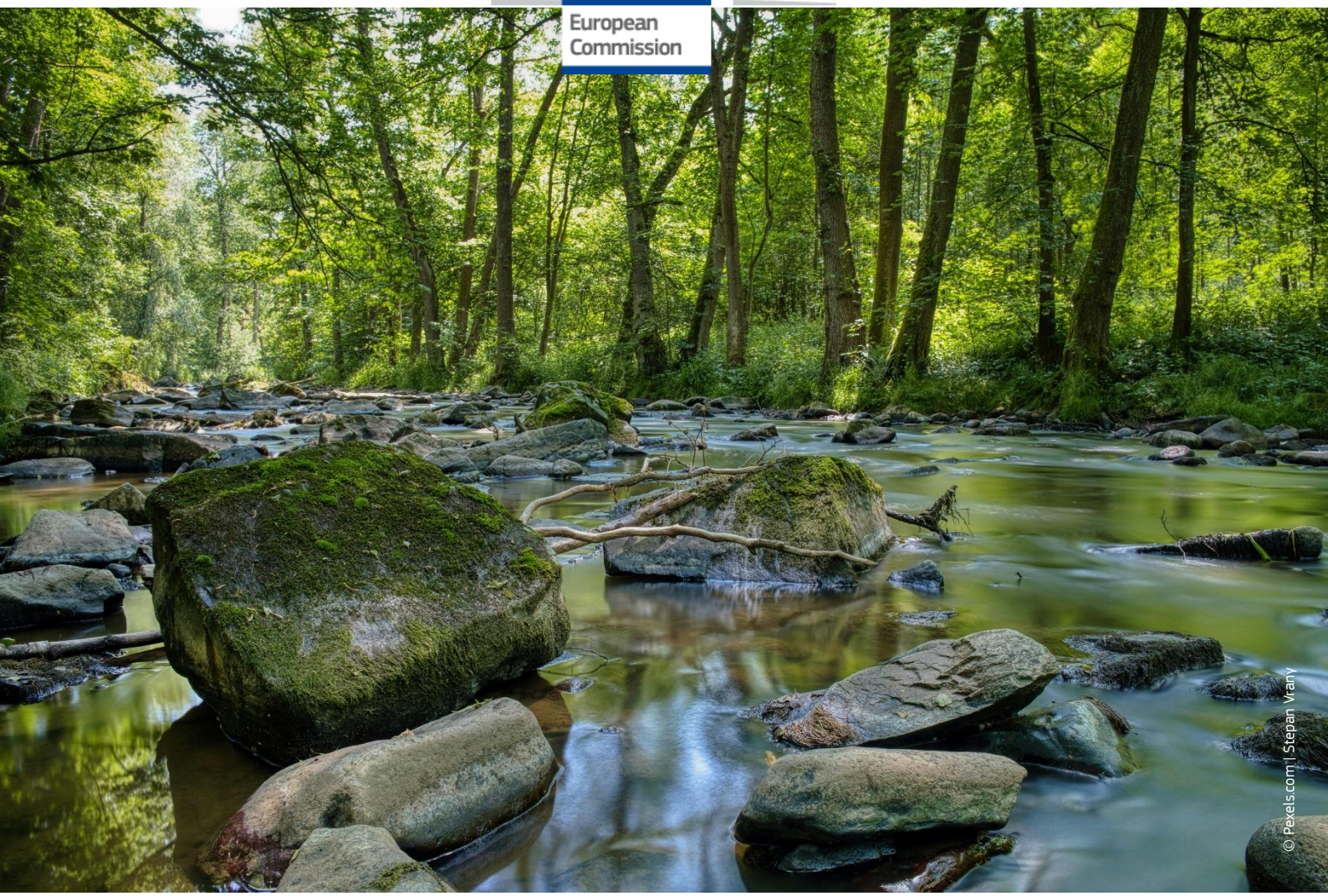
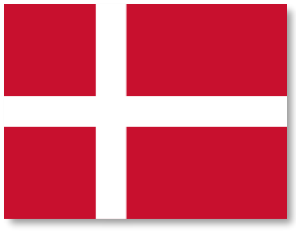


Country specific staff working document

Denmark



ENVIRONMENT

Content

SECTION A:

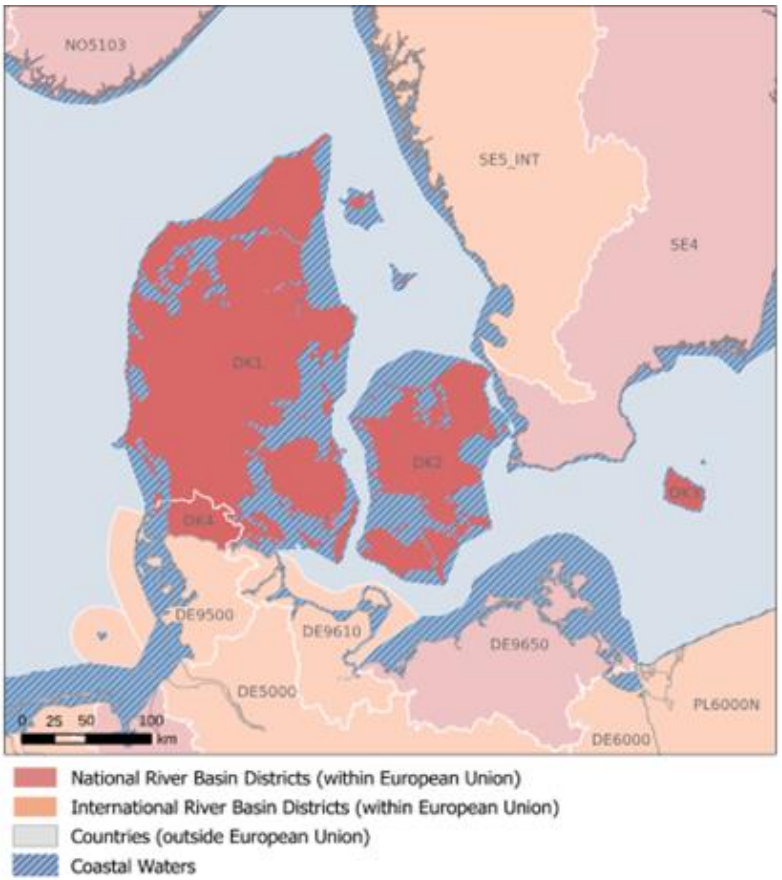
WATER FRAMEWORK DIRECTIVE

1. General info, member state characterisation

Denmark is the southernmost of the Scandinavian countries, lying south-west and south of Sweden, south of Norway and north of Germany with which it shares a short border. The Kingdom of Denmark also includes the Faroe Islands and Greenland which will not be considered in this report. Denmark consists of the larger, northern part of the Jutland peninsula and an archipelago of over 400 islands, the largest and most populous of which include Zealand, Amager Funen, North-Jutlandic Island and Lolland. Bornholm is an outlier, as it is an island situated in the middle of the Baltic Sea.

Denmark has almost 6 million inhabitants and a surface of 43,094 km2 with a population density of about 139 inhabitants per km^2, higher than the EU average. In general, population density increases when moving from west to east. About 1 of 2 Danes lives in urban centers with a population of at least 20 thousand. Almost one in five Danes live in the Copenhagen metropolitan area.

Because of the many islands and fjords, Denmark's general coastline is much shorter than its tidal short line (over 1000 and about 8700 km respectively). Hence, there are relatively many coastal waters which can be roughly divided in those bordering the North Sea, thus with strong tides, and those at the Baltic Sea where waves and tides are much smaller.



Note: *E-reporting, the source of this map, defines DK4 as a national RBD, whereas the national RBMP PDF defines it as an international RBD.*

The country is flat with little relief. The average height inland is about 30 meters about sea level, and the highest peak is only 170 meters. There are no long or big rivers in Denmark because of its small size, low elevation and relatively low rainfall. Instead, the land is drained through relatively short rivers and streams flowing into lakes or the nearby sea. Only two rivers, both in Jutland, attain more

than 100 km in length and only five more exceed 60 km. The longest river in Zealand is 83 km, and the longest in Funen is 53 km.

Denmark has 14.9% of its territory designated as nature protected areas, below the EU average of 26%. Agricultural land covers around 60% of the territory. Danish agriculture is a large net exporter of agricultural products, and the contribution of agriculture plays an important role in the country's economy. Pigmeat and dairy are the most important sectors in terms of production value.

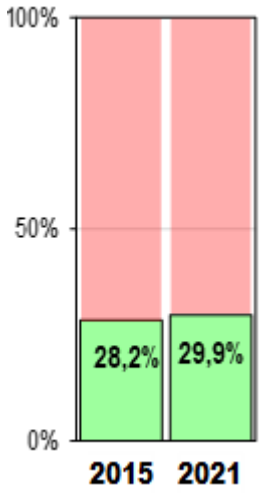
Reporting

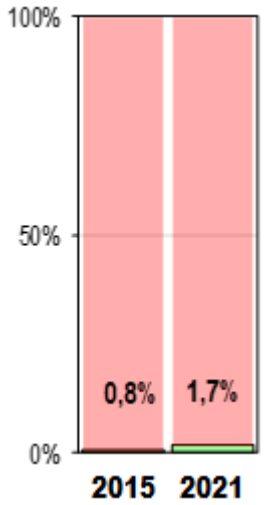
The deadline for reporting the 3rd RBMPs was in March 2022. The Commission and the EEA together with Member States developed an electronic reporting system in WISE (Water Information System for Europe). Its use was voluntary. Some Member States used it to fulfil their obligations, others reported the plans in pdf format. The cut-off date for the WISE e-reporting was September 2023 and the MS were assessed based on the datasets available by this date.

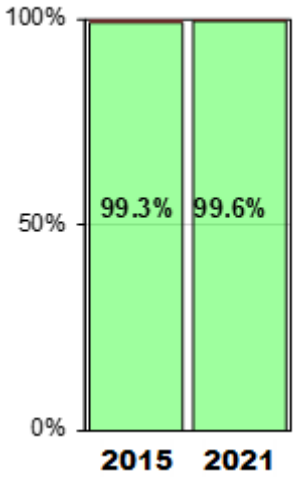
By September 2023 Denmark had not submitted full electronic reporting. Therefore, the assessment is based on the data mining of the pdf RBMPs.

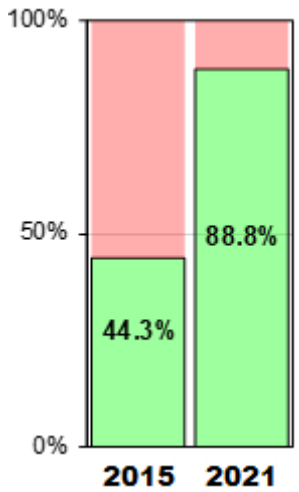
Despite the cut off dates for the production of this report, reporting continued and, for the State of Water report, the EEA aggregated the results available by July 2024 in their products and dashboards available at WISE Freshwater web portal.

Changes in Status, Pressures, Exemptions & Measures

Surface Water Bodies (7812)	Trend (% good status/potential)	Main Pressures & Changes & Exemptions
ECOLOGICAL STATUS		The large majority of surface water bodies is not in good or high ecological status. In terms of the number of waterbodies: 29.9% of surface water bodies have attained good status, while 57.8% are classified with a lower status and 12.3% have unknown status. The absence of good status concerns 68% of rivers, 84% of lakes and 95% of coastal water bodies. In fact, a high proportion is in poor or bad ecological status/potential: 34% of rivers, 43% of lakes, and 73% of coastal waters. In addition, 65% of river water bodies and 19% of lakes have unknown ecological status/potential. Assessing progress through comparing the 2nd and 3rd RBMPs is complicated by changes in the delineation of water bodies, the changes in number of quality elements as well as the reduction of the percentage of rivers with unknown status. There seems but little progress: only a slight increase in the percentage of surface water bodies in good / high status; an increase in the percentages of rivers, lakes and coastal waters in poor / bad status; and a marked rise in the percentage of rivers failing to attain good status. The confidence in the assessment has on the whole increased While almost all rivers are scheduled to have attained good ecological status / potential by 2027, over half of the lakes and almost all coastal water are expected to achieve this only well after 2027. Eutrophication caused by nutrients is the major cause of the persistent failure to timely improve the ecological quality: it concerns phosphorus for lakes and nitrates for the coastal waters. The main pressure is from agriculture's use of manure and fertilisers, while there are also significant contributions from wastewater plants and aquaculture. The included measures are insufficient to achieve the stated ecological objectives for 2027. While the baseline assumes 75 % of the estimated load reductions planned in the 2nd RBMP to be implemented, the planned measures on top of the baseline cover around 80% of the remaining gap. The included measures on river restoration fall 1650 km short of the required effort. In both cases, the announced revision of the 3rd RBMP is reported to define additional measures to bridge the gaps.

CHEMICAL STATUS		Only a tiny fraction of surface waters, namely 1.7 %, is in good chemical status, whereas 5.6 % is in poor status and for 92.7% the chemical status is classified as unknown. While the absence of good status affects the surface water types nearly equally (99% of rivers, 91% of lakes and 95% coastal waters), it is for a different reason. For almost all coastal waters, the status is known, and 93% of them are in poor chemical status. In contrast, for 70% of lakes and 97% of rivers, chemical status is unknown. The RBMPs do explain neither this low rate of chemical status classification nor the lack of classifications made with high confidence, both of which seems at odds with the extension of the monitoring network now covering 85% of all surface waters. The comparison between the 2nd and 3rd RBMPs suggests a deterioration, although its extent is hard to ascertain because of the change in the number of surface waterbodies and of priority substances as well as the reduction of the percentage of lakes and in particular coastal waters in unknown status (resp. with 25 and 39 %-points). The increased rate of chemical status classification goes together with a fall in the ratio of good over poor status, namely for all surface water bodies together, from a 1-1 ratio in the 2nd RBMP to a 1-3 ratio in the 3rd RBMP. At least for coastal waters, this does not merely reflect an observation effect, but also an actual decline: as share in the total of surface waters with a chemical status classification, the percentage of coastal waters in poor status jumps from 17 to 94. The chemical status assessment includes only 25 priority substances out of the 45 required by the Environmental Quality Standards Directive, only a few more than in the 2nd RBMP. This coverage gap is not explained. The RBMPs do not pronounce clearly to what extent rivers and lakes will attain good chemical status by 2027.xxxxxxxThe rather small sample of surface water bodies with a status classification suggests a worsening water pollution, the actual size of which remains unclear. In about one out of two surface water bodies found in poor status, mercury pollution can count as the reason; it concerns a four-fold increase in number of water bodies. Anthracene pollution is a problem in almost as many water bodies, while nearly absent in the 2nd RBMP. The number of water bodies affected by cadmium, lead and nonylphenol has also strongly increased.

