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European waters – assessment of status and pressures 2018

EEA 2018 State of Water report

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Contents

Executive summary

Key messages

- This report presents results on the status of EU waters based on the second River Basin Management Plans (RBMPs). It shows the pressures that continue to affect the quality and quantity of water and what progress has been achieved during the first RBMP cycle (2009-2015).
- European waters remain under pressure from water pollution, over-abstraction and structural change from a range of human activities. These pressures often act at the same time and affect the good functioning of ecosystems, contribute to biodiversity loss, and threaten the valuable benefits water provides to society and the economy.
- Marked efforts have been made by Member States to improve water quality or reduce pressure on hydromorphology. Some of the measures have immediate effect; others will result in improvement in the longer run. Results are usually visible at the level of individual quality elements or pollutants but often do not translate into an overall improved status.
- Of the different types of waters recognised by the Water Framework Directive across Europe, groundwaters generally have the best status. Good chemical status has been achieved for 74 % of them, while 89 % achieved good quantitative status.
- For surface waters (rivers, lakes, transitional waters and coastal waters) the percentage in good ecological status is around 40 %, while only 38 % of surface waters are in good chemical status.
- Compared to the first RBMP, this results in a marginal improvement in the overall quality status because if one of the elements fails, the entire water body quality fails (one-out-all-out rule). The same rule applies to chemical status: if one priority substance poses a risk, the chemical status is identified as bad.
- In most Member States, a few priority substances account for much of the poor chemical status. Improvements for individual substances show that Member States are making progress in tackling sources of contamination. The substance most commonly causing failure in good chemical status is mercury. If mercury and other ubiquitous priority substances are not considered, only 3 % of surface water bodies would fail to achieve good chemical status.
- Since the previous RBMPs were published, our knowledge of Europe's waters has grown significantly, providing a better understanding of the status, the pressures causing failure to achieve good status, and the measures implemented to generate improvement.

Background

The main aim of the European Union's (EU) water policy is to ensure that a sufficient quantity of good quality water is available for people's needs and for the environment. Since the first water directives in the 1970s the EU has worked to create an effective and coherent water policy. The Water Framework Directive (WFD), which came into force in 2000, establishes a framework for the assessment, management, protection and improvement of the quality of water resources across the EU.

Since December 2015, EU Member States have been publishing the second River Basin Management Plans (RBMPs) for achieving the environmental objectives of the WFD. They are an update of the first RBMPs that were published in 2009. In summer 2017, 25 Member States had reported into Water Information System for Europe (WISE). The WISE-WFD database includes data from the first and second RBMPs. In 2018, the European Commission will publish its report on the assessment of the second RBMPs and will start the process of evaluating the Water Framework Directive[1]. To accompany and inform this process, the EEA has produced this report on the 'State of Europe's water' along with presentation of more detailed WFD results in WISE.

[1] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184_en

Improvements in monitoring and assessment

The results show that with the second RBMPs the quantity and quality of available evidence on status and pressures has grown significantly. Many Member States and River Basin Districts have invested in better or new ecological and chemical monitoring programs with more monitoring sites, more quality elements and more chemicals. Surface waters and groundwater have been monitored at over 130 000 monitoring sites over the past six years. Many more assessment methods for different quality elements have also been developed and intercalibrated[2]. This has resulted in a marked reduction of water bodies with unknown status and a clearly improved confidence in status assessment in the second RBMPs, as well as a better understanding of the status ecological, chemical and quantitative status, the pressures causing failure to achieve good status, and the needed measures.

Ecological status of surface waters

Ecological status is an assessment of the quality of the structure and functioning of surface water ecosystems, including rivers, lakes, transitional and coastal waters. It shows the influence of both pollution and habitat degradation. Ecological status is based on biological quality elements, and supporting physico-chemical and hydromorphological quality elements.

During the first RBMP cycle (2009-2015), Member States have introduced better or new ecological monitoring programs with more sites and more quality elements. Many new assessment methods for biological quality elements have been developed. Overall, this has reduced the proportion of water bodies in unknown ecological status from 16 % to 4 %, and has improved the proportion of water bodies classified with high or medium confidence from one third in the first RBMPs to more than half in the second RBMPs. Higher confidence is also ensured through intercalibration of good ecological status. Since 2008, the number of intercalibrated biological assessment methods has generally increased three-fold for rivers, lakes and coastal waters making results much more comparable than for the first RBMP.

In the second RBMPs more than two thirds of all water bodies are classified with at least one biological quality element. For most of the remaining water bodies status assessment is based on supporting physico-chemical and hydromorphological quality element. All in all, these improvements mean that the ecological status classification results are now a better interpretation of the general health of the water environment.

Overall, 40 % of the surface water bodies have good or high ecological status, with lakes and coastal water bodies having better status (ca. 50%) than rivers and transitional waters bodies (ca. 30-35%). The northern countries show a high proportion of water bodies in high or good ecological status. In contrast, the central European river basin districts, as well as some of the southern RBDs show the highest proportion of water bodies not achieving good ecological status or potential. There is improvement in the ecological status of some of the biological quality elements, while the overall ecological status has not improved since the first RBMPs.

For surface water bodies, the main significant pressures are hydromorphological pressures (41 %), atmospheric deposition (40 %) and diffuse source pollution (37 %), followed by point source pollution (18 %) and water abstraction (7 %). The main impacts on surface water bodies are nutrient enrichment, chemical pollution and altered habitats due to morphological changes.

[2] EC 2008: Water Note 7: Intercalibration: A common scale for Europe's waters http://ec.europa.eu/environment/water/participation/pdf/waternotes/water_note7_intercalibration.pdf

Chemical status of surface waters

The WFD aims to ensure good chemical status of both surface water and groundwater bodies across Europe. For surface waters, this goal is defined by limits on the concentration of certain pollutants relevant across the EU, known as priority substances. Good chemical status means that the concentrations of all priority substances do not exceed the environmental quality standards (EQS).

Compared to the previous assessment results in first RBMPs there have been marked improvements in the monitoring and classification of chemical status with a clear reduction in water bodies in unknown chemical status.

The percentage of surface water bodies in good chemical status within the EU is 38 %, while 46 % are not achieving good chemical status and 16 % of the water bodies have unknown chemical status.

In many Member States, relatively few substances are responsible for failure to achieve good chemical status. Mercury causes failure in a high number of water bodies. Omitting widespread pollution by ubiquitous priority substances including mercury, the proportion in good chemical status improves to 81 % of all water bodies, and 3 % do not achieve good chemical status and 16 % have unknown chemical status. The main pressures leading to failure of good chemical status are atmospheric deposition and discharges from urban waste water treatment plants.

Since the first RBMPs were published, Member States have made progress in tackling priority substances, significantly reducing the number of water bodies failing standards for substances such as several priority heavy metals (cadmium, lead, and nickel) and pesticides.

Chemical and quantitative status of groundwater

The WFD requires Member States to designate separate groundwater bodies and ensure that each one achieves "good chemical and quantitative status". To meet the aim of good chemical status, hazardous substances should be prevented from entry into groundwater and the entry of all other pollutants (e.g. nitrate) should be limited to prevent pollution.

Good quantitative status is to be achieved by ensuring that the available groundwater resource is not reduced by the long-term annual average rate of abstraction. In addition, impacts on surface water linked with groundwater or groundwater dependent terrestrial ecosystems as well as saline intrusions should be avoided.

Knowledge and information on assessing groundwater status have increased over the first RBMP cycle with the proportion with unknown chemical status and quantitative status decreasing to low levels of 1 %, respectively.

In the EU, 74 % and 89 % of the area of groundwater bodies is in good chemical and quantitative status, respectively. Since the first RBMPs were published, there has been small improvement in groundwater chemical and quantitative status.

Agriculture is the main driver causing failure of good chemical status to EU groundwater, causing diffuse pollution by nitrates and pesticides. Other significant sources are discharges not connected to a sewerage system and contaminated sites or abandoned industrial sites. Nitrate is the main pollutant affecting over 18 % of the area of groundwater bodies. In total 160 pollutants caused failure to achieve good chemical status. Most pollutants were reported in few Member States and only 15 pollutants were reported by five or more Member States.

Water abstraction for public water supply, agriculture and industry is the main significant pressure causing failure of good quantitative status.

Overall status and overall progress since the first RBMPs

According to the WFD, EU Member States should aim to achieve good status in all bodies of surface water and groundwater by 2015 unless there are grounds for exemption. Only in this case may achievement of good status be extended to 2021 or 2027 or less stringent objectives be set. Achieving good status involves meeting certain standards for the ecology, chemistry, and quantity of waters. In general, good status means that water shows only a slight change from what would normally be expected under undisturbed conditions (i.e. with a low human impact).

Compared to the first RBMPs, there are for all four measures of status[3] a higher proportion of water bodies in good status in the second RBMPs. However, there are also for surface waters a higher proportion of water bodies in less than good status. Both the changes in proportion of good and less than good status are due to improved knowledge of the water environment (i.e. fewer water bodies have unknown status).

Ecological status has improved for many biological quality elements from the first to the second RBMPs. For chemical status, a very low proportion of surface water bodies (3 %) is reported to fail to achieve good status, if ubiquitous substances, especially mercury, is discounted, and only few priority substances are causing poor chemical status (mainly heavy metals like cadmium, lead and nickel). Improvement in status for several priority substances shows that Member States are making progress in tackling sources of contamination.

There are several possible explanations of the limited improvements in overall status from the first to the second RBMPs.

- First, additional biological and chemical monitoring was put in place after 2009 and the classification methods were improved and in some cases the standards were tightened.
- Second, for some water bodies some quality elements have improved in status, but there has been no improvement in the overall status.
- Third, the second RBMPs generally show status classification up to 2012/13 and at that time, many measures were only in the process of being implemented and there may be a lag time before the pressures are reduced and there are improvements in status.
- Finally, some pressures may have been unknown in 2009; and the measures implemented may not have been sufficient and as effective as expected at reducing all the pressures.

Pressures causing failure to achieve good status

The results from the second RBMPs show that European waters remain under multiple pressures from water pollution, over-abstraction and structural change from different human activities. These pressures affect the good functioning of water-related ecosystems, contribute to biodiversity loss, and threaten the long-term delivery of ecosystem services and benefits to society and the economy. To ensure sustainable management of water resources, better policy implementation will be needed to improve the coherence between economic, societal and environmental goals.

There are ample possibilities for improving water management to achieve the objectives of the WFD, through stringent and well-integrated implementation of existing legislation and introducing supplementary measures that reduce the pressures causing failure to achieve good status. In the following paragraphs, the challenges in water management and the measures needed to progress towards good status are summarized.

[3] Surface water ecological and chemical status; and groundwater chemical and quantitative status.

Pollution and water quality

A range of pollutants in many of Europe's waters threaten aquatic ecosystems and may raise concerns for public health. Reducing pollution to meet the objectives of the WFD requires that several other directives and regulations are implemented.

Over the past few decades, clear progress has been made in reducing emissions from point sources. Implementation of the Urban Waste Water Treatment Directive (UWWTD), together with national legislation, has led to improvements in waste water treatment across much of the European continent. These positive trends reflect increased connections to sewers, improvements in waste water treatment and reducing some substances at the source.

Agricultural production is a major source of diffuse pollution, mostly associated with excessive emissions of nutrients and chemicals such as pesticides. Further drivers include rural dwellings, run-off from urban areas, and forestry. EU action on curbing diffuse nutrient pollution has a long history. A large number of measures are currently used by Member States, including farm-level nutrient planning, fertiliser standards, appropriate tillage, nitrogen-fixing and catch crops, buffer strips, and crop rotation. During the last decades, mineral fertilizer uses and nutrient surpluses of agricultural origin have progressively decreased in the EU and the average nitrate concentration declined by 20 % in European rivers between 1992 and 2012, while groundwater nitrate concentrations in 2011 had almost returned to the 1992 level.

Contamination caused by hazardous substances is a major environmental concern in European waters and consequently is addressed by a number of EU legislative measures and policies. Reducing hazardous substances in water requires strong implementation of the current legislation, but also the adoption of more sustainable production and use of chemicals, both in Europe and beyond.

Improved efforts to retain these chemicals in waste water treatment plants with better waste water treatment should go hand in hand with clear efforts to reduce them at source, by raising consumer awareness and adjusting consumption as well as longer term initiatives, such as those towards a non-toxic environment and a circular economy.