Ground Water Bodies (2050)	Trend (% good status/potential)	Main Pressures & Changes & Exemptions
QUANTITATIVE STATUS		As in the 2nd RMBPs, almost all groundwater bodies are in good quantitative status (99.6%); these classifications are on the whole made with high confidence. In fact, all drinking water comes from groundwater reservoirs with only minimal treatment requirements. Consequently, out of the total of 2050 groundwater bodies, 1705 are protected for drinking water abstraction. Only 9 out of 2050 groundwater bodies (0.4 %) have been found in poor quantitative status in the year 2021, due to over-abstraction. This suggests an emerging (seasonal) scarcity problem, also because 4% of groundwater bodies is at risk to fail good quantitative status in 2027. A comparison with the corresponding number of water bodies in the 2nd RBMP is not meaningful because of a fivefold increase in the total number of groundwater bodies resulting from a hydrological review that aimed to define entities with more homogenous conditions (more rigorous separation of shallow, regional or deep groundwater entities). The groundwater associated aquatic ecosystems have been considered, similarly to the approach followed in the 2nd RBMPs. The main gap in the assessment methodology is the lack of consideration of groundwater dependent terrestrial ecosystems.

CHEMICAL STATUS		A large majority of groundwater bodies is in good chemical status (88.8%). The chemical status is poor in 9.4% of groundwater bodies and unknown in 1.9%. Even when accounting for the fivefold increase in the total number of groundwater bodies due to a comprehensive hydrological review, this seems an improvement vis-à-vis the 2nd RBMP which reported only 44.3% of total groundwater bodies in good status with 30.6% in unknown status. The fall in the percentage of waterbodies at risk to fail good status from 25 to 13% also suggests an improvement. The chemical monitoring of groundwater has covered the following substances: nitrate, chloride, trace-elements, pesticides and environmentally dangerous substances. The data foundation for assessing groundwaters' chemical status has improved since the 2nd RBMPs, as it now incorporates data from pesticide monitoring and water utility controls. However, despite the expanded data foundation and more homogenous water bodies, the 3rd RBMPs report 'low confidence' for most of the status assessment, whereas the 2nd RBMPs reported mostly 'medium confidence.' Pesticides are the group of substances most responsible for the failure to attain good status: almost two thirds of groundwater bodies in less than good status have too high pesticide concentrations (amounting to about 7% of all groundwater bodies). In addition, the drinking water test has a significant upward effect on the percentage of groundwater bodies in less than good status. Nitrates and trace particles are less prevalent causes. To a large extent, the pesticides pollution concerns a legacy effect as most of the pesticides concerned have been banned already. This implies that overall improvement will be slow as reflected by the small difference between the percentage of groundwater bodies in poor chemical status and the percentage of those expected to fail good status by 2027.

2. Horizontal aspects

The Danish RBMPs have been mainly assessed on the basis of the traditional reporting of RBMPs (the national document and the reports for the 4 RBDs), which were submitted to the Commission in June 2023, about a half year after the deadline. It has been possible to take account of the information by electronic reporting only to a limited extent, since many background documents and data have been submitted only in January 2024, this including apparent corrections and revisions. On top of this, the Danish authorities indicated in informal comments that they would revise the 3rd RBMPs in the course of 2024. It is likely that the ongoing development of the policy to combat nitrogen emissions and the recent publication of the new Climate Change Adaptation Plan may also inform such revised RBMPs.

2.1 Governance

Denmark has a centralised approach to water management. The Danish Ministry of Environment is the competent authority for all four River Basin Districts. While the main roles are divided between the Ministry and the Danish EPA (Environmental Protection Agency), the overall responsibility belongs to the Ministry.

Water councils are a unique Danish feature of water governance at local level. There are 23 water councils in Denmark, in which local stakeholders are represented. Each of them is responsible for one specific catchment area. In cooperation with municipalities, each of these water councils have created a sub-plan for the catchment area, thus incorporating local knowledge into water planning.

In general, the Danish RBMPs do not provide a lot of further information on important governance issues. As regards public consultation, the authorities have succeeded to elicit a substantial support from the whole range of stakeholders, because the consultation was widely advertised and had an appropriate consultation period (December 2021 to June 2022). In addition, stakeholders' active involvement was facilitated through advisory groups and even participation in the RBMP drafting process. However, the RBMPs merely state these activities have had impacts on information base and measures, but they do not specify how stakeholder recommendations have been taken up.

As regards the management of coastal waters, despite the large area of coastal waters, the RBMPs do neither include the MSFD objectives nor an account how and where the MFSD is implemented. While it is reported that the MSFD strategies are coordinated with neighboring countries, they do not mention the regional maritime conventions, namely OSPAR for the North Sea coast side and HELCOM as regards the Baltic Sea coast. Yet HELCOM plays an important role in coordinating the monitoring of the nutrient inputs into to the marine environment (nitrogen and phosphorus) and corresponding policies.

As regards transboundary cooperation, for the Vidå-Kruså RBD, the only international river basin, the RBMP does not present measures reflecting coordination with Germany. However, the Danish authorities have confirmed that such coordination is fully in place.

2.2 Characterization of River Basin District

Denmark has four River Basin Districts (RBDs) which function also as the "Units of Management" in implementing the Floods Directive. The RBDs are Jutland & Funen; Zealand; Bornholm; and Vidå-Kruså (an international RBD shared with Germany).

The first two RBDs cover over 90% of Denmark's surface. Notably, the first three RBDs are separated from one another by international waters. Table 1 below reports on the number of surface and groundwater bodies in these four RBDs, as reported in the 3rd RBMPs.

Table 1: Number of delineated surface and groundwater bodies in Denmark according to the 3rd RBMPs

RBD	Name	Rivers	Lakes	Coastal Waters	Territorial Waters	Groundwater Bodies
DK1	Jutland & Funen	5301	699	76	9	1340
DK2	Zealand	1109	244	30	6	667
DK3	Bornholm	145	12	2	1	29
DK4	Vidå-Kruså	148	31	3*	0	14
TOTAL		**6703**	**986**	**109**	**14**	**2050**

Note: ** 2 of the waters in question are shared. There are no transitional waters in Denmark.*

Delineation

The 3rd RBMPs (including the national document) reveal some significant changes in the delineation of water bodies, although the typology of water body types has reportedly remained largely the same per RBD and water categories.

The number of groundwater bodies has increased fivefold vis-à-vis the 2nd RBMPs, as the result of a hydrological review of groundwater delineation aiming to define entities with more homogenous conditions (more rigorous separation of shallow, regional or deep groundwater entities). This large change hinders in-depth status comparisons between the 3rd and 2nd RBMPs.

The review of the delineation of surface waters has led to smaller changes. The number of rivers and of coastal waters have both decreased by roughly ten percent whereas the small number of territorial waters has remained the same. In contrast, the number of lakes has increased by about fifteen percent as the net result of adding two hundred new lakes and excluding about fifty smaller lakes seen as not or no longer meeting the size or other criteria to qualify as a lake.

The RBMP national document does not provide summary information on the percentage of surface water body types for which type-specific reference conditions have been established for biological, physico-chemical or hydromorphological quality elements. Neither is it reported whether the reference conditions for the international Vidå-Kruså RBD have been coordinated with Germany.

It is not clear whether these gaps result from a reporting issue rather than a lack of implementation since the Danish authorities have submitted the relevant background documents to WISE's / Eionet's central data repository in January 2024 (thus well after the RBMPs' submission date), and they mention that they have intercalibrated type-specific reference conditions with other relevant Member

States as part of the European Commission's Intercalibration Decisions. However, the intercalibration of reference conditions is still in progress for macroalgae in coastal waters of both Baltic Sea and the Atlantic.

Pressures

The RBMPs' set of documents does not provide a detailed account of the definition of significant pressures (detailing the relationship with threshold and risk assessment), but they provide information on the main pressures on water bodies, coming from the assessments based on the findings from the national monitoring programme NOVANA, authority supervision and special investigations.

Surface waters

The key impacts on (chemical and ecological) water quality come from nutrient (both nitrate and phosphorous), organic, and hazardous pollutants as well as morphological changes.

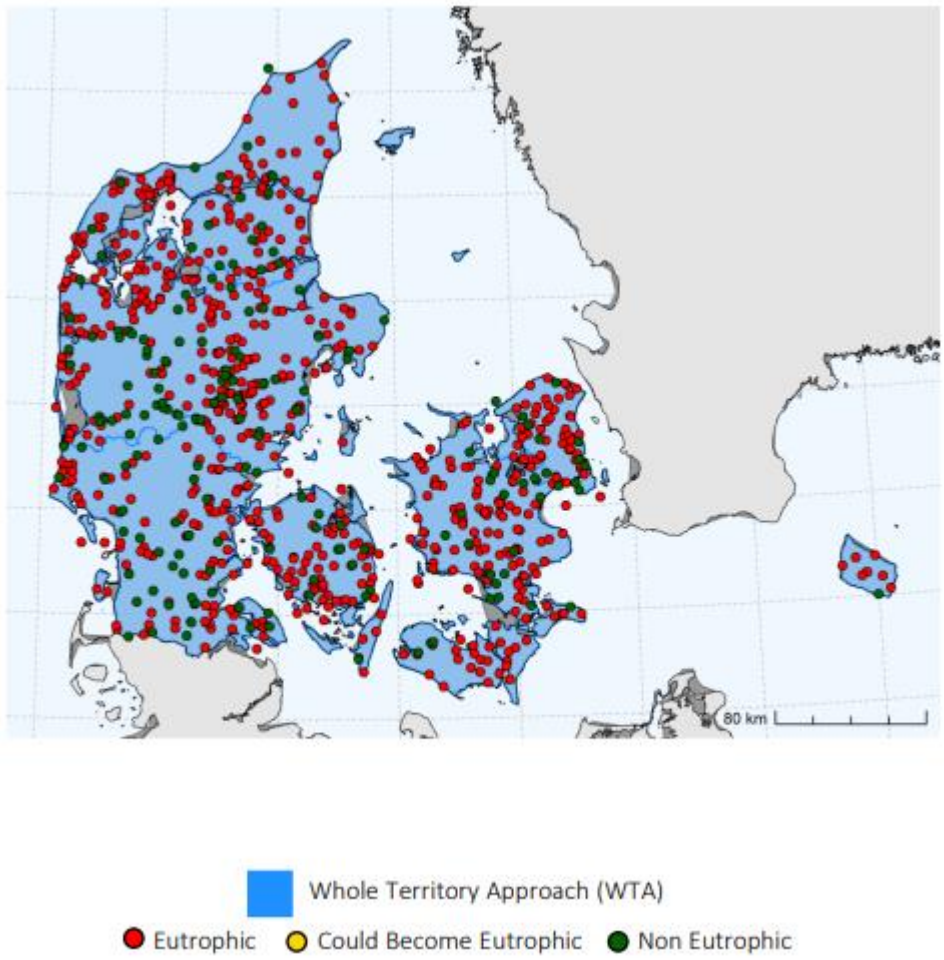
In particular, most coastal water bodies and many lakes have been affected by nutrient pollution, with wastewater discharges and aquaculture as the key point source pressures and the ammonia and nutrient emissions from agriculture as the key diffuse source pressure.

Nutrients are the major cause of the persistent failure to timely improve the ecological quality. Agricultural activities (involving manure and fertilisers) are the main culprit (although there are significant contributions from wastewater plants and aquaculture as well). Water courses transport these nutrients loads from the land into lakes and coastal waters, where they accumulate over time and significantly degrade the aquatic ecosystems. Phosphorus is considered as the main pressure factor for lakes, and nitrates for the coastal waters. Figure 1 shows the widespread and persistent impacts from sustained nutrient pollution.

The excess of nutrients causes leads to eutrophication, i.e. the excessive growth of bacteria and algae.; In combination with higher water temperatures, it causes severe (seasonal) oxygen depletion and toxic residues on the water floor, killing off entire ecosystems. There appears to be much more information on the nature and extent of ecological damage in coastal waters than for lakes; the problem concerns mostly the coastal waters at the Baltic Sea coast (see Figure 3 below). The coastal water' s high fish mortality and the increasing occurrence of large marine "dead zones" without hardly any maritime life has been widely reported in the press[1], noting that this longstanding problem has increased to (near)-catastrophic proportions raising questions on the adequacy of the nitrogen abatement measures.

[1] It has been prominently reported since 2020, in Danish mass media (see as example, this article (in Danish) from the Danish TV2 news) and even beyond (mostly in environmental news outlets, such as this one, and generic media, such as from France-international).

Figure 1: The impacts of nutrient pollution on the ecological quality of water: the trophic state of Danish surface water bodies 2016 – 2019

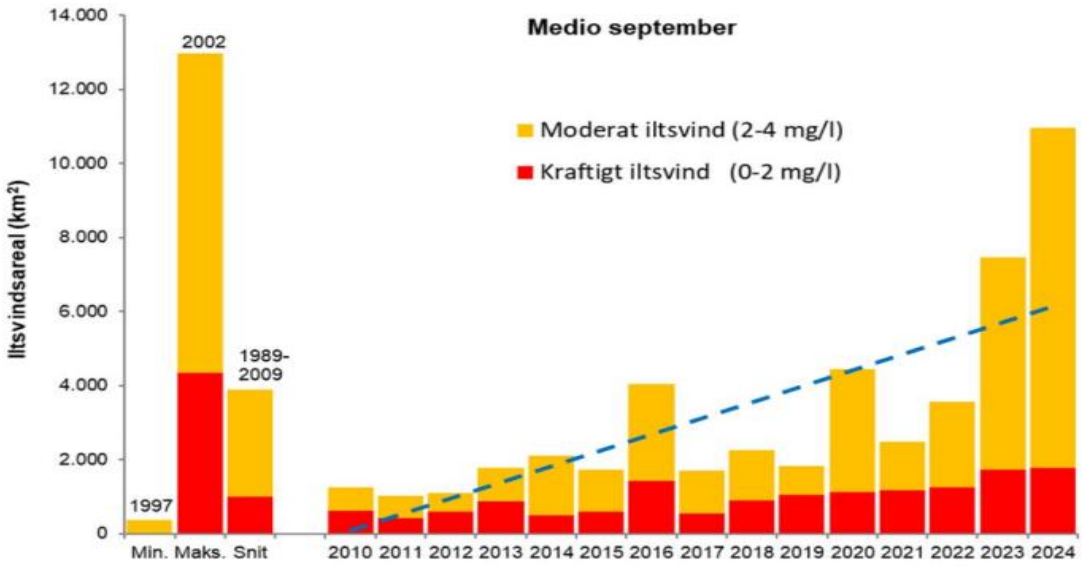


Source: Joint Research Centre of European Commission (n.d.). JRC NITRATES DIRECTIVE - Reporting Period 7 (2016-2019) Trophic Status. [online] water.jrc.ec.europa.eu.
Available at: https://water.jrc.ec.europa.eu/portal/apps/dashboards/cb6034c2a75e4df282f8a62f90c16caa

Indeed, since 2020, Aarhus University studies have signalled that, after some improvements in the previous decade, since 2019 the coastal water's oxygen depletion issue has rapidly increased in both proportion and severity. The studies are an important input to the Danish government's scientific assessment of the Danish coastal and marine waters. One of their studies already raised the alarm in 2020, based on the observation that the total coastal sea area affected by oxygen depletion in that year was about twice as high as in the previous year[2]. Their study from August 2023[3] concludes that the extent of the oxygen depletion in 2023 was the second largest one ever recorded for September. It also identifies a worsening trend over the recent years (see Figure 2 below), reflecting both the shortfall of the reductions so far achieved in the nitrogen inputs into these waters, a significant part of which originates from agricultural activities in Denmark, and the increasing impact of climatic factors, specifically a trend towards higher water temperatures in Danish coastal and marine waters.

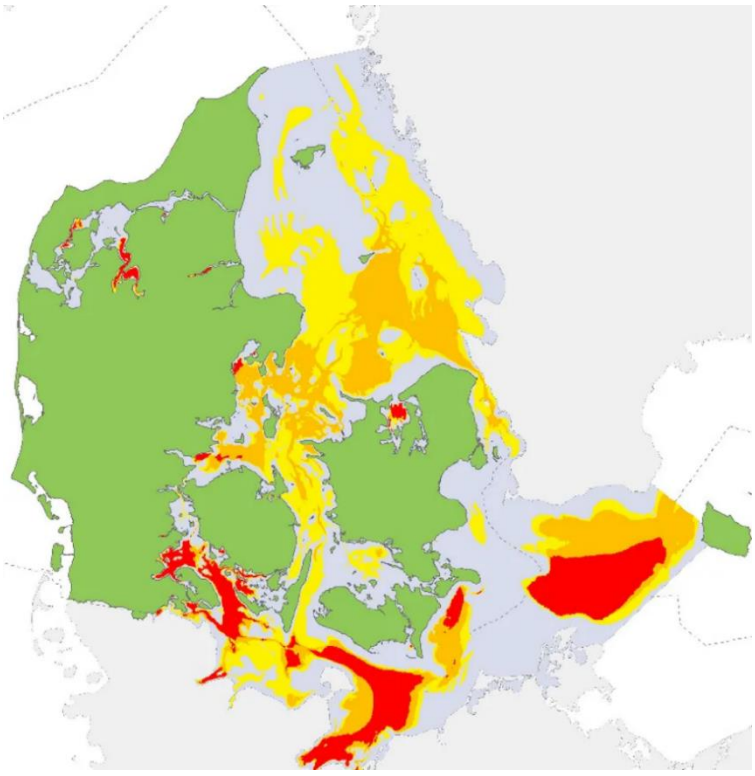
[2] See as example of the press attention for this study, this article in phys.org.
[3] Aarhus University, "Oxygen depletion in Danish waters 29 August – 25 September 2024," DCE (Danish Centre for Energy and Environment) advisory note (in Danish), 4 October 2024.

Figure 2: Reported area size of moderate and severe oxygen depletion in Danish coastal waters



Source: see footnote 3

Figure 3: Map on the geographic extent of oxygen depletion in Danish coastal waters



Source: see footnote 3. The red and orange areas are with strong and moderate oxygen depletion respectively.

As regards the discharge of wastewater from treatment plants, it is a key pollution source, affecting about 1% of the length of all rivers. Larger wastewater treatment plans (i.e. with capacity over 30 persons equivalents) constitute the largest contributor of nitrogen and phosphorus and the second largest contributor of organic material. In addition, the discharges from unconnected dwellings show comparably high discharges of the same pollutants, due to the lower degree of treatment; and the same applies to the incidental storm water overflows of sewage systems.

In addition, morphological changes (including dams, barriers and locks) alter aquatic habitats and thus reduce the ecological water quality.

As regards invasive alien species, some species of crayfish are included in the national list of invasive alien species and efforts are ongoing to map their distribution[4]. This will allow ascertaining to what extent the populations of invasive crayfish already present in the Danish aquatic environment is significant or not. Likewise, the floating fern (*Azolla filiculoides*) is an aquatic plant present on the national invasive alien species list since it has been found in some water bodies in Denmark. These plants can form very dense mats in favourable habitats, causing many difficulties for boat transport, water animals and native plant species, and becoming a source of eutrophication.

The RBMPs recognise that climate change impacts can be expected to exacerbate pressures on surface water bodies, which may contribute to them not achieving good ecological status. The increased rainfall leading to the acceleration of nutrient run-off from land into inland waters and then to coastal waters, as well as higher temperatures[5] lead to higher eutrophication and oxygen depletion resulting in long-term damage.

Groundwater

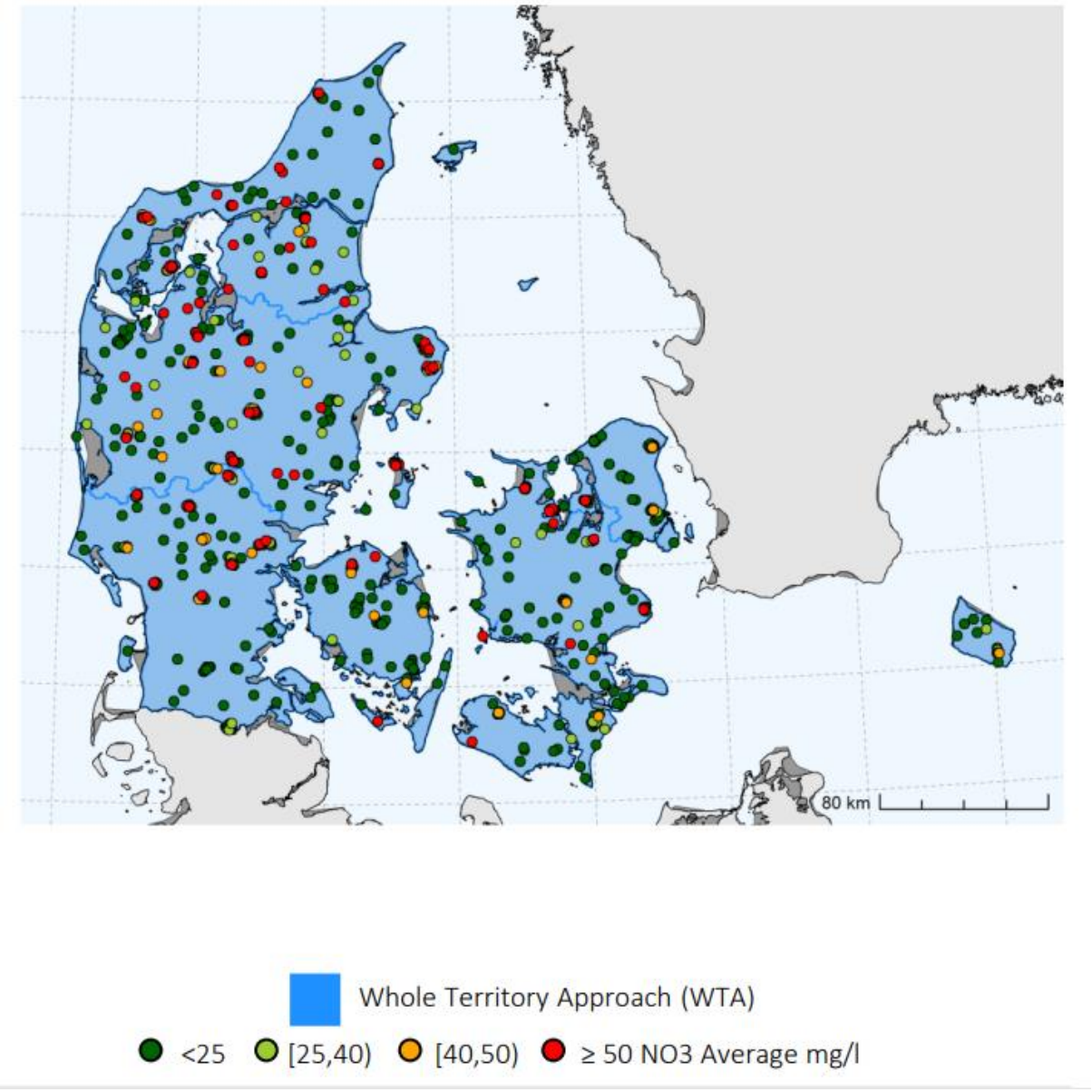
The main pressures concern pollution, namely soil pollution as point source pressure and agriculture's fertiliser and pesticide use as the main diffuse source pressure. While current pressures and impacts are much less widespread than the pressures on surface waters, the pollution concentration, in particular in deep groundwater bodies, respond to emission volumes over time with long time lags.

Nitrates concentrations in groundwater exceed the limits established in the Nitrates Directive in a considerable number of points. See the map in Figure 4 below.

[4] Søren Berg et al., "Mapping the distribution of crayfish and crayfish plague in Danish waters," DTU Aqua-rapport nr. 401-2022 (in Danish); available online.

[5] For rainfall and temperature alike, it concerns both average and peak levels. Run-offs can also lead to inflow of pesticides and sediments, putting further pressure on the ecological status.

Figure 4: Nitrates concentration from agricultural sources in groundwater- report on implementation of the Nitrates Directive[6]



As further discussed in section 3.3, water is mainly abstracted from groundwater, with agriculture and public water supply as the major user destinations. Similarly to the 2nd RBMPs, Denmark has not identified water abstraction (understood as consumptive use or net consumption) as a significant pressure at the RBD level or in significant portions of an RBD for any RBD in Denmark. However, the 3rd RBMP's economic analysis does not seem to explore whether on the longer term, there may be bottlenecks in water supply to meet the demand for abstracted water by the different user sectors. It appears that water scarcity is not seen as a significant problem as only 9 groundwater bodies fail to be in good quantitative status in 2021 and all groundwater bodies are expected to be in good status by the year 2027.

[6] Taken from the country fiche for Denmark in the Nitrate Directive Reporting 7: groundwater.

3. Policy elements contributing to biodiversity and climate change adaptation

3.1 Surface Water: what is their ecological status or potential

Monitoring

The RBMP traditional reporting has a relatively weak coverage on the state of play regarding monitoring, assessment and classification of ecological status, also because for the factual corroboration, it refers to missing or late electronic reporting on the relevant aspects. For instance, the data available to the RBMP assessment do not say anything on monitoring frequency.

The 3rd RBMPs claim progress in the monitoring scope, namely a clear increase in the number of water bodies covered and in their geographical spread. The vast majority of surface water bodies in all RBDs are monitored on the basis of the national guidelines NOVANA. Reportedly, all water types have a monitoring programme, and the monitoring is evenly spread out over the country. Consequently, for each RBD, less than 10 % of the water bodies is in unknown ecological status. All coastal waters are monitored and classified. Although not mentioned in the RBMPs, grouping has been used to classify smaller lakes. The remaining unclassified water bodies are mostly small lakes and watercourses.

The monitoring has also improved through covering more quality elements, although it appears that for none of the surface waters, the surveillance monitoring has included all required elements. Notably, it appears that there is no specific information on ecological flows. A clear picture is however difficult to obtain due to a lack of electronic reporting at the time of RBMP submission and assessment. With a view of the discussion further below, it merits highlighting that Denmark has not fulfilled its obligation to monitor all necessary quality elements. Most coastal water bodies have been monitored for all the required biological quality elements, but not for thermal conditions (neither in lakes), whereas for rivers, nutrients have not been monitored[7].

Of note, the Commission has expressed for some time concerns about the significant gaps in the monitoring systems for surface waters in Denmark, and, relatedly, about the very large number of unknowns in the status of many surface water bodies. In exchanges with the Danish authorities, it transpired that they have recognised that several of these monitoring and related knowledge gaps needed to be addressed. The 3rd RBMPs reflect these efforts, but it appears that many monitoring deficiencies and number of unknown status aspects remain, seriously hindering the possibility for Danish surface waters to achieve compliance with the WFD objectives.

Status assessment

The 3rd RBMPs reveal that Denmark faces a huge persistent challenge to improve the overall bad ecological quality of Danish waters. Overall, in the year 2021, 95% of Danish coastal water bodies, 64% of its lakes and 67% of the rivers are reported to be in less than good ecological status / potential, and quite a high proportion of them (73% of coastal waters and 43 % for both lakes and

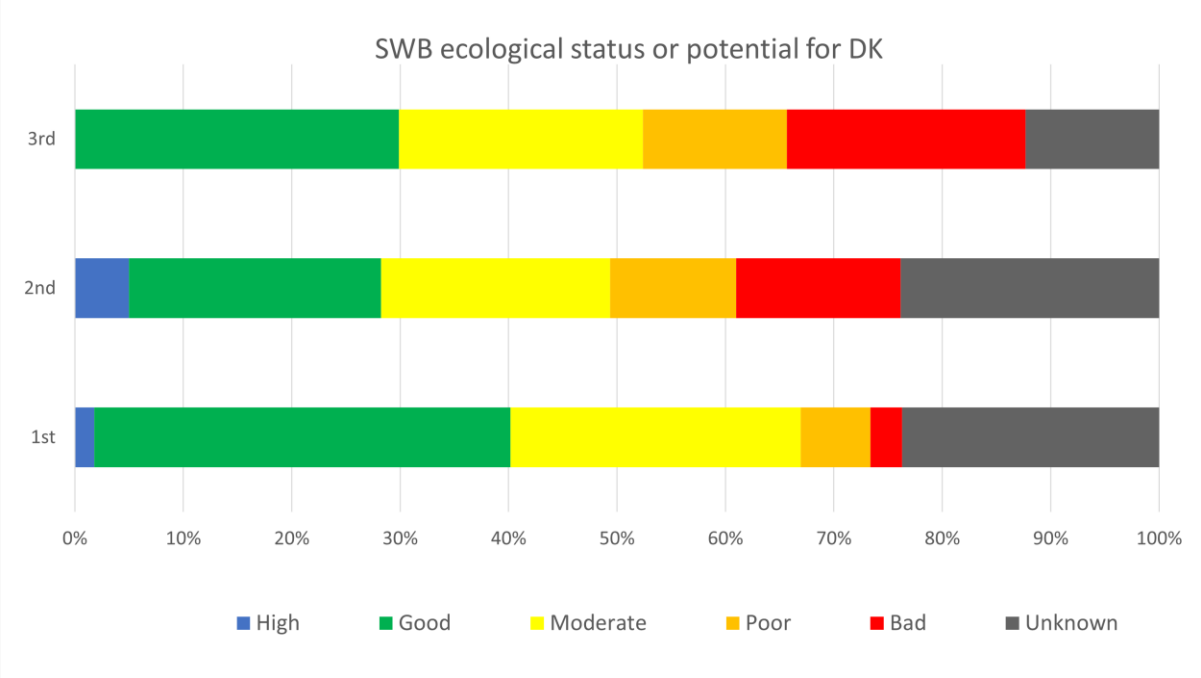
[7] Nutrients do not constitute a compulsory monitoring item for rivers.

rivers) are found to be in poor to bad ecological status / potential. The traditional RBMP reporting does not discuss the confidence of the ecological status assessments.