Although considerable success has been achieved in reducing the discharge of pollutants into Europe's waters in recent decades, challenges remain for urban and industrial waste water and pollution from agricultural sources. The implementation of existing EU water emission legislation, including the UWWT, Nitrates and EQS directives in all Member States, will improve the quality of water. Waste water treatment must continue to play a critical role in the protection of Europe's surface waters, and investment will be required to upgrade waste water treatment and to maintain infrastructure in many European countries. In some regions, diffuse pollution from agriculture in particular remains a major cause of the poor water quality and measures to tackle agricultural pollutants may be required.

Hydromorphological pressures

For decades, humans have altered European surface waters (straightening and channelization, disconnection of flood plains, land reclamation, dams, weirs, bank reinforcements, etc.) to facilitate agriculture, produce energy and protect against flooding. These activities have resulted in damage to the morphology and hydrology of the water bodies.

In the second RBMPs, hydromorphological pressures are the most commonly occurring pressures on surface water bodies affecting 41 % of all surface water bodies. In addition, 17 % of European water bodies have been designated as heavily modified (13 %) or artificial water bodies (4 %).

The WFD requires action in those cases where the hydromorphological pressures affect the ecological status, interfering with the ability to achieve the WFD objectives. If the morphology is degraded or the water flow is markedly changed, a water body with good water quality will not achieve its full potential as aquatic ecosystems.

The restoration of hydromorphological conditions includes:

- measures related to river continuity with removal of obstacles and the installation of fish passes;
- measures focused on restoration of aquatic habitats, such as improving physical habitats;
- sediment management that ensures sediment transport along the length of the river;
- reconnecting backwaters and wetlands to restore lateral connectivity between the main river channel, the riparian area and the wider floodplain;
- natural water retention measures that restore natural water storage, for example by inundating flood plains and constructing retention basins;
- restoring the natural water flow regime such as setting minimum flow and ecological flow requirements[4]; and
- developing master plans or conservation plans for restoring the population of threatened fish species.

Implementation of measures

To meet the objective of good status, the WFD requires an assessment of all the pressures in a river basin, and the development of a Programme of Measures (PoMs) to tackle them. The first RBMPs contained a large number of diverse measures. By now, many of the several thousand individual measures in the first RBMPs will have been completed. However, some measures have been delayed or even not started mainly due to funding constraints, while other measures have been difficult to implement.

Integrated water management

Sustainable and integrated water management plays a substantial role in the UN 2030 Agenda for Sustainable Development, the EU 7th Environment Action Programme (7th EAP), and the achievement of the EU's Biodiversity Strategy. Three areas are offering substantial opportunities to improve implementation and support to the achievement of WFD objectives and they are highlighted below.

Protection of Europe's aquatic ecosystems and their services

Concern has grown over the past decades about the rate at which biodiversity is declining and its consequences for the functioning of ecosystems and the services they provide. Many opportunities exist for improving implementation and maximizing synergies between environmental policies relevant for the protection of the water environment. In particular, EU policies on water and the marine environment, nature and biodiversity are closely linked, and together they form the backbone of environmental protection of Europe's ecosystems and their services.

The use of management concepts such as the ecosystem services approach and ecosystem based management can offer ways to improve coordination by setting a more common language and framework to evaluate trade-offs between the multiple benefits that healthy water bodies offer.

Restoring degraded water ecosystems

Nowadays, water management increasingly includes ecological concerns, working with natural processes. This is in line with the objective of the 7th EAP 'to protect, conserve and enhance the Union's natural capital'. It is also consistent with Target 2 of the EU's Biodiversity Strategy that *aims*

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[4] CIS guidance no. 31: Ecological flows in the implementation of the Water Framework Directive. http://ec.europa.eu/environment/water/water-framework/facts_figures/guidance_docs_en.htm

to ensure maintenance of ecosystems and their services by establishing green infrastructure and restoring at least 15 % of degraded ecosystems by 2020.

Restoring aquatic ecosystems such as 'making room for the river', river restoration or floodplain rehabilitation, 'coastal zone restoration projects' and integrated coastal zone management has multiple benefits for the water ecosystems. Synergies between policies can be important in restoring aquatic ecosystems.

Integration of water aspects into sector policies

From the assessment of status, and in particular from the assessment of pressures and impacts, it is evident that the driving forces behind achievement or non-achievement of good status are activities in sectoral areas like agriculture, energy or transport. This integration throughout the river basin is enhanced, for example, by better cooperation between competent authorities, better involvement of stakeholders and early participation of the public.

1. EEA State of Water assessment and EU water policy context

Key messages

- The Water Framework Directive requires EU Member States to achieve good status in all bodies of surface water and groundwater, in principle by 2015. Achieving good status involves meeting certain standards for the ecology, chemistry, and quantity of waters.
- The data reported for the second River Basin Management Plans (RBMPs) show that the quantity and quality of available evidence on status and pressures has grown significantly due to significant investments by Member States in monitoring and assessment. As an indication, surface waters and groundwaters have been monitored at over 130 000 monitoring sites over the past six years.
- This has resulted in markedly improved RBMPs, providing a better understanding of the ecological, chemical and quantitative status, the pressures causing failure to achieve good status, and the required measures.
- The EU Member States have reported status and pressures for 13 400 groundwater bodies and 111 000 surface water bodies: 80 % of them are rivers, 16 % lakes and 4 % coastal and transitional waters.
- The delineation of about 90 % of the surface water bodies were unchanged from the first to the second RBMPs. Around 70 % of the groundwater bodies (by area) were not changed
- The results in this report present a European overview of the data reported by the second RBMPs and the status and pressures affecting Europe's waters. Caution is needed when comparing results between Member States and between first and second RBMPs, as the results can be significantly affected by the methodology applied by individual Member States.

1.1 Background

The main aim of the European Union's (EU) water policy is to ensure that a sufficient quantity of good quality water is available for people's needs and for the environment. Since the first water directives in the 1970s the EU has worked to create an effective and coherent water policy. The Water Framework Directive (WFD)[5], which came into force in 2000, establishes a framework for the assessment, management, protection and improvement of the quality of water resources across the EU. In addition, objectives for water from the European Union's 7th Environment Action Program (7th EAP)[6], together with those from its Biodiversity Strategy 2020 and the 'Blueprint to safeguard Europe's water resources', are key components to maintain and improve the essential functions of Europe's water-related ecosystems including coastal and marine areas, and to ensure they are well managed.

Since December 2015, EU Member States have been publishing the second River Basin Management Plans (RBMPs) for achieving the environmental objectives of the WFD. They are an update of the first RBMPs, which were published in 2009. In 2018, the European Commission will publish its report on the assessment of the second RBMPs. The Commission has also started the process of evaluating the Water Framework Directive[7], with the publication of the Roadmap for the Fitness Check on the

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[5] EC 2000, Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

[6] EC (2014), The 7th Environment Action Programme (EAP). http://ec.europa.eu/environment/action-programme/

[7] WFD article 19, 2. The Commission will review this Directive at the latest 19 years after the date of its entry into force and will propose any necessary amendments to it.

Water Framework Directive and the Floods Directive[8]. To accompany and inform this process and to fulfil the requirement of WFD Article 18[9], the EEA has produced this report on the 'State of Europe's water' along with presentation of more detailed WFD results in WISE.

The report aims to present results on:

- What is the status of EU waters based on the second RBMPs?
- Which pressures are causing less than good status?
- What progress has been achieved during the first RBMP cycle (2009-2015)?

The report presents results on the status of surface waters and groundwater in Europe, providing overviews at EU level, Member State and River Basin Districts (RBDs).

Chapter 1 introduces the EU water policy context and sets the frame for the state of water assessments. It addresses the data sources and geographical scope of the report, provides an overview of water bodies, as well as heavily modified and artificial water bodies. The chapter also describes the specific challenges of comparing the data from the first and the second RBMP and the constraints that need to be taken into account.

Chapter 2 to 5 deal with the status assessments of surface waters (ecological status and chemical status) and of groundwater (chemical status and quantitative status). These chapters follow a common narrative. Each chapter introduces the particular status assessment, describes the status of EU waters in second RBMPs, looks into the pressures that are causing less than good status and then compares the status in the first and second RBMPs.

Chapter 6 brings the results together in an analysis of drivers, pressures and impacts and provides an overview of the improvements achieved since the first RBMPs. It addresses the main pressures responsible for not (yet) achieving good status in all European waters. The chapter discusses in more detail pollution from point and diffuse sources and its relationship to water quality, and how habitats have been altered and hydrology modified due to water abstraction. The chapter concludes with an outlook into the future: What will be status in 2021, 2017 and beyond? and challenges in water management.

Assessing status of water

EU Member States should aim to achieve good status in all bodies of surface water and groundwater by 2015 unless there are grounds for derogation. Only in this case may achievement of good status be extended to 2021 or by 2027 at the latest. Achieving good status involves meeting certain standards for the ecology, chemistry and quantity of waters. In general, 'good status' means that water shows only a slight change from what would normally be expected under undisturbed conditions. There is also a general 'no deterioration' provision to prevent deterioration in status. An overview of assessment the status of surface waters and groundwater according to the WFD is illustrated in figure 1.1.

Ecological status of the WFD assesses ecosystem health expressed by biological quality elements: phytoplankton, macrophytes, phytobenthos, benthic invertebrate fauna, and fish, supported by hydromorphological and physico-chemical parameters: nutrients, oxygen condition, temperature, transparency, salinity, and river basin specific pollutants (RBSPs). The Directive specifies which

[8] https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5128184_en

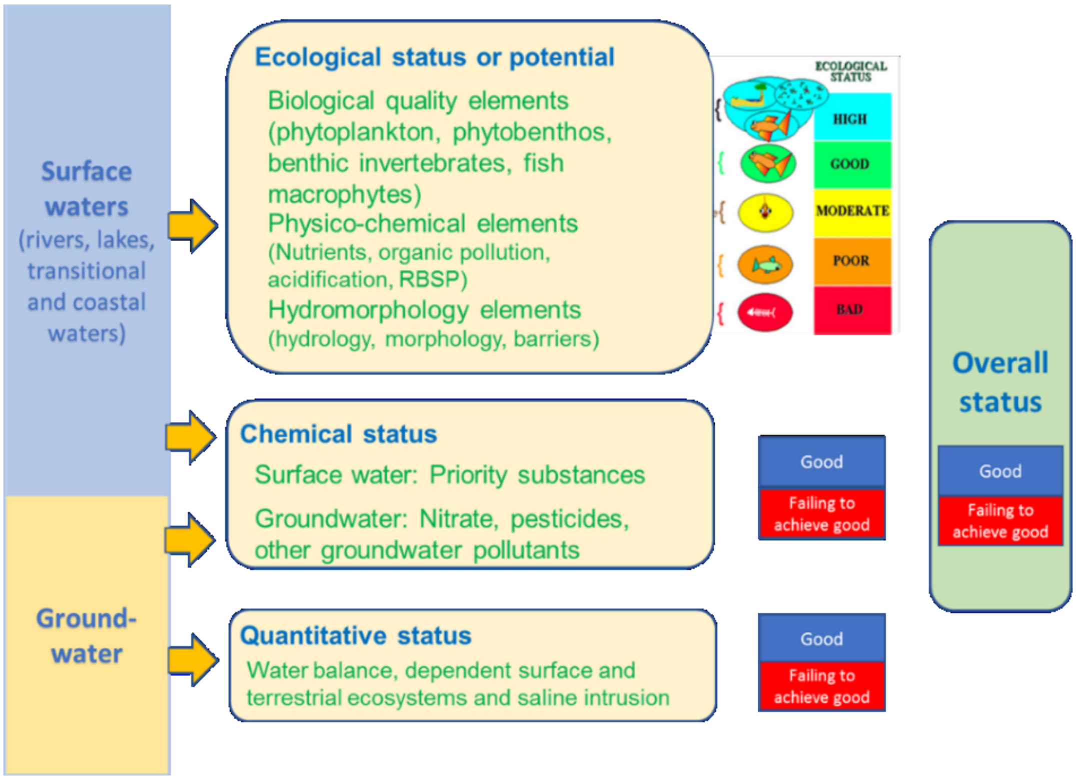
[9] WFD Article 18: The EU Commission shall publish a report on the implementation of the directive two years after the Member States have delivered the RBMPs. The report shall include a review of the status of surface water and groundwater in the Community undertaken in coordination with the European Environment Agency (EEA)

elements are to be assessed for each water category, and requires that all biological elements and supporting quality elements achieve at least good status.