Overall, the situation appears to have hardly improved over the 2nd RBMP period. 29.9% of all Danish water bodies are recorded to be in at least good status / potential in the year 2021, versus 28.2 % in 2015. This is depicted in Figure 5. Nutrients are the major cause of the persistent failure to timely improve the ecological status.

Unfortunately, the changes in the numbers of water bodies delineated and classified hinder a more robust comparison. However, as regards the fully classified category of coastal waters, while the share in good status has increased somewhat, the much larger fall in the share of moderate status is nearly matched in size by an increase in the share of poor to bad status, strongly suggesting a significant deterioration[8].

Figure 5: Ecological status of surface water bodies



The expected ecological status in 2027 varies strongly over the surface water categories. While the RBMPs expect all rivers will achieve good ecological status by 2027, a clear majority of lakes and 95% of coastal waters are expected to reach good status with the planned measures only well after 2027.

The Danish RBMPs point to an interesting trade-off in nature-based attempts to improve the ecological quality of surface waters. It is claimed that when properly executed, frequent weed-cutting contributes to mitigating high levels of nutrients, but at the expense of the diversity and hence robustness of the involved aquatic ecosystems, both as regards flora and fauna.

[8] Both tendencies need to be interpreted with some care in view of the about ten percent reduction in the number of coastal waters.

3.2 Hydromorphological changes and artificialization (HMWBs and AWBs)

The relative low share of heavily modified and artificial water bodies (see Table 2 below) suggests that level of human intervention in the physical aspects of Denmark's water system is not very high.

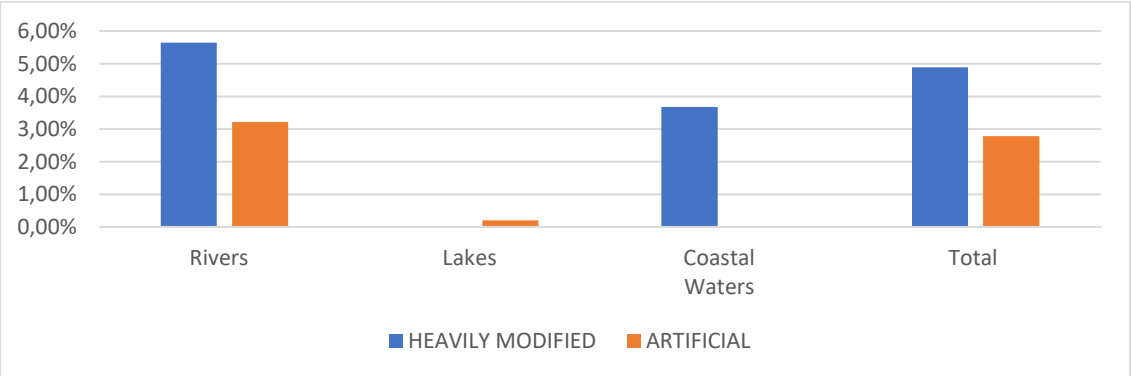
Table 2: Number of heavily modified and artificial surface water bodies in Denmark according to the 3rd RBMPs

Modifications	Rivers (% of total rivers)	Lakes (% of total lakes)	Coastal Waters (% of total CWs)	Territorial Waters (% of total)	Total (% of total SWBs)
HEAVILY MODIFIED	5.64%	0.00%	3.67%	0.00%	0.00%
ARTIFICIAL	3.21%	0.20%	0.00%	0.00%	0.00%

Note: SWB = Surface Water Bodies. There are no transitional waters in Denmark.

Both in absolute numbers and percentages, there are more rivers qualifying as heavily modified and artificial than is the case for the other surface water categories (see Figure 6). Denmark has no transitional and territorial waters, and there are only 2 artificial lakes and 4 heavily modified coastal waters. The low reported number for lakes may be related to the delineation restrictions, such as on size and specific regulatory use (it concerns lakes that according to the regions' raw material plans lakes are located in active digging areas, or lakes that are appointed as wastewater technical facilities in the municipality's wastewater plan). Coastal waters can be heavily modified due to the presence of locks which protect the inland catchment area against high sea levels during severe storms (cf the lock in Vejle fjord).

Figure 6: Number of heavily modified and artificial surface water bodies in Denmark according to the 3rd RBMPs



The 3rd RBMPs do not indicate the change vis-a-vis the 2nd RBMPs. However, when comparing the reported percentages of HMWBs and AWBs, the percentages reported in the 3rd RBMPs appear the same or a bit smaller than those reported[9] in the 2nd RBMPs.

On a positive note, Denmark has defined good ecological potential for all heavily modified and artificial surface waters. The assessment appears to use more or less the same elements as used in the assessment of ecological status.

HMWBs and AWBs do not have to reach good ecological status but just good ecological potential, which reflects a lower level of ambition. Yet only a minority of HMWBs and AWBs appear to be in good ecological potential. The 3rd RBMPs report that about one fifth of the heavily modified and artificial water courses ("rivers") have at least good ecological potential. Of the two artificial lakes, one is reported to have 'moderate' ecological status, while the status of the other one is unknown. None of the four heavily modified coastal waters are in good ecological potential. Due to the lack of detailed reporting in the traditional RBMP reporting, it is not possible to assess progress vis-à-vis the situation reported in the 2nd RBMP.

3.3 Groundwater bodies - have they sufficient water – quantitative status

Monitoring

All groundwater bodies have been monitored for the 3rd RBMP. Municipalities closely monitor the status of groundwater, as they issue and regularly review abstraction permits as regards the environmental objectives. Their assessment includes the increase in chloride contents because of saline intrusion and an increase in the concentration of toxic metals.

Status assessment

Almost all groundwater bodies have been found to be in good status in the year 2021 (99.6% of the total number of groundwater bodies). The good state of affairs is important because in Denmark, water is mainly abstracted from groundwater, and 85% of the Danish groundwater bodies are designated as potential zones for drinking water abstraction.

The assessment has used grouping within a RBD over groundwater bodies of similar sub-type (shallow, regional or deep groundwater bodies), and the assessment concerns a model-based approach, including as appraisal elements the water balance, the quality of aquatic ecosystems associated with groundwater, as well as saline intrusions. The needs of depending terrestrial ecosystems have not been included because a study found only limited indications or evidence of the related impacts on the status.[10] As for other status dimensions, the traditional RBMP reporting does not discuss the confidence of the quantitative status assessments.

However, although the level of precipitation has not fallen over time, there are 9 groundwater bodies failing to reach good status. They are all located in the larger two RBDs (namely 3 in Jutland & Funen and 6 in Zealand). Hence over-abstraction seems to be the main cause. Yet, the 3rd RBMPs say that

[9] See Figure 7.1 in the European Commission's assessment of Denmark's 2nd RBMPs, SWD(2019) 38, February 2019.
[10] The study was one of the so-called knowledge increasing measures from the 2nd RBMPs. The 3rd RBMPs conclude, however, that more research is needed. Hence, this factor contributes to the uncertainty of quantitative status assessments.

all groundwater bodies are expected to maintain or achieve good quantitative status by the year 2027.

The situation overall appears quite similar to the one in the 2nd RBMP. However, a precise quantitative assessment of the progress since the 2nd RBMP is difficult due to the five-fold increase in groundwater bodies due to the new delineation (see section 2.1.2 above).

The 3rd RBMPs introduce as new measure the cross-municipal cooperation on water abstractions in order to ensure that abstractions are drawing from more groundwater bodies and, thus, a more sustainable utilisation of each individual groundwater body.

Climate scenarios indicate as key challenge the saline intrusion into coastal wells, due to the rise in sea level rise. This implies that in the future the groundwater abstractions will have to be limited accordingly, and hence that the availability and quality of surface water as water supply source will increase in importance.

3.4 Protected Areas (identification, monitoring, objectives and measures)

There are different types and reasons why certain water bodies are protected under the law. For surface water bodies, protected areas have been designated under the Drinking Water, Bathing Water, Habitats and Birds Directives as well as for areas designated for the protection of economically significant aquatic species (i.e. aquaculture).

The 3rd RBMPs contain a register for protected areas, including a map, showing that Denmark has identified protected areas for all types associated with surface and groundwater. However, due to the traditional RBMP reporting's unclear reporting, it has been difficult to form a picture of the current status and the changes compared to the previous cycle.

The Danish authorities have declared the whole country as a nutrient sensitive area. This implies there is no differentiation over the country area as regards Nitrate Vulnerable Zones designated under the Nitrates Directive and sensitive areas under the Urban Waste-Water Treatment Directive, but there is a single, national Nitrate Action program in place that includes measures such as restrictions for the spreading of livestock manure as well as permitting and approval requirements for a range of activities that could affect the drinking water supply.

The 3rd RBMP report 1705 out of the total of 2050 groundwater bodies as protected areas for drinking water, about 40% of which are registered for active abstraction and thus subject to more stringent monitoring. These monitoring efforts also appear more focussed as before. While the 2nd RBMPs had indicated that all groundwater bodies (402 in total) functioned as drinking water source, the current 1705 drinking water bodies represent more than 99 % of the total volume of all groundwater, thus smaller water bodies are no longer subject to the additional monitoring requirements. The RBMP explains that this is a result of a revised designation process concomitant to the substantial revision of groundwater delineation (see section 2.1.2 above), but it does not provide clear details on the drivers of the increase.

Municipalities are required to develop action plans for groundwater protection in these protected areas. These plans cover approximately 40 % of Denmark's area and should address the challenges identified in the national groundwater mapping.[11] In their capacity as abstraction permitting authority, municipalities can set permit conditions to prevent potential negative effects.

As regards the other types of protected areas, the national 3rd RBMP mentions Natura 2000 areas protecting water-dependent habitats and species, as well as a few shellfish protected areas and bathing areas, for which specific protection rules from EU legislation apply. The national RBMP PDF does not explain why the number of habitats protected areas has fallen considerably vis-à-vis the 2nd RBMPs, namely[12] from 417 to 269.

As mentioned above, in general, the reporting on the protected areas suffers from two significant gaps, making it difficult to assess progress. First, the 3rd RBMPs do not present an overview of the status of the water bodies associated with protected areas. Second, regrettably, despite an explicit Commission recommendation for Denmark's in the 2nd RBMPs, the report does not clearly identify the additional objectives and the corresponding additional measures adopted for these areas (while they may be subsumed in the Programme of Measures' basic measures).

3.5 What is being done to prevent/reduce hydromorphological pressures

Denmark has a permitting regime controlling abstractions and water impoundments. Each RBD has a register of impoundments.

River restoration is the main focus of the hydromorphological measures in the PoM, aiming to achieve good ecological status (or potential) for all rivers at the end of the programming period (thus the year 2027), despite the backlog in the implementation of measures in the 2nd RBMPs and an explicitly acknowledged lack of impact from the measures defined in the current programme. The expected benefits come from the planned wastewater measures, the removal of about 750 barriers in the watercourse system (and other measures to promote free-flowing water courses), and from the ongoing effects from already completed measures. Jointly, it is expected that these measures will improve the status of up to 5500 km of rivers falling short in terms of the total kilometres below good status (and for some river stretches perhaps also as regards the extent of the improvements).

The authorities have stated explicitly that they will define the remainder of the measures in an updated version of the 3rd RBMP foreseen for later this year, but it remains unclear whether this is related to the measures aimed to reduce nitrates emissions from agricultural activities (mostly via run-offs from the fields) or also hydromorphological pressures.

As regards measures involving nature-based solutions (NBS), there are prominent NBS measures, including wetland restoration, and the establishment of wetlands and ponds aimed at capturing phosphorous and nitrogen. However, the RBMPs do neither present a systematic overview of their potential and actual implementation, nor do they mention any national or regional strategy.

[11] This mapping from the Environment Agency has identified the specific nitrate-sensitive and pesticide-sensitive abstraction areas. Municipalities also have the authority to develop additional action plans beyond designated areas and, if necessary, enforce the action plans' measures.

[12] The 2nd RBMP figures are from Table 15.1 in SWD(2019) 38, and the 3rd RBMP figure is mentioned in Annex 15 of the national 3rd RBMP document.

As regards HMWBs and AWBs, the 3rd RBMPs do not contain much information describing or assessing whether the hydromorphological modifications could be changed or mitigated. This is a cause of concern since a large number of such modified water bodies are not reaching good ecological potential. There is only some information for the four coastal water bodies designated as HMWB, namely the requirement to operate the installed locks so that it supports the achievement of good ecological potential.

3.6 What Denmark is doing for abstractions and water scarcity

As said in section 3.3 already, municipalities are responsible for abstraction permits. They regularly review these permits to ensure that all water bodies can achieve their environmental objectives, including an assessment of the abstraction activity's impact on the water flows in rivers (streams). However, the RBMPs do not appear to indicate the frequency of the review and they do not provide specific information on ecological flows.

It is important to note that there seems to be no measures proposed to reduce pressures on the 9 ground water bodies which are in bad quantitative status due to over abstractions.

While the RBMPs mention a few measures on droughts and scarcity, they do not discuss a medium to long planning. Notably, the RBMPs' economic analysis does not explore either whether on the longer term, bottlenecks in water supply side could occur to meet the demand for abstracted water by the different user sectors. The key programme measure concerns water retention through nature-based solutions for river restoration (promote the free-flowing of water courses and planting trees along riverbanks). However, it is of note that the water abstraction tax is only paid by households and industry, but not by agriculture, and that the tax rate is not informed at all by an estimate of the resource costs of water scarcity.

3.7 Adaptation to climate change

The Danish RBMPs include a general presentation of expected types of impact from climate change on Danish lakes, rivers and coastal water bodies and the extent to which the impacts of climate change will be mitigated by the proposed measures, but without providing detailed information. There are nevertheless background documents that include more detailed climate proofing of the RBMPs.

Specific climate change adaptation measures have not been reported as such in the Programmes of Measures, however a range of measures are explicitly highlighted as having co-benefits for climate change adaptation. This includes measures such as river flow restoration efforts that aim to alleviate the adverse impacts of heavy precipitation in terms of floods risk, or floodplain restoration and meandering, that are anticipated to positively affect nitrogen retention and reduce nitrous oxide emissions, while also supporting natural water retention. Furthermore, securing coastal areas throughout Denmark against floods is an ongoing theme of the RBMPs.

As regards risk of droughts, it should not be noted while the issue was not considered relevant for Denmark in the 2nd RBMPs, in the 3rd RBMPs, the potential risk of drought as a climate change impact is explicitly mentioned even if in generic terms only, without specifically highlighting drought as major climate change challenge and without presenting specific measures to tackle them. Yet, Denmark faces the emergence of seasonal droughts spells and corresponding seasonal water scarcity. At first

sight, climate change does not seem to pose a water availability challenge in Denmark, since climate scenarios point to a likely increase of the annual precipitation volume. However, it is necessary to consider the variation in water availability as well as vividly illustrated by the drought spells in 2022 and Spring 2023[13], with the ensuing water scarcity impacting agricultural production and public water supply in some regions.

Despite this recent experience, as well as mounting evidence on the increased risk of drought across Europe[14], there is no mention of any plan drought management plan in development and the PoMs of the 3rd RBMPs do not include specific measures against droughts, but only provide a cross-reference to the fact that some of the restoration measures (as mentioned above) also contributes to climate adaptation. In addition, the underlying economic analysis does not explore whether on the longer terms there may be bottlenecks in water supply to meet the demand for abstracted water by the different user sectors (see section 5.2).

As regards floods, fluvial and sea water floods are considered as potentially significant sources of flooding in Denmark and are expected to become more frequent and severe in the future. The Floods Directive requires to consider the impacts of climate change on the occurrence of floods, and therefore in the preparation of Flood Hazard and Risk Maps (FHRMs) and Flood Risk Management Plans (FRMPs). More information on these can be found in Section B. However, considering the close relationship between overall water management and floods management and the importance of climate change effects on both, climate change effects are jointly addressed in this section.

The impacts of climate change on flood risk have been considered in Denmark at the time of the second preliminary flood risk assessment. The spatial extent of all APSFRs is assessed based on an extreme event (historic extreme event or 1 000 years statistical event, whichever was more extreme) plus a climate factor. The climate factor used was determined in a previous study specifically for Denmark and is for fluvial flooding and storm floods based on the scenario RCP8.5 of IPCC's 5th assessment report.

In the first FHRMs future scenarios were related to the years 2050 and 2100, in the current FHRM cycle the same time intervals were used, but updated, resulting in future scenarios for 2065 and 2115. Both in the first and second FHRMs the results were used to inform the maps. RCP8.5 emission scenarios are used in the current modelling to consider climate change, in the first FHRMs it was unclear which IPCC information/data was used.

Denmark's two UoM-level FRMPs, as well as the three municipal FRMPs assessed, indicate that the likely impact of climate change on flood extent and frequency is considered (some plans note that it is addressed in the FHRMs used to develop the FRMPs). In the second FRMPs, while they refer to coordination with local adaptation plans, no progress was found concerning coordination between the FRMPs and the national climate change adaptation strategy, nor how this strategy impacted the selection of flood risk management objectives and measures. On the other hand, some municipal FRMPs include measures to address floods in the context of climate change or indicate an intention to integrate flood and climate change plans more closely in the future.

[13] These droughts are not a fully new phenomenon given the droughts in 2008 and 2018.
[14] European Drought Risk Atlas, EEA European Climate Risk Assessment

4. Policy elements contributing to zero pollution

4.1 Surface Water: what is their chemical status

Monitoring

The Danish authorities report that out of the 7812 surface water bodies, there are monitoring data for 6769 water bodies (87%). The monitoring coverage varies a bit over the various surface water body types. Almost all coastal water bodies are monitored (99%), more or less in line with the percentage of coastal waters with a known status. However, the RBMP does not provide a clear explanation why the high monitoring rates for rivers and lakes (respectively 88% and 79%) do not result in more status classifications.

Status assessment

The problems to assess and classify chemical status are widespread within and over the various inland surface water categories: 97.4% of rivers and 70.3% of lakes are reported to be in unknown status[15] (corresponding to 6532 rivers and 693 lakes). In contrast, this is so for only two coastal waters (1.8%)[16]. Overall, 92.7% of surface water bodies (excluding territorial waters) do not have a status. In addition, the traditional RBMP reporting does not discuss the confidence of the chemical status assessments.

Strangely, the reported high coverage of monitoring starkly contrasts with the widespread lack of status classification. Two large barriers impede a good view on the chemical state of Denmark's surface waters, namely the large share of surface waters without a status classification, despite the reported increased geographical coverage of the monitoring, and the exclusion of about half of the priority substances in the chemical status definition or its determination.

With these large gaps, it is far from assured that the RBMP figures on the share of water bodies in good status are representative, and hence, it cannot be excluded that the actual situation is different and perhaps less favourable than reported.

The prevalence of surface water bodies in unknown status has been a persistent problem, where only limited and uneven progress has been made. The 2nd RBMPs reported[17] that for 99.7% of rivers, 95.7% of lakes and 41.1% of coastal waters, the status was unknown; for all surface waters, it was 98.5%. Hence, only for coastal waters has this problem be largely solved, with little progress for lakes and hardly any at all for rivers.

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[15] Following difficulties to extract the relevant information from the 3rd RBMP PDFs, the Danish authorities kindly provided for each of the different surface water types, the percentages of water bodies in unknown status as well as those in good status and less than good status, the latter two both in terms of all surface water bodies of the type in question and of those with known status. The corresponding percentages were not provided for the total of all surface water bodies (apparently without terrestrial waters).
The corresponding number of water bodies have been calculated at the hand of the figures from Table 1 above and the provided percentages. These numbers have a margin of error because the percentages were reported in round numbers and because of an apparent inconsistency in the percentages reported for lakes (a discrepancy of 10 lakes).

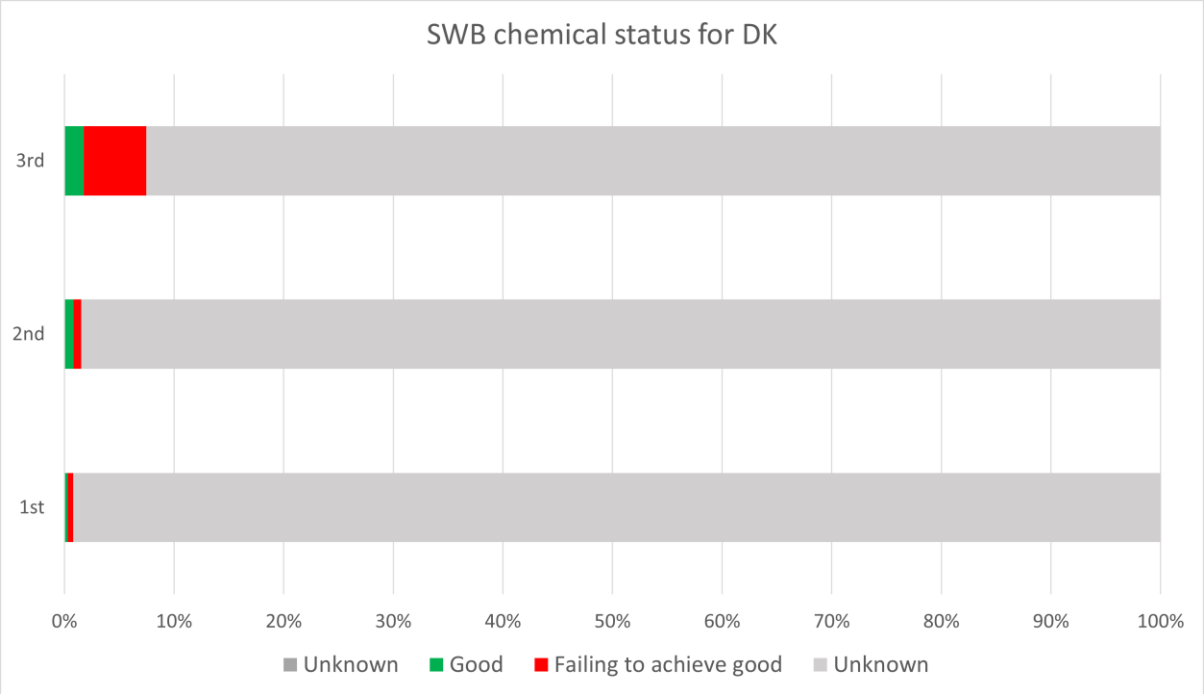
[16] This figure is based on the EEA dashboard. Table 6.9 of the national RBMP mentions 3 coastal water bodies in good status.

[17] SWD(2019) 38, Table 4.1

Of note, the Commission has expressed for some time concerns about the significant gaps in the monitoring systems for surface waters in Denmark, and, relatedly, about the very large number of unknowns in the status of many surface water bodies. In exchanges with the Danish authorities, it transpired that they have recognised that several of these monitoring and related knowledge gaps needed to be addressed. The 3rd RBMPs reflect these efforts, but it appears that many monitoring deficiencies and number of unknown status aspects remain, seriously hindering the possibility for Danish surface waters to achieve compliance with the WFD objectives.

However, even with the current limited knowledge on status, the reported figures on chemical status are reason for concern (see Figure 7 below). 7% is reported to be in good status and 5.6 % in less than good status (corresponding to 136 and 435 surface water bodies). For rivers (water courses), lakes and coastal waters, these percentages are respectively 0.6, 9.3 and 5.5%, for good status (corresponding to 38 rivers, 92 lakes and 6 coastal water bodies); and 2.0, 20.4 and 92.7% for less than good status (corresponding to 133 rivers, 201 lakes and 101 coastal water bodies).[18]

Figure 7: Chemical status of surface water bodies



As regards (observed) good status, there has been very modest progress since the 2nd programming cycle for inland surface waters and a marked deterioration for coastal waters The 2nd RBMPs reported[19] a mere 0.1% of rivers (7 in total) and 0.4% of lakes (3 in total) in good status, while about half of the coastal waters (48.7% amounting to 58 coastal waters) was in good status, whereas for most of other ones (41%) the status was unknown. The observed deterioration in the Danish coastal waters' chemical status matches the overall decline in their ecological status (as reported in section 3.1 above), although there is no information whether this is due to common underlying drivers.

[18] In terms of water bodies with known status, 22 % of rivers is in good status (rather than less than good status), and 31% of lakes, and 7% of coastal waters. For all surface water bodies, it is 23.8%.
[19] See footnote 17.

The Danish authorities classify the chemical status of surface waters at the hand of an assessment that overall includes only 25 priority substances out of the 45 required by the EQSD.[20] The national RBMP document does not provide the reasons for this assessment gap. Without the necessary information on the presence and concentrations of the substances ignored, it is not possible to ascertain as to whether their inclusion would have led to a worse percentage of water bodies failing to achieve good chemical status.

While the traditional RBMP reporting does not inform how often specific priority substances cause surface water bodies to fail good status, these data are publicly available.

In decreasing order of occurrence, these chemicals with observed exceedances concern: mercury (280 water bodies), anthracene (205), lead (88), cadmium (64), nonylphenols (36), BDE (23), PFOS (19), naphthalene (16), octylphenol (1). Two of these substances (mercury and PFOS) are part of the set of substances considered uPBT.

Above all, mercury pollution ranks first. For about one in three water bodies failing good status, mercury is (one of) the reason(s)[21].

A comparison with the most common pollutants in the 2nd RBMP and their occurrence, gives reason for concern. For mercury, in terms of the percentage of all surface water bodies (2.9%), it concerns a huge four-fold increase since the 2nd RBMP, equally worrisome be it an effect of better monitoring or an increase in pollution.

The 3rd RBMP also reports for other priority substances a higher prevalence of causing status failure than before. The second ranking priority substance, anthracene, is just behind mercury in prevalence (2.6%), while in the 2nd RBMP, it was reported for just one water body. Lead and cadmium lead to status failure for about 1% of all surface water bodies, and nonylphenol for about 0.5% (with 88, 64 and 32 water bodies respectively ranking 3rd., 4th and 6th); for all three, this implies a strong increase in the percentage share of water bodies affected. Just as nonylphenol, the priority substances PFOS and naphthalene are found to cause status failure for the first time (in 19 and 16 water bodies, which is about 0.2%). PBDE is found as a cause for status failure for 23 water bodies (about 0.3%). Nickel and benzopyrene are no longer reported as leading to water bodies failing to attain good status, whereas nickel was found in eight water bodies in the 2nd RBMP.

This increases might be partly due to a more accurate monitoring but regrettably are not reflected in the status assessment which are largely unknown.

[20] In subsequent communication, the Danish authorities have confirmed they include in the chemical status assessment: (1) Anthracene, (2) atrazine, (3) benz(a)pyrene, (4) cadmium, (5) chloroform, (6) chlorpyrifos, (7) Di(2-ethylhexyl)phthalate (DEHP), (8) dioxins and furans, (9) diuron, (10) fluoranthene, (11) HBCDD, (12) hexachlorbenzene, (13) isproturon, (14) lead, (14) mercury, (16) naphthalene, (17) nickel, (18) nonylphenol, (19) octylphenol, (20) PBDE, (21) perfluorooctane sulphonic acid (PFOS), (22) simazine, and (23) terbutryn, while assessing (24) DDT and (25) cypermethrin (25) at the hand of alternative matrices.

[21] Mercury would lead to this failure with or without other priority substances crossing the threshold ("one-out-all-out principle")

4.2 Groundwater Bodies: what is their chemical status

Monitoring

The regulation of the chemical state of Denmark's groundwater appears to have improved overall, both as regards the degree of monitoring and the extent of groundwater bodies in good status. However, a solid comparison with the situation in the 2nd RBMPs is marred by the five-fold increase in the number of groundwater bodies (see section 2.2) as well as by late or unclear and incomplete reporting on key aspects in the set of the 3rd RBMPs.

The overall assessment of chemical status is based on a more solid and larger data set than before, incorporating data from pesticide monitoring and water utility controls, and thus including more substances and tests. The assessment includes nitrates, chloride, trace elements (aluminium, arsenic, cadmium, lead, mercury, nickel, and, for the first time, also chromium, copper and zinc), pesticides, environmentally hazardous pollutants (the substance groups BTEXN, chlorinated solvents, cyanides, PFAS, phenols, MTBE, and water-soluble solvents)[22] as well as the drinking water test. The latter is a verification whether in a groundwater body, pollution requires increased treatment of the water abstracted for drinking water or even that abstraction points for drinking water had to be taken out of service.

The RBMP PDFs do not provide the RBMPs much further detail on the chemical assessments which hinders to obtain a clear picture on drivers and trends. Importantly, just as for the other status dimensions, the traditional RBMP reporting does not discuss the confidence of the status assessments It does not say much either about monitoring, grouping methodology, trend and trend reversal analysis, despite an explicit Commission recommendation on this point in the 2nd RBMPs[23]. E-reporting of figures on these elements (submitted well after the 3rd RBMPs' publication) cannot replace such a discussion.