The WFD aims to ensure good chemical status of both surface water and groundwater bodies across Europe. For surface waters, this goal is defined by limits on the concentration of certain pollutants relevant across the EU, known as priority substances. Good chemical status means that the concentrations of all priority substances do not exceed the environmental quality standards (EQS) established in the Environmental Quality Standards Directive 2008/105/EC and amended by the Priority Substances Directive 2013/39/EU[10]. EQS are set to protect the most sensitive species, including humans via secondary poisoning.

Good groundwater chemical status is achieved when there is no saline intrusion in the groundwater body, when concentrations of specified substances do not exceed relevant standards, and does not result in failure to achieve good status of associated surface water bodies, nor cause significant damage to terrestrial ecosystems which depend directly on the groundwater body[11].

Figure 1.1. Assessment of status of surface waters and groundwater according to the WFD



Good groundwater quantitative status is achieved by ensuring that the available groundwater resource is not exceeded by the long-term annual average rate of abstraction[12]. Accordingly, the level of groundwater may not lead to any diminution of ecological status of connected surface waters or any diminution of groundwater dependent terrestrial ecosystems. Furthermore, reversals of flow direction may not result in saline or other intrusions.

[10] http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm
[11] http://ec.europa.eu/environment/water/water-framework/groundwater/framework.htm
[12] http://ec.europa.eu/environment/water/water-framework/groundwater/framework.htm

Status classification up to 2012/13

The second RBMPs generally show status classification up to 2012/13 and at that time, many measures were only in the process of implementation. With this in mind, the impact of the measures from the first RBMPs may be expected to be small. It takes time to turn plans into changes on the ground. It also takes time for changes on the ground to come through in monitoring results. This is partly due to lag times in the recovery of plant and animal communities and groundwater response times and partly because some status assessments are based on combining monitoring results collected over a number of years.

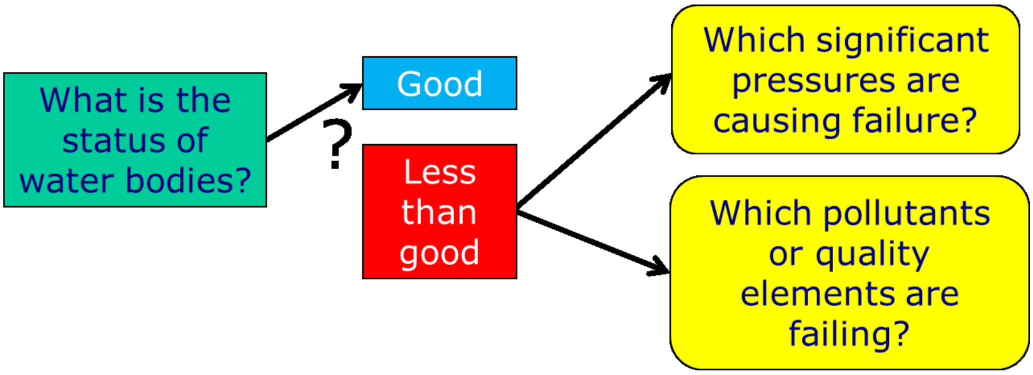
Significant pressures and impacts

Europe's waters are affected by several pressures, including water pollution, water scarcity, droughts and floods. Major physical modifications to water bodies also affect morphology and water flow.

The WFD requires the identification of significant pressures from point sources of pollution, diffuse sources of pollution, modifications of flow regimes through abstractions or regulation and morphological alterations, as well as any other pressures. 'Significant' is interpreted as meaning that the pressure contributes to an impact that may result in the failing of Article 4(1) Environmental Objectives (of not having at least good status or potential).

The identification of significant pressures and their resulting impacts (which in turn lead to a reduced status) can involve different approaches: field surveys, inventories, numerical tools (e.g. modelling), expert judgement or a combination of tools.

Figure 1.2. For water bodies in less than good status the significant pressures and pollutants should be identified.



By now, many of the several thousand individual measures in the first RBMPs are completed. However, some measures are not fully completed yet mainly due to funding constraints, while other measures have been difficult to implement.

Further and detailed information on WFD and second RBMPs

- European Commissions homepage on WFD Link
- Main reports on progress in the implementation of the WFD since the adoption of the first River Basin Management Plans <*a web page with overview of relevant Commission, JRC and EEA reports on implementation of WFD*> Commissions WFD reports Link; JRC and EEA
- Overview of RBMPs Link – Link2.

Further and detailed information on assessing status of waters is available in

- Commissions Water Notes Link
- CIS guidance documents Link
- WFD reporting guidance CIS Guidance No. 21; EC, 2009; and 2016 see http://cdr.eionet.europa.eu/help/WFD/WFD_521_2016

1.2 Data sources, geographical coverage, and methodology

This report is compiled from information on the status of European surface water and groundwater bodies as reported by the EU Member States into the Water Information System for Europe (WISE). In summer 2017, 25 Member States had reported into WISE. The WISE-WFD database includes data from the first and second RBMPs. The reporting of WFD data is based on the Common Implementation Strategy (CIS) Reporting Guidance, which has been revised in 2016[13].

The implementation of the WFD has resulted in the designation of 180 RBDs across the EU, and 31 international RBDs. RBMPs have been produced for all the RBDs. Each of the RBMPs consists of many different documents, maps and datasets. The main RBMP document that often is 200-300 pages long provides detailed information on status and pressures affecting the designated water bodies, monitoring programmes and the Programme of Measures to be implemented during the new management cycle. In addition, RBMPs often include several appendixes and in some cases, Member States have established interactive map services or information systems to provide detailed information for the individual water bodies.

This report only presents key results, while more detailed WFD results are presented in an interactive tool in WISE. The following chapters include small text boxes with links to more detailed information (see examples below)

Further and detailed information on delineation of RBDs and water bodies is in WISE
- Surface water bodies: Number and Size; Number or Size, by Category
- Groundwater bodies: Number and Size

The WISE visualisation tool is being further developed during the consultation period, and updated versions of some of the tables and graphs will be produced. EEA will regularly upload two files (one with links to tables and one with links to graphs) to the consultation folder.
https://forum.eionet.europa.eu/nrc-eionet-freshwater/library/2018-state-water-consultation-1

Surface water and groundwater bodies

In the context of the WFD, the 'water environment' includes rivers, lakes, transitional waters, groundwater and coastal waters out to one nautical mile (12 nautical miles for chemical status (i.e. territorial waters). These waters are divided into units called water bodies.

The EU Member States now have reported 13 400 groundwater bodies and 111 000 surface water bodies: 80 % of them are rivers, 16 % lakes and 4 % coastal and transitional waters (Table 1.1). All Member States have reported river and groundwater bodies. 23 Member States (all reporting Member States except Luxemburg and Slovakia) have reported lake water bodies, 14 Member States have reported transitional water bodies and 20 reported coastal water bodies. In the second RBMPs seven Member States have delineated 46 territorial waters i.e. water bodies from 1-12 nautical mile.

Table 1.1: Number of Member States, RBDs, water bodies, and length or area, per water category

Category	Member States	Number of water bodies	Total length or area	Average length/area
Groundwater	25	13411	4.3 million km^2	323 km^2
Rivers	25	89234	1.2 million km	13.1 km
Lakes	23	18165	81 800 km^2	4.5 km^2
Transitional	14	782	14 600 km^2	19 km^2
Coastal waters	20	2835	290 000 km^2	102 km^2
Territorial waters	7	46	214 000 km^2	13 400 km^2

Source: Extract from WISE SoW database, 25 Member States (EU28 excluding Greece, Ireland and Lithuania).

[13] CIS Guidance No. 21; EC, 2009; and 2016 see http://cdr.eionet.europa.eu/help/WFD/WFD_521_2016

The number of water bodies varies considerably between Member States due to the size of their territory but also due to their approach to delineate water bodies. Sweden has by far the largest number of surface water bodies, followed by France, Germany, United Kingdom and Italy. Sweden and Finland show the highest number of lake water bodies. Coastal water bodies are the most numerous in Italy, Sweden and United Kingdom.

A similar disparity can be seen for groundwater bodies. France reported 30 % of the total groundwater area in the EU, and Germany and Spain 9 % each. Groundwater bodies can occur in different horizons, and some groundwater bodies overlay others. The average size of groundwater bodies also differs significantly. In Sweden and Finland, the average area is 7 km^2, while in the other Member States the average area is nearly 700 km^2.

Some Member States have re-delineated some of their water bodies for the second RBMPs. About 90 % of the *surface water bodies* are unchanged from the first to the second RBMPs. About 10 % have either been deleted, markedly modified (split or aggregated) or newly created. In most of countries, there were only minor changes in number and length/area of surface water bodies but in some Member States water body delineation has been completely revised and replaced by new groundwater bodies.

The area of reported *groundwater bodies* was nearly the same for the first and the second RBMPs. Around 70 % of the groundwater bodies (by area) were not changed, while 29 % of the groundwater bodies from the first RBMPs were deleted and replaced by new groundwater bodies.

In the comparison of results from the first and second RBMPs EEA has in general only compared those water bodies that are unchanged or have only minor changes that do not hamper the comparison. For water bodies that have been deleted, aggregated, split or newly created, a comparison is not possible.

Further and detailed information on delineation of RBDs and water bodies is available in WISE:

- Map RBMPs and relevant RBD statistics (update of 2012 map)
- Surface water bodies: Number and Size; Number or Size, by Category
- Groundwater bodies: Number and Size
- Comparison of delineation of water bodies first and second RBMP: surface water bodies*
- WISEevolutiontype – change in delineation of WBs: surface water bodies Link (details Link) and groundwater bodies Link (details Link)
- CIS Guidance Document No. 2: Identification of Water Bodies Link

* draft dashboards;

Designation of heavily modified and artificial water bodies

In the case of water bodies that have undergone hydromorphological alteration, the WFD allows Member States to designate some of their surface waters as Heavily Modified Water Bodies (HMWBs) or Artificial Water Bodies (AWBs).

In many river basins, the upper stretches in mountainous areas, highland areas, and often in forest areas remain largely in their natural state except when hydropower and irrigation reservoirs have changed the system. However, lower stretches, often passing large cities and intensive agricultural land, are modified by embankments and other public works. These areas are usually designated as heavily modified waters. Other examples of heavily modified water bodies are rivers with flood defenses, inland waterways, and reservoirs on rivers, or lakes. Heavily modified transitional and coastal water have often been altered by land reclamation or dredging due to urban, transport, and agricultural developments.

Overall, 17 % of European water bodies were designated as HMWBs (13 %) or AWBs (4 %) during the second RBMPs. Around 30 % of the transitional water bodies were designated as heavily modified and 14 % and 10 % of the river and lake water bodies, respectively.

Artificial water bodies can include canals, reservoirs or open-cast mining lakes. More than 6 % of lakes and around 4 % of river water bodies have been identified as artificial. However, only a few of the transitional and coastal waters are listed as being AWBs.

The main reasons for designating European water bodies as heavily modified are land drainage, urban infrastructure, agriculture, but also water regulation and flood protections.

Further and detailed information on designation of natural, heavily modified and artificial water bodies is available in WISE:

- Designation of natural, heavily modified and artificial water bodies, Number or Size, by Category and Type
- HMWB physical alterations Table*
- HMWB water uses Table*
- CIS Guidance Document Heavily modified water bodies – HMWB Link

* draft dashboards;

Improvements in monitoring and assessment

The data reported for the second RBMPs shows that the quantity and quality of available evidence on status and pressures has grown significantly due to significant investments into monitoring and assessment. This has resulted in markedly improved RBMPs providing a better understanding of the status (ecological, chemical and quantitative status), the pressures causing failure to achieve good status, and the needed measures.

Surface waters and groundwater have been monitored at over 130 000 monitoring sites over the past six years (Table 1.2). The number of surface water monitoring sites, quality elements and pollutants assessed have increased relative to the first management cycle (see following status chapters).

Table 1.2: Overview of monitoring sites and monitored water bodies

	Monitoring sites	Monitored water bodies
Surface water ecological status	92243	51762 (46 %)
Surface water chemical status	36221	26481 (28 %)
Groundwater chemical status	47726	6095 (47%/86*%)
Groundwater quantitative status	37151	4863 (36%/77*)

Note: A monitoring site may be used both for ecological and chemical monitoring or chemical and quantitative monitoring. The percentage indicate the proportion of surface water or groundwater bodies being monitored
*percentage calculated excluding groundwater bodies from Finland and Sweden.
Source: WFD2016 database, 25 Member States (EU28 excluding Greece, Ireland and Lithuania).

There is a marked reduction in unknowns and improved confidence in assessment in the second RBMPs. For surface water bodies the proportion in *unknown* ecological status and chemical status fell from 16 % to 4 % and from 39 % to 16 %, respectively, while for groundwater bodies, the proportion in unknown chemical status and quantitative status decreased to only 1 %.

The *confidence* in the status assessments[14] has also improved. In the first RBMPs Member States reported fewer than one third of surface water bodies' ecological status with high or medium

[14] The CIS Reporting Guidance defines confidence as Low = no monitoring data; Medium = limited or insufficiently robust monitoring data; and High = good monitoring data and good understanding of the system.

confidence, while in the second RBMPs this has improved to half of the water bodies. The confidence in surface water body chemical status is relatively low compared to the other status assessments, with only 41 % of the water bodies in the second RBMPs having high or medium confidence. The confidence in groundwater chemical and quantitative status assessments is good with two thirds of the water bodies having high or medium confidence.

Higher confidence is also ensured through intercalibration[15] of ecological status with the number of intercalibrated biological assessment methods that has generally increased three-fold since 2008 making results much more comparable than for the first RBMPs (see chapter 2).

Further and detailed information on monitoring and assessment is available in WISE:

- Overview of monitoring statistics – (Table & maps)
- Ecological status - Monitoring sites Tables* & Monitored water bodies Tables* & percentage of classified water bodies using different quality elements. (missing – see Figure 2.1)
- Quality elements – monitored, grouping or expert judgement Table* - Graph*
- RBSPs (pollutants monitored, threshold values) (missing)
- SWB Chemical status - (2nd RBMP) Monitoring sites, by purposeMS*, CategoryPurposeEU*, categoryPurposeMS* (2nd RBMP) Monitored water bodies purposeMS*, CategoryPurposeEU*, categoryPurposeMS*
- Groundwater monitoring (missing)
- Surface water bodies: unknown ecological status and unknown chemical status
- Groundwater unknown GW chemical status and GW quantitative status
- Confidence in: ecological status assessment Table and Graph*; SWB chemical status assessment Table and Graph*; GW chemical status assessment Table and Graph* and GW quantitative status assessment Table and Graph*
- CIS Guidance Document on monitoring: No. 7: Monitoring; No. 15 Groundwater monitoring; No 19 - Surface water chemical monitoring; and No 25 - Chemical Monitoring of Sediment and Biota Link

* draft dashboards;

1.3 Assessment methodologies

The results in this report present a European overviews of the data reported by the second RBMPs and the status and pressures affecting Europe's waters. Caution is advised for Member State comparisons and comparison between first and second RBMPs, as the results are affected by the methodological approach used by the individual Member States. The following text describes some issues that may affect the interpretation of results.

Difficulties in assessing change from the first to the second RBMPs

Comparisons between the two RBMPs are difficult for several reasons. Firstly, the WFD Reporting Guidance was significantly revised and extended in 2016. There have been many changes in how Member States implement the Directive, e.g. water body re-delineation and improvement of assessment methods. Some of the issues relevant for the understanding of this report are discussed below.

Status classification up to 2012/13

The second RBMPs generally show status classification up to 2012/13 and at that time many measures were only in the process of being implemented. Lag times in the recovery of plant and animal communities and groundwater response times can also cause long delays in recovery of status after pressures have been reduced. With this in mind, the impact of the measures from the first RBMPs on the status reported in the second RBMPs may be expected to be small.

[15] EC 2008: Water Note 7: Intercalibration: A common scale for Europe's waters http://ec.europa.eu/environment/water/participation/pdf/waternotes/water_note7_intercalibration.pdf

Comparability of overall status assessments

The WFD objectives for all water bodies are expressed as overall good water status, encompassing both chemical and ecological status for surface waters and chemical and quantitative status for groundwater. Each of these status assessments includes a number of quality elements/-determinants. The WFD uses the "one-out-all-out" principle in assessing water bodies (i.e., the worst status of the elements used in the assessment determines the overall status of the water body).

If only the overall status assessment or the aggregated status (ecological and chemical) are used, the progress achieved in some quality elements/determinants may be hidden by the lack of progress in others. This may result in an overly pessimistic view on the progress achieved by WFD implementation, in particular for those Member States, which have more developed, and comprehensive assessment schemes, which include many elements. In some cases, the lack of development of assessment methods in the first cycle, or from incomplete intercalibration may also have made the results from the first RBMPs less confident.

In this report, the results of the overall ecological and chemical status assessments are supported by the analysis of status assessments at the level of quality elements or individual pollutants. Caution should be made in using the results for Member State comparisons. The Member States' results depend on the monitoring activities and the number of quality elements used or chemicals assessed. The results have to be interpreted together with the results on confidence in status and the details on quality elements and chemicals and their threshold values.

Full implementation of standards for chemical status assessment

The Directive 2008/105/EC on Environmental Quality Standards (EQS Directive 2008/105/EC)[16] is fully in force for the second RBMPs and means stricter standards for some priority substances compared to the first RBMPs. The Directive also requires Member States to report an inventory of emissions, discharges and losses in their second RBMPs.

During our analysis, it has become clear that Member States have used a variety of approaches to determine chemical status, for instance,

- In how they extrapolate monitoring results. Several Member States (Austria, Belgium, Germany, Sweden, Luxembourg and Slovenia), having found that the environmental quality standard for mercury is exceeded in all monitoring samples, have extrapolated the assessment "failing to achieve good" to all surface water bodies.
- Using different standards for chemical status. According to the WFD2016 reporting guidance, Member States should have reported chemical status for 2015 using the standards laid down in the EQS Directive 2008/105/EC, but some Member States have reported chemical status by using the stricter standards in the 2013 amendment to the Priority Substances Directive.

As regards the Groundwater Directive, the assessment of trends of pollutants in groundwater will be possible for the first time in the second RBMPs, by comparing the monitoring results with the results in the first RBMPs.

Changes in reporting requirements in 2010 and 2016

Besides the changes mentioned above, reporting of the second RBMPs also brings new elements into play: some due to legislation, which was not fully in force at the time the first RBMPs were adopted; others due to the fact that the second RBMPs can be compared with the first RBMPs, thereby allowing assessments of progress towards objectives.

[16] http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm

Some of these new elements relevant for the State of Water assessments are listed below (extract from CIS Reporting Guidance). They provide possibilities for new assessments, but results cannot be compared to first RBMPs.

Text Box 1.1: Key changes in the Reporting Guidance between first and second RBMP

Heavily modified water bodies:
- Report the water use and type of physical modification, for which the HMWB has been designated.

Pressures and impacts:
- Use new list of drivers, pressures and impacts common for surface and groundwater.

Ecological status:
- Provide status information at the more detailed quality element (QE) level (including reference year).
- Provide information on the change in class since the first RBMP was reported, if available. Changes in class should be reported as consistent (i.e. real) or as due to changes in methodology, e.g. monitoring and/or assessment methods.
- Report the River Basin Specific Pollutants (RBSP) causing failure.

Surface water chemical status:
- Report failure of individual substances.
- Provide a qualitative indication of the confidence in the chemical status assessment.
- Indicate the substances that have improved from poor to good chemical status since the first RBMP was reported.
- Indicate if the more stringent EQSs introduced in 2013 for 7 substances change the status of water bodies.

Groundwater chemical status:
- Report individual substances causing failure to chemical status.
- Provide a qualitative indication of the confidence in the classification of quantitative and chemical status (optional).
- Report substances showing exceedance of quality standards or threshold values but not assessed as chemical status failures, i.e. cases in which Article 4(2)c of the GWD apply.

Objectives and exemptions:
- Report whether the water body is expected to achieve good status in 2015 and if not, by when.
- Report the drivers behind exemptions at water body level for ecological status and groundwater quantitative status, at substance level for surface water and groundwater chemical status.

2. Ecological status and pressures

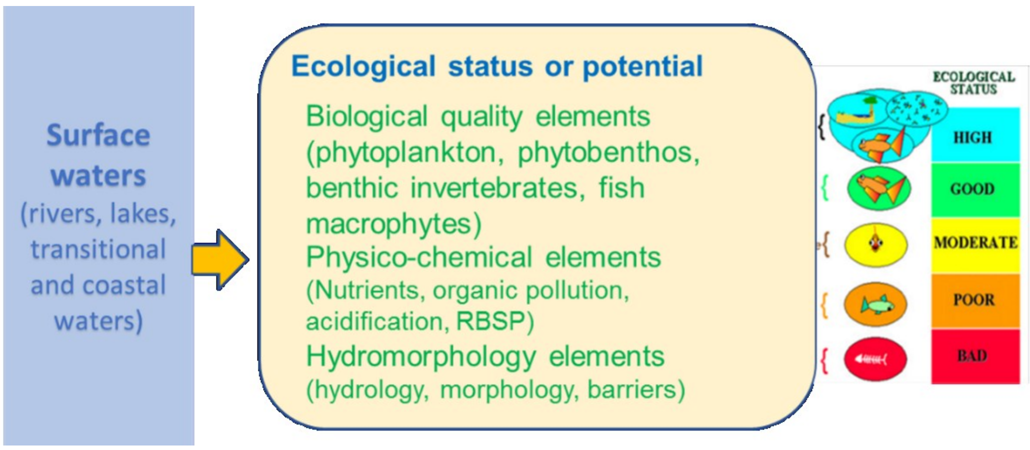
Key messages

- On a European scale, around 40 % of the surface water bodies are in good or high ecological status, with lakes and coastal water bodies having better status than rivers and transitional waters bodies. The improvement in overall ecological status since the first RBMPs were reported is limited.
- Marked efforts have been made by Member States to improve water quality and hydromorphology. Some of the measures have immediate effect; others will result in improvement in the longer run. Results are usually visible at the level of individual quality elements but often do not translate into an overall improved ecological status.
- However, for the individual quality elements (biological quality elements, supporting physico-chemical and hydromorphological quality elements) that make up the overall status the situation has improved.
- The main pressures are point and diffuse source pollution, and various hydromorphological pressures. Diffuse pollution affects 37 % and point source pollution 18 % of the surface water bodies, while hydromorphological pressures affect 41 % of water bodies.
- The main impacts on surface water bodies are nutrient enrichment, chemical pollution and altered habitats due to morphological changes.

2.1 Introduction

Ecological status[17] is an assessment of the quality of the structure and functioning of surface water ecosystems. It shows the influence of pressures (pollution, habitat degradation, climate change, etc.) over the identified quality elements. Ecological status is determined for each of the surface water bodies of rivers, lakes, transitional and coastal waters based on biological quality elements, supporting physico-chemical and hydromorphological quality elements (Figure 2.1). The overall ecological status classification for a water body is determined, according to the one-out-all-out principle, by the worst status of all the biological quality elements and the supporting quality elements.

Figure 2.X. Assessment of ecological status of surface water bodies



[17] In the analyses in this report, no distinction has been made between ecological status and potential. The criteria for classification of natural water bodies (ecological status) and HMWBs or AWBs (ecological potential) vary, but the ecological conditions they reflect are assumed to be comparable, having the same deviation from reference conditions.

Significant pressures causing less than high or good ecological status

Water bodies in moderate, poor or bad ecological status require action in terms of mitigation and restoration measures to achieve the WFD good status objective. To plan the measures, the pressures causing water bodies to fail good ecological status must be identified.

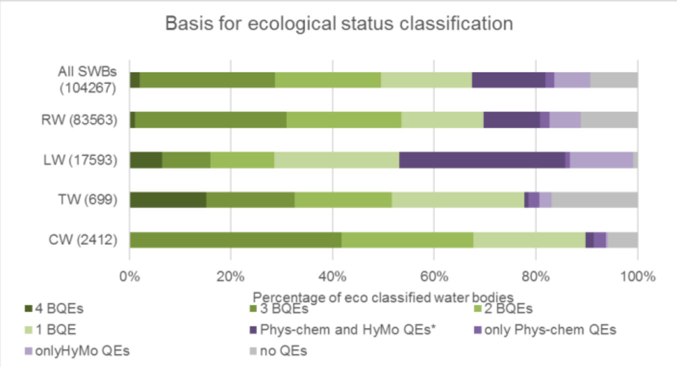
These include pressures from point sources of pollution, diffuse sources of pollution, hydrological and morphological alterations, and a number of other pressures. Similarly, impacts include nutrient, organic and chemical pollution, altered habitats, and acidification.