State Assessment

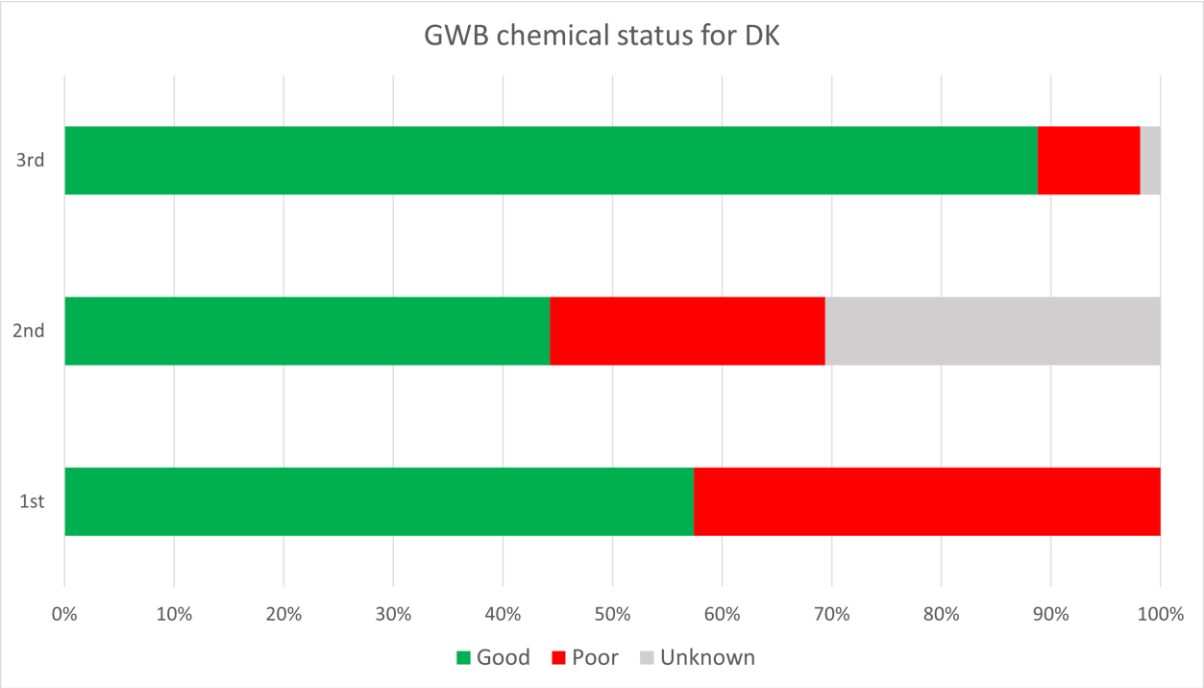
The 3rd RBMPs suggest the chemical state of Danish groundwaters has overall improved, but a solid comparison with the situation in the 2nd RBMP is marred by the five-fold increase in the number of groundwater bodies (due to the overhaul of groundwater body delineation) as well as by late or unclear and incomplete reporting on key aspects.

As depicted in Figure 8, the national RBMP document reports 1820 out of the 2050 groundwater bodies (88.8%) are reported to be in good chemical status in 2021, whereas 192 (9.4%) are below good status and for 38 (1.9%) the chemical status is unknown. As mentioned in the 2nd RBMPs[24], 44.3 % (178 out of 402) of groundwater bodies (as delineated then) were in good status in 2015, 25.1% were failing and 30.6% in unknown status. Even while the overhaul in groundwater body delineation

[22] This list of substances fully covers the 'minimum list of pollutants' from the Groundwater Directive 2006/118/EC, Annex 2, part B, apart from 'saline intrusion' which has been discussed in section 3.4 above in the context of protected drinking water areas.
[23] SWD(2019) 38, pp 19-20
[24] SWD(2019) 38 – p 93

stands of a direct comparison of these percentages, these changes indicate an overall improvement, both as regards the degree of monitoring and the quality of groundwater.[25]

Figure 8: Chemical status of groundwater bodies



Pesticides are the group of substances most responsible for the failure to attain good status: almost two thirds of groundwater bodies in less than good status have too high pesticide concentrations[26]. It is worth noting that a majority of them concern already banned and phased-out pesticides, demonstrating the long-time lag between emission and pollution concentrations.

In contrast, the corresponding percentages for nitrates, the group of trace elements and all environmentally hazardous pollutants combined are only around ten percent. This highlights that the drinking water test has a significant upward effect on the percentage of groundwater bodies in less than good status: pushing it up from 7.5 to 9.4%. This underlines the importance attached to protecting groundwater bodies which are in Denmark the nearly exclusive source of drinking water.

Regrettably, the 3rd RBMPs do not inform about the expected date for achieving good chemical status for all ground water bodies, but the later submitted e-reporting indicates that 86 groundwater bodies (4.2% of the total) are at risk of failing good chemical status by 2027. Neither do the RBMPs provide much detail on the chemical assessments which hinders to obtain a clear picture on drivers and

[26] This proportion as well as the one in the next paragraph are derived from Table 1.4 in the national 3rd RBMP for Denmark. To note, to a large extent, this pesticide pollution concerns a legacy issue: the national RBMP notes that the majority of pesticides found in groundwater bodies, have been banned and phased out already.

trends. They do not say much either about monitoring, grouping methodology, trend and trend reversal analysis, despite an explicit Commission recommendation on this point in the 2nd RBMPs[27].

4.3 What Denmark is doing to combat pollution from agriculture

Agriculture is by far the largest contributor to the discharge of nitrates and phosphorus into surface waters (coastal waters and lakes respectively) and the key source of pesticides pollution.

Measures on nitrates emissions (mainly, but not exclusively from agriculture) have so far not been sufficient to achieve the reductions necessary to achieve good ecological status. Up to now, Denmark has enjoyed extensions on its derogation under the Nitrates Directive, which have allowed to spread abatement measures over time. At the time of the submission of the 3rd RBMPs, Denmark had opted to prolong this derogation which would otherwise expire at the end of July 2024. However, in Spring 2024, well after the submission of the RBMPs, Denmark has decided to relinquish this derogation.

Yet, it has become clear that further substantial reductions are required to stop the built-up accumulation of nitrates in coastal waters and then have natural forces reduce it over time. Now that the possibilities for incremental measures appear to have largely been exhausted, more ambitious measures are needed. The recognition that *inter alia* the required sustained nitrates reduction efforts in this sector can only be successfully pursued with wide political support, has led to a "broad political agreement on the green transition of Danish agriculture," concluded between all major Danish political parties in October 2021.[28] The 3rd RBMPs have taken this 2021 agreement into account, and the upcoming revised 3rd RBMPs are expected to take on board the measures reflecting the so-called "tripartite" agreement "on a Green Denmark," concluded in June 2024 between agricultural associations, nature protection NGOs and municipalities[29]. Reportedly, the agreement includes a focus on nutrient emission reduction through a conversion of farmland into nature area.

It is welcomed that the RBMPs indicate the 'distance to target' for nitrogen reduction, the estimated or envisaged effects of the various types of measures, indicating, importantly, two remaining gaps, namely one between the foreseen and required reductions and one indicating the size of the reductions attributed to hitherto unspecified measures. Figure 9 presents this information in a stack diagram.

The diagram first shows the shortfall of the 2021 political agreement on nitrate reduction and thus also the RBMP's program of measures: by 2027 an annual reduction in nitrogen (mostly nitrates) of about 13 thousand tonne is required to meet the objective of good ecological status in Danish coastal water, but the political agreement concerns a commitment to reduce 10.8 thousand tonne only[30]. It should be noted that these reduction figures are inherently uncertain also because they are contingent on nitrates reduction assumed to be realized already within the baseline, reflecting estimations on respectively autonomous trends in agricultural production as well as the impact of pre-existing policy measures.

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[28] See Denmark's "National Reform Program 2022" (Danish Ministry of Finance, April 2022) and the "Second opinion on the need for reduction of nitrogen in the third RBMP for 2021- 2027, Phase I" (COWI for Danish Ministry for the Environment). The former source focuses much more on the agreement's carbon reduction dimension in view of the envisaged financial support from the EU Recovery and Resilience Facility, requiring regular reporting.

[29] "Agreement on a Green Denmark" (in Danish), June 2024.

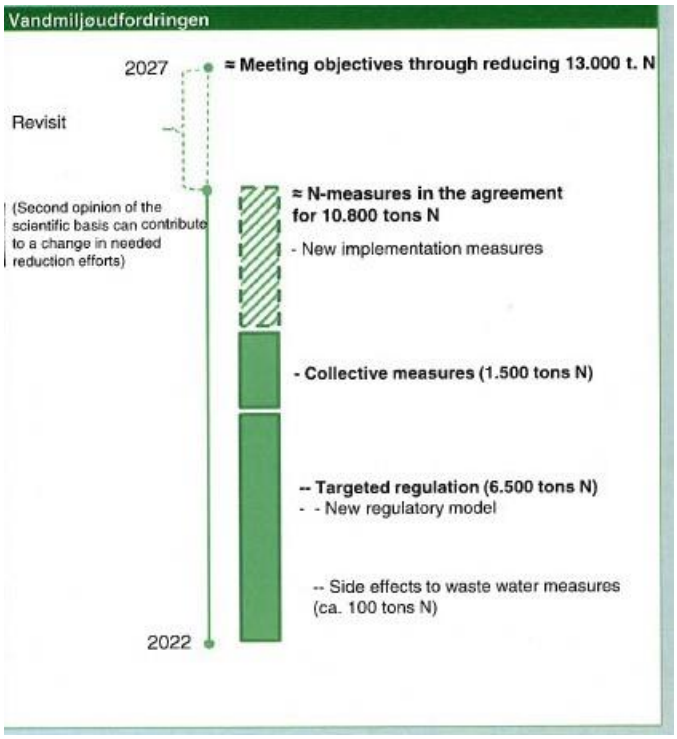
[30] Two remarks are in order. First, this apparent lack of effort may not qualify as lack of technical feasibility, as ground for an exemption under WFD article 4(4), which the RBMP only calls on for a minority of coastal water bodies expected to fail good ecological status in the year 2027; see further section 2.1.8. Second, a modest 0.4 out of the 10.8 Ktonne concerns the reductions achieved by the measures but occurring outside of catchment areas and thus with an ecological effect on Danish waters.

Apart from a small reduction related to wastewater plants, these reductions are supposed to take place in the agriculture sector. The Danish CAP Strategic Plan for 2023-2027 has set out much of the foreseen measures in the 3rd programming period. They allocate 20% of direct payments to voluntary measures by farmers beneficial for the climate, environment and animal welfare. 19% of the rural development funds is reserved for farmers taking multi-annual management commitments benefitting nature and biodiversity, e.g. to double the area for organic farming by 2030 (13% of UAA in 2022)[31] and by afforestation.[32]

However, the diagram reports a further second gap that also need to be addressed with further measures in the upcoming revised 3rd RBMPs. While the policy has set fixed reduction tasks of 6.5 and 1.5 thousand tonne, respectively from[33] "targeted regulation" and "collective measures," the additional 2.8 tonne reduction needs to come from "new implementation measures," that have not yet been defined. The 2021 political agreement foresees decisions on these measures in the course of the year 2024, based on a "second opinion" by experts that has now arrived[34].

Danish authorities have already indicated to come with revised 3rd RBMPs that hopefully address these two gaps in a satisfactory manner.

Figure 9: The stack of nitrate reductions of various measure types vis-à-vis the 2027 reduction objective



[31] File:Organic-area-2022.jpg - Statistics Explained (europa.eu)
[32] At a glance: Denmark's CAP Strategic Plan (europa.eu)
[33] The "targeted regulation" includes measures on cover crops, energy crops, fallow areas, precision agriculture and catch crops. The "collective measures" concern "voluntary" measures on wetland restoration, set-aside of low lying soils, et cetera, with a so-called "environmental guarantee" that in case the resulting impact are below expectation, mandatory buy-outs with financial compensation will be pursued in order to meet.
[34] See footnote 28

Source: mimeo Danish government

In relation to phosphorus pollution from diffuse agricultural sources, the RBMPs include the establishment of wetlands capturing phosphorus, the location of which is informed by risk-maps developed in the previous programming period.

In line with the pesticide strategy 2022-2026, a range of specific measures aims to reduce pesticide emissions into water, such as a pesticide-fee,[35] a pesticide authorisation scheme related to inter alia a broad screening for pesticides in the groundwater, and the assignment of water protection areas around all drinking water supply stations.

4.4 What Denmark is doing to combat pollution from other sectors

In general, the RBMPs do not provide detailed assessments on the gaps in implementation of measures for the pollution coming from other sources than agriculture. In addition, the corresponding policy responses tend to be presented through mere references to basic measures.

However, the reduction of nutrient point source pollution with nutrients has been included in an overall gap assessment of the required nitrogen (and phosphorous) load reductions. There is no reference to the deposition into water of NOx and ammonia emissions into the air, apart from a mention of measures to reduce emissions from ships.

As regards the discharge of wastewater from treatment plants, measures to reduce the pollution from these sources build on the efforts in previous programming cycles. Denmark has a nation-wide authorisation and permitting regime in place to control wastewater point source discharges. There are no thresholds in Denmark below which wastewater discharges do not require registration and permits, while direct discharges to groundwater are prohibited in all RBDs.

For pond farming and aquaculture, the number of facilities and general pollutants are indicated per water district, however, without indicating the quantity of pollution associated with them. As measure, the RBMPs mention a buy-out scheme (to be bought and closed down) for aquaculture firms in inland waters.

While an Annex to the RBMPs lists the measures per priority substances or substance (groups), they are not linked to KTMs, as requested in a Commission recommendation on the 2nd RMBP. In addition, the main drivers of chemical pollution as well as mitigating measures are explained, but often without sufficiently concrete indications on the expected effectiveness of the measures, rendering it impossible to assess the expected reduction of the chemical pollution concentration. To some extent, this seems a reporting issue as much of this information may be retrieved from the e-reporting (which became available well after the RBMP transmission). The same seems to be the case for the information gaps on the type and quantity of pollutants of industrial discharges at local level, and how they are measured and monitored.

[35] In order to incentivise a change to less harmful pesticides, the fee is differentiated at the hand of the active ingredients' toxic potential to harm human health and nature.

The RBMPs stresses continuation with the measures in the previous programming period, which has comprised efforts to extend monitoring, a review in 2020 of the existing permits and licenses for priority substances[36] where their pollution concentrations exceed the thresholds in water bodies, as well as a wide array of actions under national and EU chemical and sectoral legislation.[37]

The description of the new measures appears to focus on the first half of the programming period: setting new and revising existing Environmental Quality Standards (EQS) and addressing the large data knowledge gaps concerning the provenance of the pollution and the chemical status of waterbodies. Reportedly by 2024, this should lead to a comprehensive inventory of pollution sources, and, where EQS exceedances are found, to revision of permits, as long as provided for by standing legislation. The overall ambition level and concrete abatement actions in the second half of the programming period appear to have been left open, as the RBMP refers to a "partnership for substances dangerous for the environment" between authorities and stakeholders to contribute to the development of "an instrument catalogue."

4.5 What Denmark is doing to combat significant pressures – overall assessment of the Programmes of Measures

As Denmark's RBMPs are structured by types of water bodies (coastal, rivers, lakes and groundwater), rather than according to KTMs, they do not provide a clear comprehensive overview of the prioritisation of measures, including their timing, and of the mandatory gap analysis, including gap indicators. The later e-reporting of the relevant descriptive data and figures (submitted well after the RBMP publication) cannot replace such a discussion in the RBMP.