Better understanding and knowledge of ecological status

During the first RBMP cycle (2009-2015), Member States have introduced a vast network of monitoring sites and assessed the ecological status of their water bodies. From 2008 to 2017, the number of intercalibrated ecological assessments methods increased from around 100 to nearly 400 methods. Overall, this has reduced the proportion of water bodies with unknown ecological status from 16 % to 3 %, and the confidence in the classification has improved from one third of water bodies with high or medium confidence in the first RBMPs to more than half of the water bodies in the second RBMPs.

In the second RBMPs more than two-thirds of all water bodies are classified based on at least one biological quality element (Figure 2.1). For most of the remaining water bodies, status has been assessed based on supporting physico-chemical and/or hydromorphological quality elements.

Figure 2.1. Percentage of classified water bodies using different quality elements.



Notes: * at least one physico-chemical quality element and one hydromorphological quality element, but no biological quality elements. Number in parenthesis is number of water bodies.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Overall, these improvements mean that the results of the ecological status classification are now a better indication of the general health of the water environment. However, the improved status assessment in the second RBMPs makes the comparison between the status in the first and second RBMPs difficult. Caution is advised when drawing detailed conclusions regarding changes observed between the two RBMPs and when comparing results between Member States.

Further and detailed information on improvements in ecological status assessment is available in WISE

- Monitoring of ecological status (see chapter 1)
- Change in proportion unknowns: unknown ecological status
- Confidence in: ecological status assessment Table and Graph*;
- Proportion of water bodies assessed by using biological quality elements, and supporting physico-chemical and hydromorphological quality elements (see Figure 2.1 – dashboard to be produced)

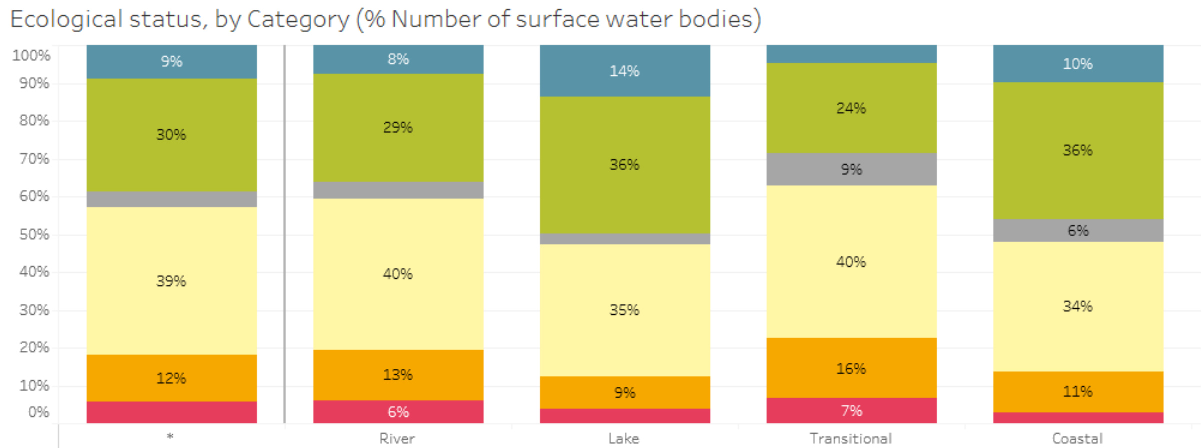
* draft dashboards;

2.2 Ecological status in the second river basin management plans

Ecological status and potential

Overall, around 40 % of the surface water bodies are in good or better ecological status, while 60 % did not achieve good status (Figure 2.2). Lakes and coastal waters are in better status than rivers and transitional waters. The ecological status of natural water bodies is generally better than the ecological potential of heavily modified and artificial water bodies.

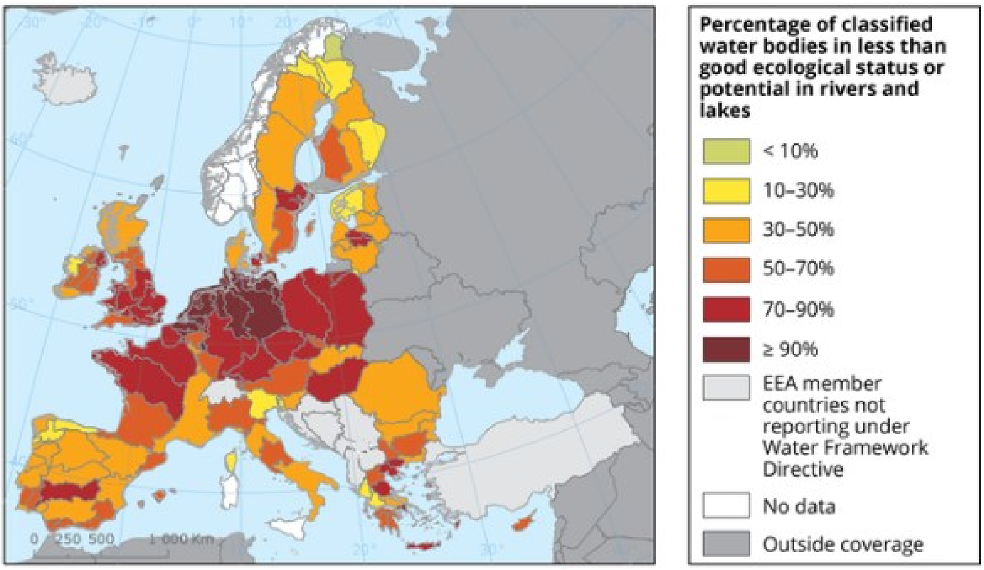
Figure 2.2. Ecological status/potential of rivers, lakes, transitional and coastal waters.



Notes: The term (*) means all surface water bodies summarizing rivers, lakes, transitional and coastal waters. Classification by length of rivers and surface area of the other water categories shows similar distribution of status classes as the classification by number of water bodies for each water category (see below links to WISE), except a lower proportion high and good for the area of transitional waters.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

The northern countries, particularly the northern Scandinavian region and Scotland show a high proportion of water bodies in high or good ecological status. In contrast, the central European river basin districts as well as some southern RBDs show the highest proportion of water bodies not in good ecological status or potential.

Figure 2.3. Percentage of water bodies not in good ecological status in Europe's river basin districts in 2016 <Maps from 2012 (first RBMPs)>



An updated map has not been included – EEA is exploring different option on presenting the information on interactive map services. The map service should present ecological status per RBD for either the first or second RBMP with filters for the four categories (rivers, lakes, transitional and coastal waters) and by count of water bodies and by size (Length for rivers; and area for the other categories) and with pop-up windows with the results for the specific RBD. See results for map Table

In general, highland rivers and lakes have better status than lowland water bodies. Mid-altitude and siliceous water bodies are also in better status compared to lowland and calcareous water bodies. The European downstream part of large rivers has in many cases less than good status, while the status of large European lakes is much better than the average status of lakes.

In coastal and transitional waters, the best ecological status is found from the Celtic Sea to the Iberian Coast and in the Mediterranean, while the worststatus is found in the Baltic and Black Seas.

Further and detailed information on ecological status results is available in WISE

- Ecological status by category, table – graph –
- Ecological status of natural or heavily modified and artificial water bodies (use the filter)
- Ecological status by common broad types
- Ecological status by Member States – see above table - graph MS - graph MS category
- Ecological status by RBDs (Results for Map) - Table
- Ecological status in 2015 Table

* draft dashboards;

2.3 Status of quality elements

Ecological status is determined for rivers, lakes, transitional and coastal water bodie based on biological quality elements and supporting physico-chemical and hydromorphological quality elements.

Textbox: Biological quality elements and supporting quality elements

Phytoplankton are free floating microscopic algae, which are very sensitive to the level of nutrients in a given water body. Phytoplankton may cause the water to become green, brown or red, depending on the dominant species. Phytoplankton consist of many different groups of algae, e.g. green algae, diatoms, dinoflagellates, as well as the potentially toxic cyanobacteria that may create blooms in nutrient enriched lakes, and cause problems for use of the water for drinking water supply and recreation.

Aquatic benthic flora comprises phytobenthos and macrophytes in rivers and lakes, and macroalgae and angiosperms in coastal and transitional waters. Aquatic flora is particularly susceptible to elevated nutrient concentrations in the water.
Phytobenthos are small algae that grow on rocks and other substrates, including bacterial tufts and coats if the water body is enriched with organic matter from waste water.
Aquatic plants (**macrophytes** and **angiosperms**) grow mainly on soft substrate in shallow waters in rivers, lakes and transitional and coastal waters, while large algae (macroalgae) grow on rocky substrate along the shores of coastal and transitional waters.

Benthic invertebrates are small animals that inhabit the bottom, as well as nearshore areas of streams, rivers, lakes, coastal and transitional waters. They include e.g. aquatic insects, crustaceans, snails and mussels. Benthic invertebrates are a key source of food for fish. Benthic invertebrates are susceptible to many different pressures, such as organic enrichment causing oxygen deficiencies, alterations of habitats, acidification, fine-sediments, and inputs from agricultural pesticides.

Fish are particularly susceptible to hydromorphological pressures, revealing impacts of river bank constructions, large flow fluctuations, water abstraction, inadequate shelters beneath roots and poorly structured water beds. Such habitat alterations affect the fish abundance, their species composition or age structure. In addition, salmon and many other fish species that migrate from the sea to river headwaters to spawn are dependent on river continuity. Hence, changes in fish composition and abundance often reveal lost river continuity (e.g. due to barriers or dams). Fish are also very sensitive to acidification.

Hydromorphological elements support the biological elements. They generally consist of 1) the hydrological regime (e.g. quantity and dynamics of water flow and connection to groundwater bodies) and 2) the

morphological conditions (e.g. depth and width variation, structure and substrate of the bed, and structure of the riparian zone). In rivers, it also includes river continuity (i.e. presence of barriers and dams or other transversal structures).
Physico-chemical quality elements support the biological quality elements. They generally consist of 1) light and thermal conditions, 2) oxygenation conditions, 3) salinity, 4) nutrient conditions, and 5) river basin specific pollutants (RBSPs). For rivers and lakes, they also include acidification status.

Although a large proportion of water bodies are not classified for each single quality element (grey bars in figure 2.4), more than two-thirds of all water bodies are classified with at least one biological quality element. The most frequently classified biological quality elements for rivers are benthic invertebrates, phytobenthos/other aquatic flora/macrophytes and fish, phytoplankton for lakes and phytoplankton and benthic invertebrates for transitional and coastal waters.

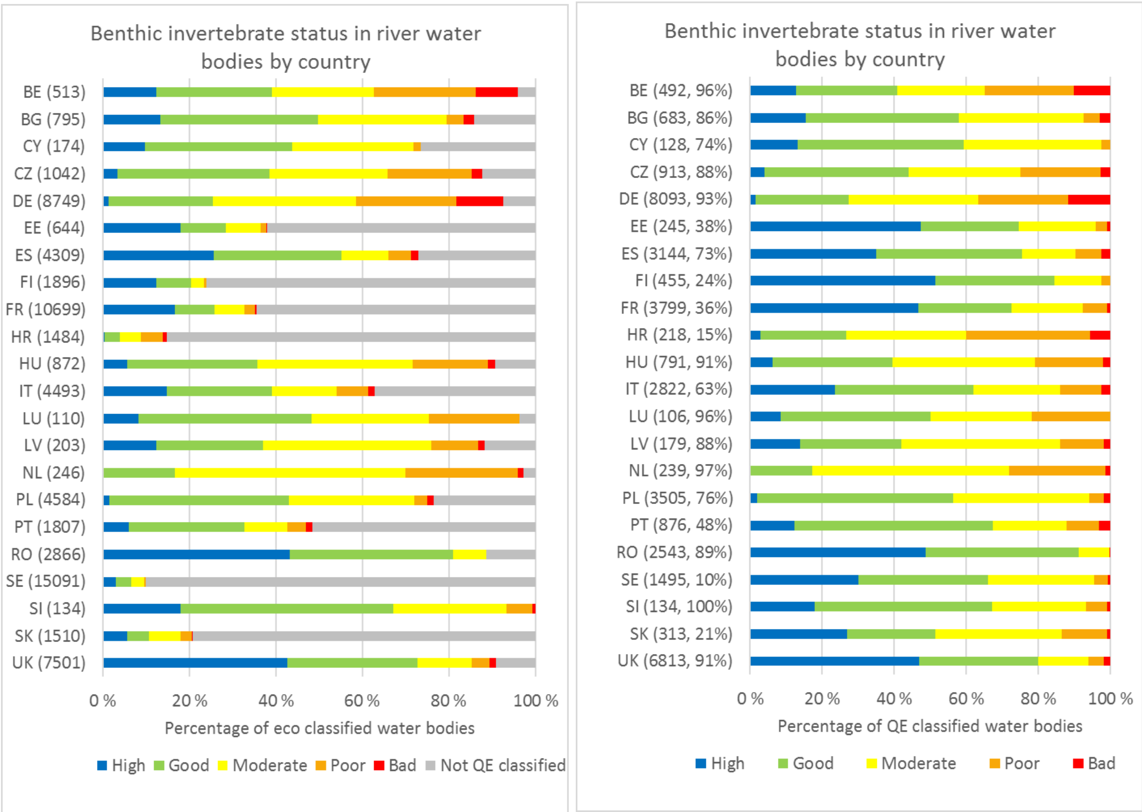
The ecological status for individual quality elements is generally much better than the overall ecological status. For rivers, for example, 50-70 % of the classified water bodies have high or good status for several biological quality elements, while the overall ecological status is only high or good for less than 40 % of the river water bodies. For the physico-chemical and hydromorphological quality elements generally more than two-thirds of the water bodies have at least good ecological status.

Figure 2.4. Ecological status of biological quality and supporting elements in rivers, lakes, transitional and coastal waters.

Notes: Ecological status for biological quality and supporting elements in water bodies classified for overall ecological status (100%). The grey part shows water bodies not classified for that particular quality element. EEA is exploring possibilities to present aquatic flora correctly – some Member States report "Other aquatic flora" while other Member States have reported the aquatic flora sub-indicators.
Source: Preliminary results from WISE-SoW database including data from 22 Member States (excluding Austria, Denmark, Greece, Ireland and Malta). See Link for results including 25 Member States.

The best ecological status for benthic invertebrates in rivers is found in Romania, Finland and the UK, while the worst is found in the Netherlands, Germany and Croatia (Figure 2.5).

Figure 2.5. Ecological status for benthic invertebrates in rivers in different countries.



Notes: Classification of ecological status for macroinvertebrates in rivers including the water bodies not classified for this biological quality element (grey bars) (left panel) and excluding these water bodies (right panel). The number in brackets in the left panel is the total number of water bodies classified for overall ecological status (100% on the x-axis). In the right panel, the numbers in brackets indicates the number of water bodies classified for benthic invertebrates in rivers (100% on the x-axis). Here, the percentage in brackets is the number of water bodies classified for benthic invertebrates out of the total number of water bodies classified for overall ecological status. Source: Preliminary results from WISE-SoW database including data from 22 Member States (excluding Austria, Denmark, Greece, Ireland and Malta). See Link for results including 25 Member States.

Further and detailed information on quality elements results is available in WISE

- Quality elements Table - ; QE group Table; QE:EU_overview Table
- BQE_table; BQE_graph*; HYMO_QE_table; HYMO_QE_graph*; PhysChem_QE_table; PhysChem_QE_graph*; RBSP_QE_table and RBSP_QE_graph*
- Quality elements by category and Member States
- Quality elements – monitored, grouping or expert judgement Table* - Graph*

* draft dashboards;

River Basin Specific Pollutants

Ecological status includes the assessment of RBSPs[18]. The status of RBSPs was not reported for a large proportion of surface water bodies (around 50 %). At EU level, 88 % of water bodies with

[18] RBSPs are substances discharged in significant quantities into a water body and are identified by Member States. Environmental quality standards (EQS) are set by the Member State, often at national level but can be at river basin district level. Where the environmental quality standard is exceeded, a water body cannot not be in good or better status. In contrast with priority substances, which are considered under chemical status

known RBSP status were in good ecological status[19]. The proportion of water bodies where RBSPs did not compromise good or high status ranged from [7% (NL) to 100% (FI)].

About 150 RBSPs were reported as causing failure to achieve good ecological status in at least one waterbody. Those most frequently reported as causing failure were the metals zinc, with 798 waterbodies failing to achieve good ecological status, and copper (522 such waterbodies). Other types of substances causing most failures were pesticides, such as glyphosate and its breakdown product AMPA. As individual substances, most RBSPs caused fewer than 100 waterbodies to fail good ecological status.

There are differences in the numbers of substances defined by countries as RBSPs (between 4 and 300) and differences in environmental quality standards applied. This means comparison between countries should be undertaken with care.

Of the thousands of chemicals in use and potentially present in surface waters, relatively few have been identified as causing failure. From the information reported, it is not known how many other chemical pollutants are present in surface waters, and whether their concentrations should be of concern. Further discussion on chemicals is provided in chapter 3 link and chapter 6 link.

Further and detailed information on RBSPs/quality elements results is available in WISE

- Ecological status by RBSPs see Table and RBSPs status including water bodies with unknown status Table – graph* – graph2*
- RBSPs causing failure to achieve good ecological status Table - TableEU – graph
- table*, table_category* – table_Member_States* and specific RBSPs*

* draft dashboards;

2.4 Change in ecological status between first and second RBMPs

The quality of the ecological status classification has largely improved from the first to the second RBMPs. There is a marked reduction of unknowns, a marked improvement of confidence in classification and a large increase in the intercalibrated biological assessment methods.

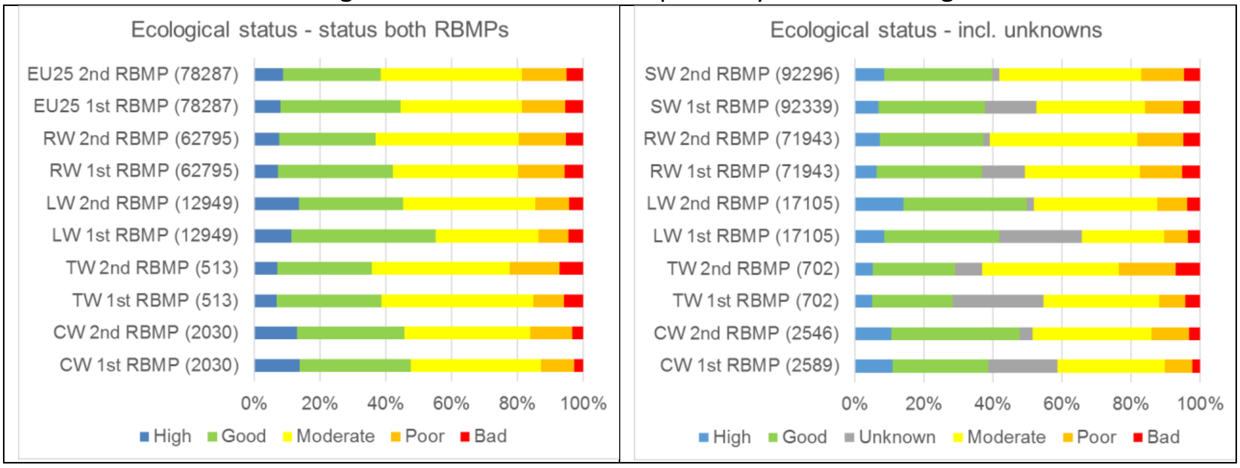
However, the overall ecological status has not improved since the first RBMPs (figure 2.6). In fact, the results show a slight reduction in the proportion of water bodies in good or better ecological status or potential for all the water body categories. During the first RBMP cycle Member States have introduced better or new ecological monitoring programs with more monitoring sites and more quality elements included.

This complicates the comparison between the status in the first and second RBMPs. The results show that there is limited change in the ecological status from the first to the second RBMPs.

(chapter 3) the comparability of number of substances set as RBSPs and the value of the EQS can vary between Member States.

[19] Ecological status by RBSPs see Link and RBSPs status including water bodies with unknown status Link

Figure 2.6. Ecological status or potential of all surface waters, rivers, lakes, transitional and coastal waters in the two RBMPs A) with known ecological status in first and second RBMP; and B) both known and unknown ecological status. <in the final report only one of the diagrams will be shown>

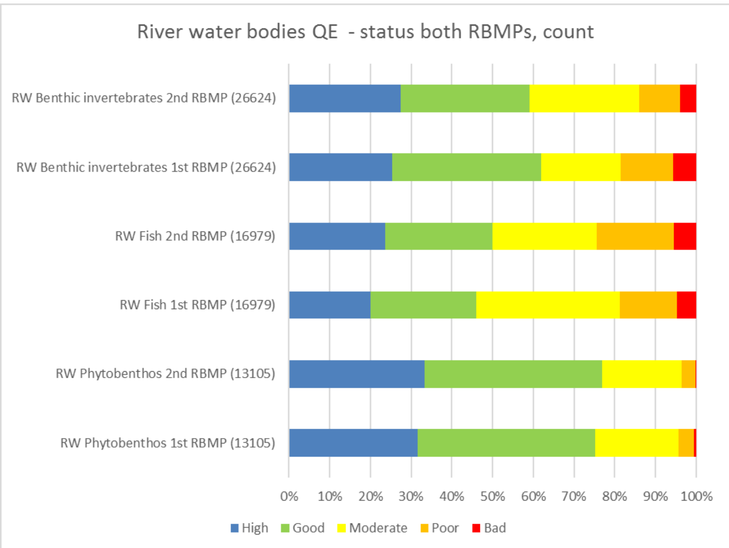


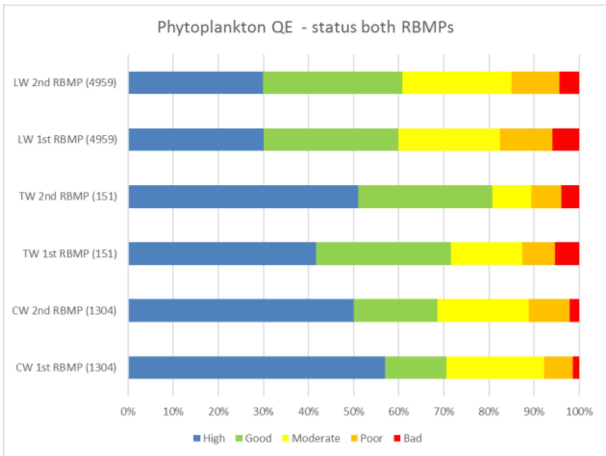
Notes: SW are surface water bodies summarising all the water categories. The numbers in parenthesis are the number of classified waters bodies that are comparable between the two cycles of RBMPs (WISE evolution type nochange, change, changecode).
Source: Preliminary results based on WISE-SoW database including data from 25 countries

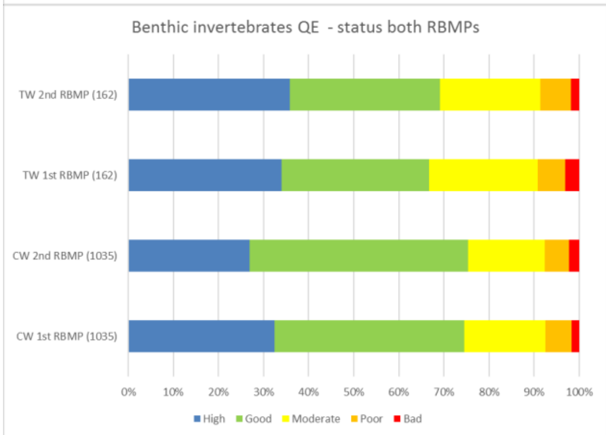
A closer look at the change in quality elements shows some improvement (Figure 2.7). The improvements are seen in all the most commonly used Biological quality elements (BQEs) in rivers, and in phytoplankton in transitional waters, but is less clear in phytoplankton in lakes and benthic invertebrates in coastal and transitional waters. For phytoplankton in coastal waters, there is even a slight deterioration.

Most of the changes are not reported as consistent, but are rather due to changes in methodology. However, many countries have not reported on consistency, so it is unclear how the changes should be interpreted.

Figure 2.7. Ecological status or potential for major biological quality elements in surface waters in the first and second RBMPs.







Notes: The numbers in parenthesis are the number of classified waters bodies that are classified for the single biological quality elements and that are comparable between the two cycles of RBMPs (WISE evolution types nochange, change, changecode).
Source: Preliminary results based on WISE-SoW database including data from 25 Member States EU28 except Greece, Ireland and Lithuania).