However, the RBMPs seems to provide a clear account of the intervention logic for key challenges, also indicating where measures will not fully close the gap:

- *Nitrogen load in coastal waters:* the RBMPs describe the measures to reduce the nitrogen loads that have led to widespread eutrophication and oxygen depletion in coastal waters. There is an assessment of the annual loads, an estimation of the maximum load compatible with good ecological status and of the resulting need for reduction of the loads. The RBMPs describe a baseline assuming that 75 % of the estimated load reductions planned in the 2nd RBMP period are expected to be implemented. The planned measures on top of the baseline cover around 80% of the estimated of nitrogen reduction need. The RBMP refers to the political commitment to define the additional measures to meet the 2027 nitrogen reduction target (while good status in coastal waters remains out of reach at that time horizon). See further section 2.1.11 above.

- *Wastewater discharge to rivers and lakes*: the RBMPs describe the measures implemented to improve the wastewater treatment and reduce polluting discharges into water courses and lakes, and explicitly consider their effect on top of the measures from the 2nd RBMPs that

[36] According to section 1.2.2 of the national RBMP document, the environmental authorities have carried out this review between April and September 2020 with the aim of pursuing any necessary revisions. The scope and outcome of this exercise are not specified.

[37] Annex 5 to the national RBMP document provides a list of actions which unfortunately lacks specific indications as to whether they concern 2nd or 3rd RBMP measures, and neither of their date of implementation, stringency, individual and overall impact.
Section 7.1.1 outlines the new measures.

have not yet been fully implemented. The nitrogen and phosphorous reductions are considered in the light of the required overall reductions.

- *Water course restoration measures*: the 3rd RBMPs identifies the need to address the situation in 5,500 km of rivers as contribution to the goal / expectation that all rivers will attain good ecological status by 2027. However, they present measures to address the situation in 3,850 km of rivers. The Danish authorities indicate that the remaining gap will be handled by a planned update of the RBMP in 2024, although they may also reassess the size of the gap.

- *Environmentally hazardous chemicals*: While there appear data on discharges, the RBMP does not appear to base the measures on a specific gap assessment in relation to priority substances, river-basin-specific pollutants and pesticides, based on reaching good chemical status by 2027. The widespread lack of chemical status classification appears to constitute a major barrier for such an assessment. Annex 5 to the national RBMP PDF lists the measures from the previous and current programming period (mostly the first half), and the RBMPs propose to further extend the knowledge and monitoring on the pollution sources. This suggests possibly significant gaps in ambition and implementation vis-à-vis the pressures and impacts, in particular in lakes and coastal waters.

- *Groundwater*: Recognising that groundwater pollution poses a long-term challenge (due to slow natural regeneration), the RBMP refers mostly to existing strategies and regulations as providing the basis for ultimately achieving good status for groundwater bodies, including the 2022-2026 Pesticide Strategy as well as basic and supplementary agricultural measures

The RBMPs also list a number of pressures without accompanying information about any specific measures to address them. Examples include harbours and associated dredging, and the dumping of dredging material.

5. Exemptions and economics

5.1 To what extent are exemptions applied in Denmark

Denmark makes a very considerable use of exemptions. The 3rd RBMPs report that only 1816 water bodies out of the total of 9848 (excluding territorial waters) have already attained good status in 2021 (amounting to almost one fifth)[38]. Most of them are groundwater bodies (1801), nearly 90% of the total number of groundwaters[39]. In view of the WFD's general obligation of "no deterioration," these water bodies do no longer need an exemption, as long as there are no temporary deteriorations due to natural causes or *force majeure*, or due to structural changes affecting the water body. The 3rd RBMPs imply that this is indeed so, because they do not report any corresponding exemptions, respectively on basis of WFD article 4(6) and 4(7). For the other water bodies, the 3rd RBMPs present 8745 targets and deadlines.

[38] National RBMP PDF, Table 6.1.
[39] It has not been possible to verify in the EEA dashboards the provided figures on water bodies without an exemption as well as those with an exemption or rather the number of exemptions.
The cited figure implies that there are very few surface water bodies for which both good ecological and good chemical status has been ascertained. A major reason for this is the high percentage of water bodies with unknown chemical status.

The RBMPs report that almost all river water bodies have an exemption of the time extension type (WDF article 4(4)) on the grounds that it is technically only feasible to reach good status (or potential where applicable in this paragraph or the next ones) by the year 2027, the end of the 3rd programming cycle, and not earlier. As there are 6700 of such exemptions reported for a total of 6703 rivers, one may infer that many river water bodies have such an exemption (even taking account of multiple chemical exemption per individual river water body). In the light of the very large share of rivers with unknown chemical status in 2021, it is not entirely clear on what data and assessment the expectation is based that good status will be reached by 2027.

As regards lakes, there are 950 article 4(4) exemptions reported[40], with less than half (423) on the grounds of technical infeasibility and / or disproportionate costs, with the status condition expected to become good by the year 2027. The remainder (527) gets such an exemption on the grounds of natural conditions, as the measures in place are expected to deliver good status only after 2027. The main pressure comes from the emissions of nutrients (nitrogen and phosphorous) and in some cases pesticides and hazardous substances from agricultural run-offs, as well as point source pollution of residential and industrial wastewater discharges and overflows.

Similar to rivers, article 4(4) exemptions are applied for nearly all coastal waters[41], as only 3 out of the 109 coastal water bodies have been found in good status in 2021. In line with the widespread nutrient and oxygen depletion problems as discussed in section 3.1 above, the RBMPs invoke a total of 120 article 4(4) exemptions, 12 of which on the ground of technical feasibility and disproportionate costs (which is expected to be no longer necessary by the year 2027), and the remaining 108 on the grounds of natural conditions (as good status can be attained only well after 2027). Remarkably, only 14 deadline extensions are reported for chemical status, while 101 coastal water bodies are reported to be in poor status.

Article 4(4) exemptions are called upon for 223 groundwater bodies[42] out of a total of 2050 (thus for about 10%). For all but one, this is justified for reason of natural conditions. This is understandable in view of the long-time lags between nutrient and pesticides emission at the source and their filtering into groundwater bodies, which for the deeper ones can amount to multiple decades, implying an impact of emissions dating back from even before the entry into force of the European Nitrates and Pesticides Directives[43].

Article 4(5) exemptions, i.e. lowering the environmental ambitions for the time being, have been applied in a much lower degree. It concerns 31 lakes (amounting to only 0.4 % of the total number of surface water bodies) which have been constructed as the most cost-effective solution to capture excess nutrients,[44] as well as, at most[45], 26 groundwater bodies (1.3 % of their total number) where either contaminated land renders it technically impossible to remove the pollution inflow into groundwater by 2027 or where natural recharge needs more time to reduce too high concentrations of trace element caused by over-abstraction.

[40] The Danish authorities have provided the disaggregation of the figure reported in Table 6.7 of the national RBMP PDF.
[41] All figures are from Table 6.9 of the national RBMP PDF.
[42] All figures are from Table 6.11 of the national RBMP PDF.
[43] Directive 91/676/EEC and Directive 2009/128/EC
[44] National RBMP PDF, section 5.3. It is not clear how this related to the definition of "ecological potential" for these water bodies, which is already lower than ecological status.
[45] 'At most' because there can be more than one exemption concerning chemical status.

Apart from the specifications in the previous paragraphs, the RBMPs do not provide a split between exemptions regarding chemical status (for either groundwater or surface water), ecological status or quantitative status.

It is a source of strong concern that the RBMPs do not provide a specific justification for the invoked exemption grounds for individual water bodies. The Danish authorities have pointed out that this information can be made available by the Danish Environmental Protection Agency, but the reporting issue remains as the RBMPs do not provide a clear, accessible reference to it as required by the law. In line with ECJ jurisprudence on the restrictive interpretation of exemptions, the RBMPs should not give the impression that across-the-board exemptions have been applied for water body categories in their (near) entirety (in this case rivers and coastal waters).

The national RBMP PDF appears to suggest[46] that further minor modifications of "individual lake or wetlands rivers, including adjacent rivers" may cause a temporary deterioration requiring an exemption according to WFD article 4(7). However, it does not provide specific details on the number of these exemptions and their reasons but provides a general reference to the Environmental Protection Agency. Hence, it remains unclear how much these exemptions have been applied, including whether article 4(7) exemptions still apply for ongoing large infrastructure projects.

5.2 Use of economic analysis and water pricing – cost recovery

The economic analysis is provided in a background document to the RBMP(s). It provides a detailed description of the financial costs of the broad water services (drinking) water supply and sanitation service and the cost recovery arrangements. Whether publicly owned or privately owned, each water utility or company is required to set its charges so as to fully recover its costs at municipal level. This implies that the water service charges vary both within and across RBDs, and that the Danish authorities do not lower cost recovery for economic and social reasons. These cost recovery arrangements imply that the RBMPs need not report on the factors mitigating the cost recovery efforts and can relegate details on costs to a background document.

The (updated) economic analysis seems to have two weaker aspects: the long-term outlook of the analysis, specifically on water consumption, and the cost-effectiveness assessment.

There is a rough long term forecast on the demand for drinking water until 2035, basically noting that population growth would increase demand counteracting the ongoing trend of decreasing water consumption per capita, but without a clear conclusion on the net outcome. In addition, there is no long-term scenario on total water consumption in the absence of forecasts on water abstraction by industry and agriculture. It appears that the strong decentralisation in decisions on water services provision would explain the absence in the RBMPs of fully developed water demand and supply long term scenarios as well as a comprehensive forecast of investments. Hence, the emergence of future potential bottlenecks does not seem to have been systematically explored. It also renders the RBMP's indication that water scarcity is not an issue for Denmark, a rather short-term notion, not sufficiently explored for the longer term and the related emerging impacts of climate change in the water sector and corresponding required investments.

[46] National RBMP PDF, section 6.2 "Specific environmental objectives for rivers."

The second major flaw in the economic analysis concerns the unclear reporting on the outcomes of the cost-effectiveness assessment. While the RBMPs declare cost-effectiveness as the guiding principle for the selection of measures, they do not report on the conclusions of the cost-effectiveness assessment of either individual measures or the overall set of measures. The background documents referred to do not clearly identify which measures in the catalogue have been introduced for the first time, which ones are selected and which ones concern (selected) investments.

The RBMPs do not provide a complete account of water pricing and whether they provide "adequate incentive" to efficient water use, but the available information suggests that the pricing policy provides some clear incentives. It concerns full cost recovery at municipal level resulting prices varying with local cost conditions as well as the large variable element in all water charges. However, there is no information as to whether prices vary by broad user sectors (households, industry, agriculture), neither whether unit rates increase with individual water consumption volume, whether there is a social tariff, and whether the "additional taxes" are included in or put on top of cost recovery.

There is no discussion on whether the (broad) water user sectors (households, industry and agriculture) provide an adequate contribution to the (full) cost recovery. This is related to the lack of information on possible sectorial variation in water charges. For example, it is not clear why agriculture[47] is exempt from the water abstraction tax. A positive element, worth highlighting however, is the "tax" on water utilities varying on the degree on leakages in water distribution network.

On a related point, the RBMPs reveal a mixed track record on the application of the polluter pays principle. On the one hand, the reports suggest it is applied because the revenues from (gross) water prices exceed the financial costs basically because of the water abstraction tax, the leakage tax and the tax on organic matter and nutrients from treated wastewater. As the destination of these revenues is not specified, it remains unclear however whether the polluters pay for the broader costs of water services or rather for a part of the Program of Measures or both. On the other hand, the green basis of these taxes is rather weak because they are explicitly not based on an estimate of the environmental and resource costs. The RBMP justifies this some arguments, namely a presumed lack of agreement on the estimation method; that the environmental costs are equal to the costs of the abatement measures (leaving the remainder pollution out of the picture), and that there is no water scarcity and hence no resource costs (not discussing seasonal water stress).

6. WFD recommendations

On the basis of the assessment performed, Denmark should:

1. Denmark is invited to come as soon as possible with the set of revised 3rd RBMPs as announced in the submitted RBMPs, taking on board already, to the extent possible, the recommendations below.

2. Address the identified lack of compliance of achieving good status by increasing the level of ambition and reducing the knowledge and compliance gap as much and as soon as possible until the next reporting cycle.

[47] The RBMPs point out that agriculture covers all the irrigation costs (fed by abstraction from groundwater)

This means in particular, that:

Denmark is invited to adopt and submit as soon as possible the set of revised 3rd RBMPs as announced in the current RBMPs, taking on board already, to the extent possible, the recommendations included in this assessment.

Where the objectives of the Directive for a specific water body cannot be met and exemptions are invoked, Denmark should do so in line with ECJ jurisprudence on the restrictive interpretation of exemptions and better justify the use of exemptions, providing sufficiently detailed justifications at the level of the water body and ensure that their application is regularly reviewed. Importantly, they should explain how an exemption is justified in the case that the status of the water body is not known. This implies:

a) Providing clear, accessible references to the justification for the invoked exemption grounds (for both time extensions and lowered objectives, according to respectively WFD article 4(4) and 4(5)) as well as a clear split on the exemptions invoked for attaining, on the one hand, good ecological status (or potential) or quantitative status, and, on the other hand, good chemical status.

b) Ensuring that the lowering of objectives (Article 4(5) is well documented and justified, in particular as regards disproportionate cost and unfeasibility taking into account the shortcomings in the implementation to date.

c) Recognising that the possibilities for time extensions (Article 4 (4)) are extremely limited and will no longer be allowed after 2027 (except if duly justified for natural conditions).

d) Much more information on the exemptions under Article 4(7) WFD for new projects, including new dams and water transfers. This includes better justifications of the use of these exemptions by detailing cumulative effects, the assessment of better environmental options, and the measures taken to mitigate the adverse impacts of new developments.

3. Continue strengthening the economic dimension of the RBMPs:

a) improve the content of or reporting on the economic analysis as regards its long-term outlook, specifically on water consumption and investments, linking this outlook specifically and extensively with their recent national Climate Adaptation Strategy;

b) Make more and more clearly use of the cost-effectiveness assessments in the selection and prioritisation of measures, including investments;

c) Present in the revised RBMP a long-term planning / forecast of the investments, clearly identifying the timeline, as well as the funding; more generally, identify the source of financing for implementation of all measures;

d) Strengthen the application of the 'polluter-pays principle' and eliminate environmental harmful subsidies whilst ensuring affordable, just and fair pricing mechanisms for all water users in line with Article 9 WFD;

4. Identify and put in place supplementary and other additional measures to reduce existing persistent environmental challenges (pressures) preventing the achievement of good status, and based on robust gap analysis, as those pressures are aggravated by climate change (pollution concentrates in times of less water availability).