Further and detailed information on change in ecological status and status of quality elements from first to second RBMPs is available in WISE

- Ecological status by category in first and second RBMPs graph*
- Ecological status by category and Member States in first and second RBMPs graph* -
- Ecological status by main quality elements by category in first and second RBMPs table* & graph* – graph2*

* draft dashboards;

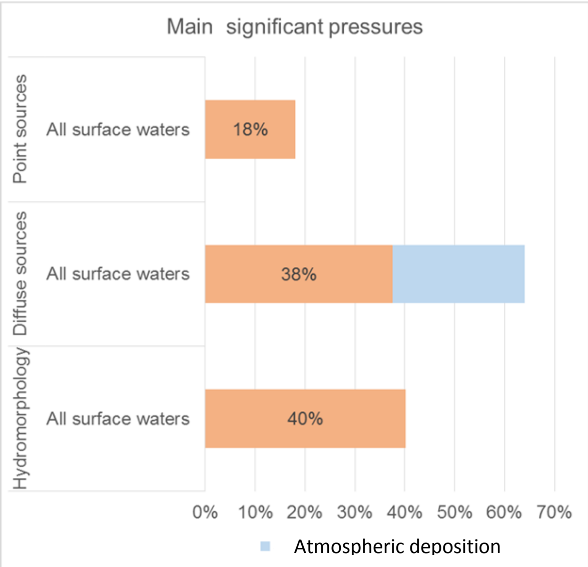
2.5 Pressures and impacts

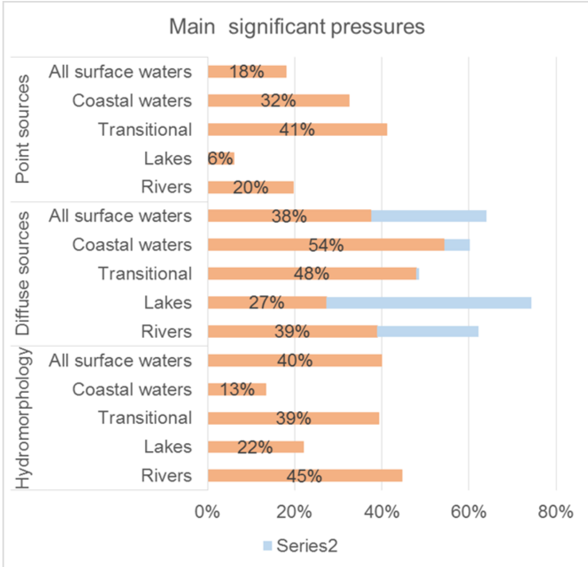
The main significant pressures causing risk of not achieving good ecological status are point and diffuse source pollution and hydromorphological pressures. The main impacts on surface water bodies are nutrient enrichment, chemical pollution and altered habitats due to morphological changes, reflecting the key pressures.

Diffuse pollution and point source pollution affects 38 % and 18 % of the surface water bodies, respectively. A relatively higher proportion of transitional and coastal water bodies are affected by pollution pressure compared to rivers and in particular lakes. The main drivers for point source pollution pressures are urban wastewater, followed to a lesser degree by industrial plants and storm overflow. For diffuse source pollution, the main driver is agriculture, followed by atmospheric deposition and discharges not connected to sewerage plants.

Hydromorphological pressures comprise all physical alterations of water bodies (including continuity interruptions) which modify their channel, shores, riparian zones, water level/flow, e.g. dams, embankments, channelization, flow regulation. These activities cause damage to the morphology and hydrology of the water bodies. They result in altered habitats, with significant impacts on the ecological status.

Figure 2.8. Proportion of water bodies affected by main pressures of all surface water bodies and by categories: rivers, lakes, transitional and coastal waters.

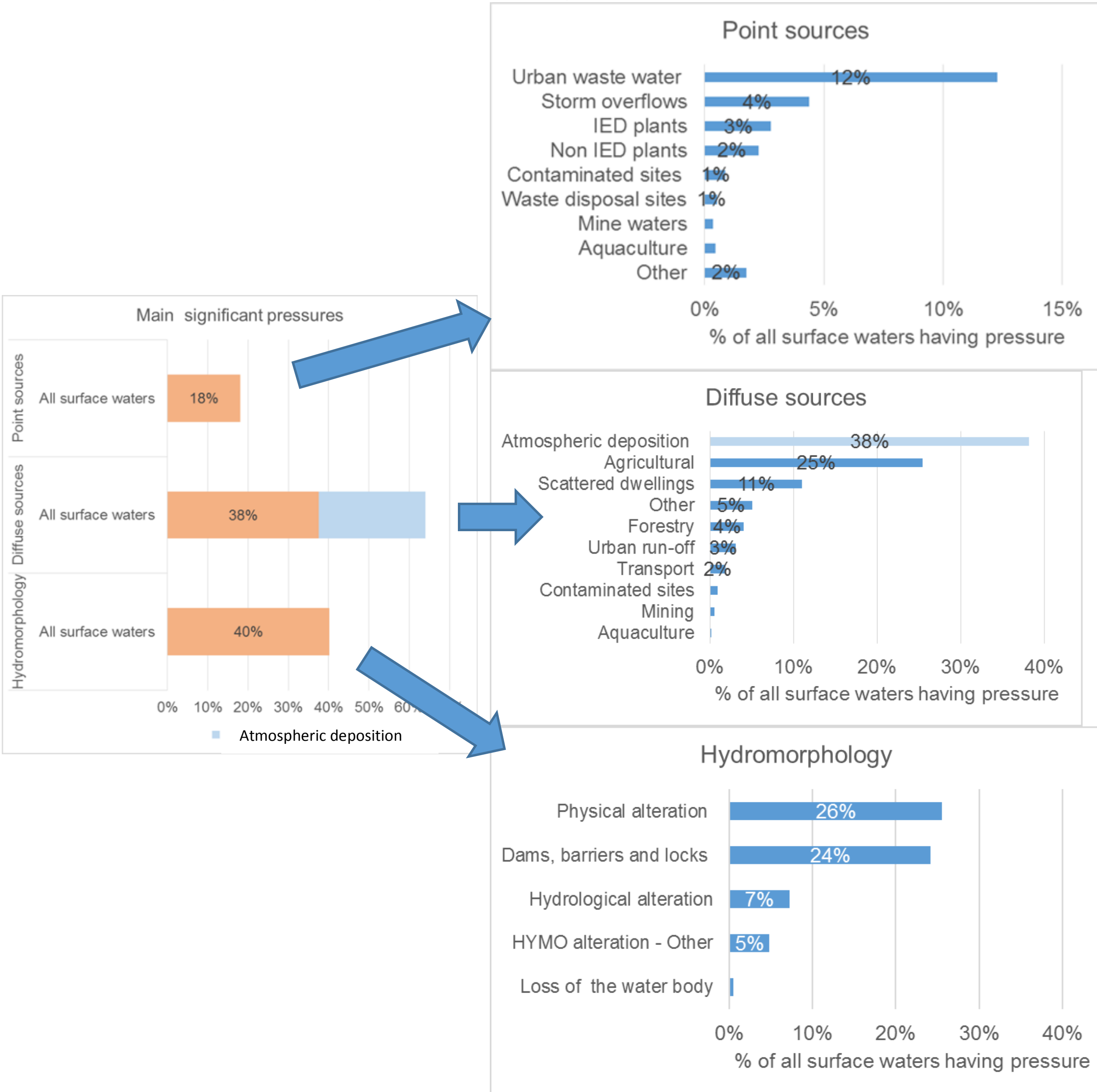




Notes: The term all SWBs means all surface water bodies summarizing rivers, lakes, transitional and coastal waters. A full attribution of main pressures to ecological status or chemical status is not possible. For diffuse source pollution, 25% of the classified water bodies have diffuse pollution only from atmospheric deposition, which is most relevant for chemical status.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States EU28 except Greece, Ireland and Lithuania).

Hydromorphological pressures affect around 40 % of the surface water bodies, and the highest proportion is reported for rivers and transitional water bodies. Hydromorphological pressures are subdivided into further categories of pressures: physical alterations in the channel, bed, riparian zone or shore (26 %), as well as structures which impact longitudinal continuity (dams/barriers and locks, 24 %) affect the largest share of water bodies. Hydrological alterations affect a smaller share (7 %) of total surface water bodies.

Figure 2.9. Proportion of water bodies affected by main pressures (left) and detailed point source, diffuse source and hydromorphological pressures (right).



Note: Proportion of water bodies with specific pressures, for example, 18 % of water bodies are affected by point sources, and the main point source pressure is discharges from urban waste water treatment plants affecting 12 % of all surface water bodies. A water body may be affected by more than one pressure therefore the sum of percentages is greater than 100 % for the main significant pressures or the percentage for the groups, e.g. the sum of detailed point source pressures is greater than 18 %.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States. EU28 except Greece, Ireland and Lithuania).

Further and detailed information on pressures and impact results is available in WISE

- Main pressures by category table,
- Main impacts by category table
- Detailed pressures table; point source pressures table, diffuse source pressures table and hydromophological pressures table; abstraction pressures table; other pressures table

* draft dashboards;

3. Chemical status and pressures in surface waters

Key messages

- 38 % of surface water bodies in the EU are in good chemical status.
- Only a few substances are responsible for failure to achieve good chemical status in many Member States, in particular mercury and brominated diphenylethers (flame-retardant).
- Without these and similar ubiquitous priority substances, chemical status would improve to 81 %, with 3 % of surface waters not achieving good chemical status and 16 % of water bodies having unknown chemical status.
- The main pressures leading to failure of good chemical status are atmospheric deposition and discharges from urban waste water treatment plants. Atmospheric deposition leads to contamination with mercury in most of the water bodies failing good chemical status. Inputs from urban waste water treatment plants are less significant but lead to contamination with PAHs, mercury, cadmium, lead and nickel.
- It is complicated to compare chemical status from first to second RBMPs due to more monitoring of pollutants, and some Member States in second RBMPs identifying all surface water bodies to fail good chemical status due to mercury.
- Comparison of the chemical status reported in the first and second RBMPs periods shows that the proportion of water bodies with unknown chemical status has dropped significantly, from 39 % to 16 %.
- During the first RBMP cycle, Member States have made progress in tackling several other problematic substances, such as heavy metals (cadmium, lead, and nickel) and several pesticides, suggesting effective measures have been implemented.
- The outlook for chemical status in Europe's waters is challenging, because of the addition in 2021 of new substances to the Priority Substances list and the entry into force of stricter standards for some existing priority substances (from 2015).

3.1 Introduction

Chemicals are used in products which we make use of in many different ways to try and improve our quality of life, from food production to health protection to transport and heavy industry. At some point in their lifetime, chemicals can enter the water cycle, whether by deliberate discharge following waste water treatment, or as a result of processes such as leaching from soils into groundwater, run-off from surfaces, or atmospheric deposition (including the “raining out” of small particles taken up into the atmosphere). Some chemicals can be very harmful through direct toxicity, such as through sublethal effects which affect an organism’s healthy functioning, or can become problematic as they accumulate up the food chain. Once in the environment, it can be very difficult both to clean up harmful chemicals and to prevent their migration to places distant from original use. Thus much source control legislation for chemicals, such as REACH and the Regulation on Biocidal Products, is aimed at minimising release of harmful substances into the environment. Monitoring under the WFD provides key feedback as to the success of measures intended to restrict harmful releases (chapter 6).

The WFD aims to ensure the good chemical status of both surface water and groundwater bodies across Europe. For surface waters this goal is defined by limits on the concentration of certain pollutants relevant across the EU, known as priority substances[20]. In addition, there may be other chemicals discharged in significant quantities within a river basin district. These River Basin Specific Pollutants (RBSPs) are part of the assessment of good ecological status (chapter 2).

[20] http://ec.europa.eu/environment/water/water-dangersub/pri_substances.htm

Good chemical status means that no concentrations of priority substance exceed the relevant environmental quality standards (EQS) established in the Environmental Quality Standards Directive 2008/105/EC (as amended by the Priority Substances Directive 2013/39/EU[21]). EQS are set to protect the most sensitive species by direct toxicity, including predators and humans via secondary poisoning.

The WFD seeks to progressively reduce emissions, discharges and losses of priority substances to surface waters. Under the WFD, losses, discharges and emissions to water of a particularly harmful subset of these, *priority hazardous substances*, should be completely phased out within 20 years, and the uses of these substances have been significantly restricted.