This implies, inter alia:

a) Address the explicit shortfall of nitrate reduction measures in the current Program of Measures, based on the measures currently under consideration as follow-up to Denmark's decision to relinquish their derogation under the Nitrates Directive as well as in the framework of the broad agreement on the

green transition in Danish agriculture of October 2021 and the "tripartite agreement on a Green Denmark" of June 2024;

b) Addressing key emerging water pollution issues, such as the observed marked increase of water bodies failing good status because of exceeding pollution concentration for priority substances: mercury or other metals, as well as anthracene, nonylphenol, PFOS and naphthalene. Measures should include adequate permit conditions for industrial installations and addressing the pollution coming from the sewage sludge, storm overflows and wastewater from unconnected houses;

c) Addressing diffuse chemical pollution, e.g. including nutrient and pesticide pollution i including through reducing their use and phasing out unsustainable practices;

d) Take immediate action for pollution problems discovered in water bodies which are currently in unknown chemical status, and for priority substances that have not yet been included in the assessment;

e) Expanding the efforts on the deployment of nature-based solutions including renaturalisation and ecosystem restoration, including the upgrading and expansion of wetland areas as well as measures that bridge the gap between the river restoration targets and the expected results of the current measures.

5. As regards *climate change* start developing a policy response to emerging seasonal droughts and water scarcity, taking a long-term perspective, and with an explicit Drought Management Plan which includes the identification of surface water bodies as candidate water abstraction source as well as adaptation measures in all major water user sectors and further nature-based solutions.

6. Step up the efforts to meet the requirements set out in the WFD as regards monitoring, assessment, data management and reporting. In particular, Denmark should:

   a) identify the main causes of the widespread lack of chemical status classification for surface waters and take the appropriate measures to address this lack as much as possible within the current programming cycle;

   b) include all priority substances in the assessment of chemical status (or explain why the substances left out would not have a material impact on the quality of Danish surface waters);

   c) For the water bodies without a known status, explain the robustness of the reported expected date of achieving good status, and also why the 31 lakes built for nutrient removal are not included in the reported number of artificial and heavily modified water bodies.

7. In cooperation with the Commission and the EEA, ensure timely submission of the RBMPs in line with the WFD requirements and fully covering all topics. To meet the reporting requirements in a more transparent manner, the RBMPs should refer more clearly to background documents, to publicly available data, and to the electronic reporting, coupled with explanations in the RBMPs on the regulatory aspects and assessments. For future cycles, Denmark should ensure that they make the electronic reporting available about the same time as the RBMPs and that they are fully consistent with the submitted RBMPs and provide a more extensive coverage of the important technical details.

SECTION B:

FLOODS DIRECTIVE

7. Flood risk management under floods directive (FD)

The Directive requires each Member State (MS) to scan its territory for flood risks, assess the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity, identify the significant risks, map the flood extent and the potential adverse consequences, and take measures to reduce the flood risk. These activities are reflected in (a) the preliminary flood risk assessments, or PFRAs (including the identification of areas of potential significant flood risk, or APSFRs), (b) the preparation of flood hazard and risk maps, or FHRMs, and (c) the establishment of flood risk management plans, or FRMPs. The preliminary assessments, mapping and planning for flood risk are repeated in six-yearly cycles.

There are four Units of Management (UoMs) in Denmark, which are the same as the Water Framework Directive's River Basin Districts (RBD). Fluvial and sea water floods are considered as potentially significant sources of flooding in Denmark. Denmark has designated in two of its UoMs (for which UoM level FRMPs were prepared) 14 Areas of Potential Significant Flood Risk (APSFRs)[48].

7.1 Flood hazard and risk maps

Denmark is using a national web-GIS viewer[49] for their FHRMs. FHRMs were prepared at the national level and show the whole country. Maps for floods with low probability (1/100 years for fluvial and 1/1 000 years for coastal), with medium probability (1/50 years for fluvial and 1/100 years for coastal) and with high probability (1/20 years) are provided. Flood extent is shown on all maps. Water depth is shown on all maps. Number of inhabitants is shown on all maps. Likewise, type of economic activity is shown on all maps. There are neither maps with IED installations available on the national web-GIS portal nor is this mentioned in the methodology report. However, the information has been reported to EIONET[50]. Potentially affected protected areas identified in Annex IV(1)(i), (iii) and (v) to Directive 2000/60/EC are shown in the FHRMs.

In terms of changes of contextual information (i.e. the way in which information about the maps is conveyed to the public) since the first FHRMs, the following improvements were made: 1) address level information of critical infrastructure and potentially polluting installations are included instead of only grid-based information as was the case before, 2) the descriptions and order of data layers on the web-GIS portal is more concise, i.e. information is easier to find, and 3) additional APSFRs and expanded APSFR areas were included.

In terms of changes in methodologies used to prepare flood hazard maps since the first FHRMs, the main differences are: 1) for fluvial floods, since the first FHRMs, the scenario's probabilities were changed from 1 000 years (low probability) and 100 years (medium probability) to 100 years for low probability and 50 years for (medium probability). No explanation for this change was found in the assessed documents (the FD mentions a 100-year return period as the medium scenario), and 2) data series used as input were updated to also include recent years since the first FHRMs were

[48] The main observed changes are that additional APSFRs were identified and included and for two exiting APSFR the area was expanded. This led to additional and expanded FHRMs in the GIS web-viewer. For all FHRMs the same approach was used to generate the maps, so for all APSFRs, FHRMs of the same quality and detail exist.

[49] https://kms.maps.arcgis.com/apps/webappviewer/index.html?id=63f098e64248465abbd7a3283e5e2707 (accessed: 2023.08.18)

[50] Denmark clarified that IED and IPPC installations are shown in the web-GIS portal for each APSFR in a layer called "polluting organisation" (DK: *Forurenende virksomheder*).

developed. Scenarios are adapted accordingly i.e., 2019 as base year, 2065 and 2115 for future scenarios.

In terms of changes in methodologies used to prepare flood risk maps since the first FHRMs, the methodologies and approaches used were largely the same and are based on an approach developed by a research project in Germany. The approach was further refined i.e., by considering losses to airports in the category infrastructure and losses for businesses. The total risk is displayed in the second FHRMs as economic damage in Danish currency per grid-cell. The input data to calculate damage costs per unit damaged or per grid cell was updated so that the damage costs are displayed in 2019 values.

Climate change in the second FHRMs

As regards the consideration of climate change effects in the preparation of flood hazard and risk maps, reference is made to section 3.7 on 'adaptation to climate change'.

7.2 Flood risk management plans

Objectives and measures

The UoM-level FRMPs (which are summary documents of the municipal FRMPs) can be downloaded from a webpage[51] of the Ministry of Environment's web portal for the FD. The UoM-level FRMPs can also be found on the front page of the web portal[52].

Objectives are recommended at national level for inclusion in Denmark's FRMPs, which are prepared at municipal level. All three municipal FRMPs assessed incorporate these objectives and set detailed sub-objectives.

Objectives recommended at national level call for the reduction of potential adverse consequences, as do more detailed sub-objectives in all three municipal FRMPs assessed. Sub-objectives in all three municipal FRMPs assessed include non-structural initiatives, such as strengthening emergency responses for flood events. The general objective recommended at national level refers to the reduction of adverse consequences of floods for human health, the environment, cultural heritage and economic activities. Each of the three municipal FRMPs assessed includes objectives related to the protection of citizens. In terms of the economy, the three municipal FRMPs address this topic indirectly, for example by making businesses aware of their flood risk and their options to reduce it. Reduction of adverse consequences for the environment is incorporated in the general objective recommended at national level and is indirectly addressed by objectives in the FRMPs (e.g. the Copenhagen FRMP has an objective to address wastewater treatment). While incorporated in the

[51] https://oversvommelse.kyst.dk/planperioder/planperiode-2016-2021/plantrin-3 This website also contains national templates and guidance to support municipalities in preparing their FRMPs, notably:
- Guide for the preparation of FRMPs
- MS Word template for preparing new FRMPs
- MS Word template for reassessing and updating FRMPs
- Action/measures planning table in Excel
- A risk management plan checklist
- FAQ on FRMPs

[52] https://oversvommelse.kyst.dk/

general objective recommended at national level, the protection of cultural heritage is not included in the objectives of the municipal FRMPs assessed.

Denmark has reported measures to EIONET. Denmark's reporting to EIONET includes prevention, protection and preparedness measures, as do the three municipal FRMPs assessed. All three municipal FRMPs assessed contain tables listing measures and priorities, and the UoM-level FRMPs list the total number of measures across all municipal FRMPs (these totals do not match the numbers that Denmark reported to EIONET).

Denmark indicates the priority of all measures reported to EIONET. In its reporting to EIONET, Denmark's measures are divided between all five possible categories of priority: critical priority (36 measures, 6 % of the total), very high priority (203 measures, 34 %), high priority (142 measures, 24 %), moderate priority (156 measures, 26 %), and low priority (55 measures, 9 %). All three municipal FRMPs assessed contain tables listing their measures and the priority of each on a three-point scale.

Denmark's two UoM-level FRMPs report on the status of completion of measures in the first FRMPs. The second FRMPs state that the municipalities will track the progress of their measures; they do not, however, identify clear targets or indicators for assessing whether measures have been implemented. None of the FRMPs assessed (either at UoM or municipal level) provide a baseline against which progress can be monitored and assessed.

Denmark reported (to EIONET) the following categories of completion for its measures: Completed (170 measures, 29 % of all measures); Ongoing construction (six measures, 1 %); Ongoing recurrent (e.g. maintenance works) (15 measures, 3 %); In preparation (304 measures, 51 %); Not started (77 measures, 13 %); Abandoned/interrupted (20 measures, 3 %).

The highest share of completed measures is in protection measures, at 46 measures completed (46 % of protection measures), compared to 24-26 % of the prevention, preparedness and 'other' measures. For both prevention and preparedness measures, 60 % were reported in preparation, as were 51 % of 'other' measures. Between three and eight measures of each measure type were reported as abandoned/interrupted, with the largest number and share in protection measures (eight measures, 8 % of all protection measures). T

he distribution of progress is similar across the two UoMs. In each, the greatest share of measures are in preparation (60 % or 193 measures for Jutland and Funen (DK1); 41 % or 111 measures for Seeland (DK2)). The Seeland UoM has a slightly higher share of completed measures (37 %, 100 measures) compared to Jutland and Funen (22 %, 70 measures).

As noted earlier, Denmark's two UoM-level FRMPs provide a different number of measures than reported to EIONET. These plans report on the status of completion of measures in the first FRMPs. They indicate that 10 % (13 of 30) of measures in the Jutland and Funen UoM (DK1) and 5 % (6 of 125) of the measures in the Seeland UoM (DK2) were cancelled. This information cannot be compared to Denmark's reporting to EIONET, which identified only 28 measures for its first FRMPs.

Denmark has not reported the costs of its measures to EIONET. Only one of the three municipal FRMPs (Odense municipality) provides information on costs, and not for all of its measures. The five FRMPs assessed do not specify how their measures should be funded. There is an indication in the Copenhagen FRMP that at least some measures are to be financed by combined public-private financing.

Neither the municipal FRMPs that were assessed nor the two UoM-level FRMPs report using CBA.

Both Denmark's reporting to EIONET and the FRMPs reviewed include natural water retention measures (NWRMs). FRMPs assessed refer to the WFD objectives, with the Odense FRMP noting synergies for one measure and the Slagelse FRMP stating that projects will be assessed for potential impacts. However, they provide few other details on how WFD objectives are considered.

Spatial planning and land-use measures are included in the measures Denmark reports to EIONET, as well as in the FRMPs assessed.

Nature conservation (especially at Natura 2000 sites) is considered in developing the FRMPs and in specific measures reported to EIONET and listed in the three municipal FRMPs assessed. The second FRMPs assessed do not provide detail on progress towards the achievement of the objectives in the first FRMPs, though they state that such an assessment should be made (in each municipal FRMP it is at least briefly described the status of objectives set in the first FRMP).

Governance

Denmark reported that neither UoM featured coordination at international level, since Denmark, although sharing a border with Germany, no APSFR has been identified as being shared with a neighbouring Member State. The FRMPs assessed do not have any information on transboundary cooperation.

The two UoM-level FRMPs levels state that 'all the municipalities have a focus on the fact that risk management affects many stakeholders, including citizens, and they all plan for involvement during the implementation of the plan. Furthermore, all municipalities have had their risk management plan in six months of consultation before it was adopted, where several municipalities held public meetings etc. along the way'[53]. The three municipal FRMPs assessed state that the draft plans were provided for consultation for six months. The Copenhagen and Odense FRMPs do not include details on how the consultation was carried out. The Slagelse FRMP mentions public meetings and dialogue meetings with relevant stakeholders in the consultation period.[54]

Consideration of climate change

As regards the consideration of climate change effects in the preparation of flood risk management plans, reference is made to section 3.7 on 'Adaptation to climate change' above.

Progress identified in the second FRMPs

The second FRMPs assessed followed a similar structure based on national guidance. While the first FRMPs presented FHRMs only for 100-year return floods, the second FRMPs assessed provide more maps, including some related to flash floods.

Nearly all of Denmark's second municipal FRMPs explicitly address the reduction of adverse consequences and more generally the risk of flooding, an issue found in the objectives of only some of the first FRMPs assessed.

[53] UoM-level FRMPs, p. 4.
[54] Slagelse FRMP, p. 26.

The second FRMPs provide details on the process to monitor measures.

On coordination with RBMPs, the second FRMPs provide more information. Two of three municipal second FRMPs assessed (Copenhagen and Odense) state that the effects of some measures were assessed for their WFD objectives, while the third plan assessed (Slagelse) indicates that this will be done.

Also, the second FRMPs assessed provide further information on how nature protection is addressed by measures. In addition, it appears from Denmark's reporting that there is greater attention to nature-based solutions in the second FRMPs.

It continues to be unclear in two of the three municipal FRMPs assessed how stakeholder input was used – the exception is the Odense FRMP, which describes how consultation responses were addressed. Some municipal FRMPs include measures to address floods in the context of climate change or indicate an intention to integrate flood and climate change plans more closely in the future.

8. FD recommendations

On the basis of the assessment performed, and in addition to the progress already achieved, Denmark should:

- link the flood risk maps for pluvial and sewerage flooding produced by the municipalities to the national web-GIS portal;
- provide detail on how the FHRM was used in the choice of objectives and measures of the FRMP;
- set more specific objectives in the FRMP and where possible linked to quantitative indicators and be timebound. An assessment of the progress made towards the achievement of the objectives should be included in the FRMP;
- provide information on the costs, budgets and funding sources for measures
- provide more information on the prioritisation of measures in the FRMP;
- provide information on the role of insurance in flood risk management, since provisions appear to be in place;
- depending on the nature of the measures, the subject the FRMP to a Strategic Environmental Assessment, next to the screenings carried out at the municipal level;
- set out a clear overview of the use of Cost Benefit Analysis and the methodology behind it in the FRMP;
- better coordinate the discussion on the impact of climate change between the various FRMPs and national/sub-national adaptation plans or strategies;
- include information on transboundary cooperation in the FRMP in view of potentially worse future flood risk conditions even if the cooperation is basic for the time being;

- provide detail on the public consultation and active stakeholder involvement in the FRMP, in particular, the comments received, and how they were taken into account;
- where appropriate, consider flow velocity or relevant water flow in the FHRM and flood conveyance routes in the FRMP, as these are relevant to emergency response.