A smaller group of priority hazardous substances were identified in the Priority Substances Directive as uPBTs (ubiquitous[22], Persistent, Bioaccumulative and Toxic). uPBTs persist in the environment, can be transported long distances and pose long-term risks to human health and ecosystems. Owing to widespread environmental contamination, achieving concentrations at or below the EQS for this group of substances can be particularly challenging.

Text box: How chemicals can get into water

Information regarding the sources and emissions of many priority substances remains incomplete. Examples of uses and pathways into the water environment of some of the substances causing frequent failure to achieve good chemical status are listed below:

- Mercury was used in thermometers, dentistry, batteries, paints and fluorescent lights, although most of these uses have now been restricted. However, the most significant anthropogenic pathway for release to the environment is via burning of fossil fuels. Approximately 50 % of the mercury atmospherically deposited in Europe comes from legacy or natural sources, for example, during volcanic eruptions.
- Cadmium has been used in batteries, pigments and stabilizers. Like mercury it is released to the environment via burning of fossil fuels and waste. Emissions to water also arise from use of phosphate fertilisers which contain cadmium as a contaminant, non-ferrous metals production, and the iron and steel industry.
- Brominated diphenylethers (BDE) are used in many household goods - from cushions to computers - to prevent the spread of fires. Treated items will shed particles, which mix into household dust - and most of this is thought to reach the environment through washing machines draining to sewers, or by being mixed in with rainfall.
- Polyaromatic hydrocarbons (PAHs) are produced naturally and from burning substances containing carbon, such as petrol, diesel, coal, wood and plastics and can reach the water environment via atmospheric deposition, road runoff and discharges from waste water treatment plants.
- Tributyltin (TBT) was widely used as an antifouling agent in paints for ships and boats until the EU restricted its use on small boats in 1989, because of its proven harm to the environment and shellfisheries.

Sources
AMAP/UNEP, 2015. Global Mercury Modelling: Update of Modelling Results in the Global Mercury Assessment 2013. Arctic Monitoring and Assessment Programme, Oslo, Norway/UNEP Chemicals Branch, Geneva, Switzerland. iv + 32 pp.https://www.amap.no/documents/doc/global-mercury-modelling-update-of-modelling-results-in-the-global-mercury-assessment-2013/1218
http://public.tableau.com/views/GlobalMercuryEmissions/Dashboard1?:embed=y&:display_count=no&:showVizHome=no#1
http://www.who.int/ipcs/features/cadmium.pdf

[21] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:226:0001:0017:EN:PDF
[22] Definition of "ubiquitous" - present, appearing, or found everywhere

Further and detailed information on chemical status assessment is available in WISE

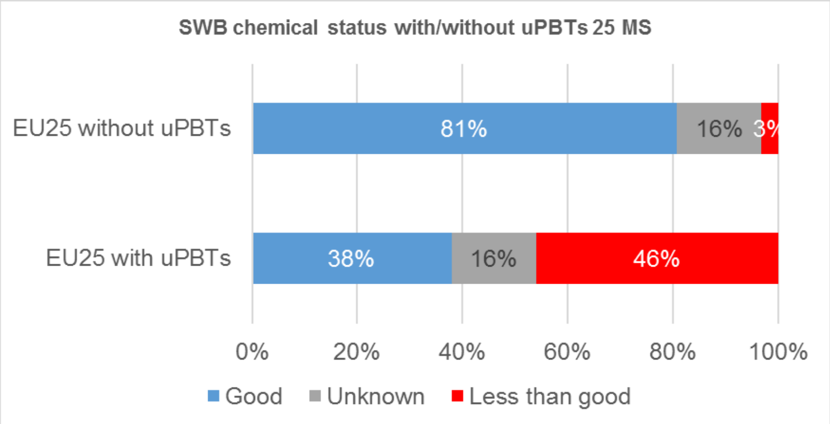
- Monitoring of chemical status (see chapter 1)
- Change in proportion unknowns unknown chemical status
- Confidence in: SWB chemical status assessment Table and Graph*;

* draft dashboards;

3.2 Chemical status of surface waters

Reporting under the second RBMP shows that 38 % of surface water bodies are in good chemical status (by number of waterbodies), while 46 % are not achieving good status and the status of 16 % is unknown (Figure 3.1). While the percentage of water bodies in good status is more or less similar in rivers and in transitional and coastal waters at 40-58 %, that in territorial waters and lakes is considerably lower (15-24 %). The lower quality of lakes is driven by widespread contamination by mercury in Finland and Sweden.

Figure 3.1: Chemical status of surface water bodies, with and without and uPBTs



Note: For some surface water bodies in Poland (1265 WBs) and Italy (265 WBs), there is no information on the priority substances causing failure and it is therefore not possible to identify if the failure is caused by uPBTs or other priority substances.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

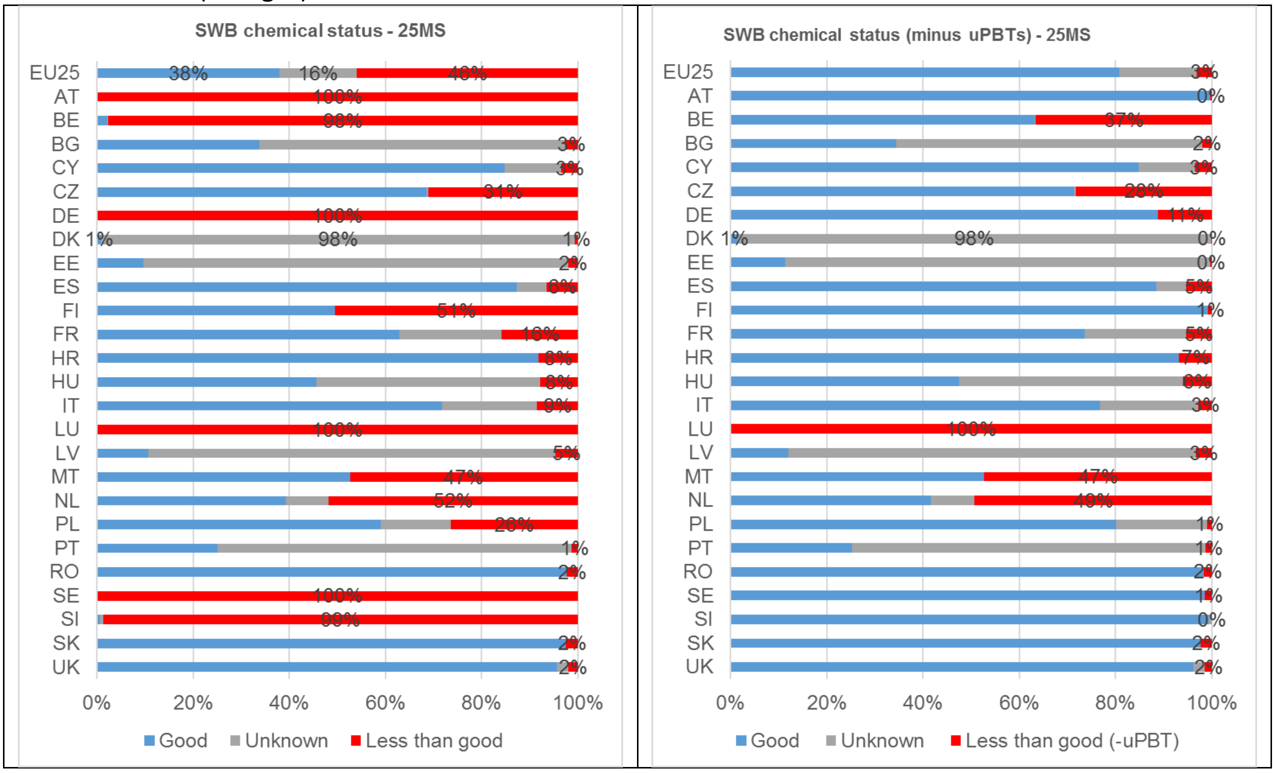
The uPBTs are mercury, polybrominated diphenylethers ("BDEs"), tributyltin and certain[23] polycyclic aromatic hydrocarbons (PAHs). Widespread failure of mercury, and to a lesser extent BDEs (used as flame retardants), leads to significant failure to achieve good chemical status, as can be seen in Figure 3.2, where omission of the uPBTs shows 3 % of the surface water bodies as not being in good chemical status.

Map 3: Chemical status per RBD – one map with uPBTs and one map without uPBTs *A map has not been included – EEA is exploring different option on presenting the information on interactive map services. The map service should present chemical status per RBD for either the first or second RBMP with filters for the four categories (rivers, lakes, transitional and coastal waters) and by count of water bodies and by size (Length for rivers; and area for the other categories) and with pop-up windows with the results for the specific RBD. See results for map* Table

[23] Benzo(a)pyrene , benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, benzo(b)fluor-anthene and benzo(k)fluor-anthene

There are substantial differences between Member States. Some report that over 90 % of their surface water bodies are in good chemical status, while others report that fewer than 10 % are in good chemical status (Figure 3.2). In addition, the proportion with status reported as "unknown" differs widely between Member States. For several Member States there is a marked change in the proportion failing to achieve good chemical status when the water bodies failing due to uPBTs are omitted.

Figure 3.2: Chemical status of all surface water bodies, with all priority substances (on left) and without uPBTs (on right)



Note: For some surface water bodies in Poland (1265 WBs) and Italy (265 WBs), there is no information on the priority substances causing failure and it is therefore not possible to identify if the failure is caused by uPBTs or other priority substances.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Some variation between Member States might be expected, owing to differences e.g. in population density, industry or geography, but such extreme variation needs to be understood. Member States have interpreted information in different ways, leading to some variation. For example, some Member States applied the revised – generally stricter - EQS set out in the 2013 amendment to the Priority Substances Directive (LU, NL, SE) while most countries used those from the 2008 version of the Directive. However, the major contribution to variability seems to arise from the approach taken to monitoring, modelling and extrapolation of results, and from the choice of monitoring matrix – water, sediment or biota (e.g. fish). Some countries extrapolated failure of the standard at monitoring sites to all water bodies, while others reported failure only where failure was confirmed (Table 3.1). Typically, measurements of mercury in biota extrapolated to all similar waterbodies lead to widespread failure to meet the EQS.

Luxembourg failed to achieve good chemical status in any of its surface water bodies, owing to application of the 2013 EQS for fluoranthene, while neighbouring countries applied the 2008 standard.

Table 3.1 Broad approaches to chemical status reporting, based on results shown in Fig 3.2.

With uPBTs	Without uPBTs	Approach taken	Countries using this approach
Widespread (80-100%) failure to achieve good chemical status	Few failures to achieve good chemical status	Extrapolation of monitoring results – usually, mercury in biota	AT, (BE), DE, FI, (LU) SE, SI
Frequent (30-50%) failure to achieve good chemical status	Frequent/widespread failure to achieve good chemical status	Other priority substances identified as causing failure to achieve good chemical status	(BE), CZ, (LU), MT, NL
Widespread good chemical status	Widespread good chemical status	Extrapolation not widely applied: status shows confirmed status only	CY, ES, FR, HR, IT, PL, RO, SK, UK
Frequent/widespread unknown chemical status	Frequent/widespread unknown chemical status	Extrapolation not widely applied: status shows confirmed status only	BG, DK, EE, HU, LV, PT

Further and detailed information on chemical status is available in WISE

- Surface water bodies: Number and Size, by Chemical status Table
- Chemical status by category, Member States – Table and with and without uPBTs graphEU - graphMS - MemberStates
- Chemical status by RBDs (Maps) results for map Table - with and without uPBTs
- Chemical status in 2015 Table

* draft dashboards;

3.3 Chemical substances causing failure in achieving good status

Chemicals legislation focuses on controlling the use of a particular substance, supported by regulation to control emissions. Chemical status under the WFD provides an overview of contamination and the effectiveness of measures. If a priority substance is causing failure, either pollution prevention is not yet delivering the required environmental objective, or the contamination results from historic sources. For some substances, chemical pollution may be a local issue which can be controlled within the river basin district. But where several Member States report that a substance is not meeting the standard for good chemical status, and a significant number of waterbodies are failing the standard, the issue may be of wider concern, particularly where persistent, bioaccumulative and/or toxic substances are concerned.

Table 3.2 shows the most frequently reported “top 15” priority substances found in surface water bodies; all the uPBTs are in this list. Looking at the number of water bodies it is clear that mainly mercury and brominated diphenylethers are responsible for failure to achieve good chemical status. The other substances cause failure in relatively low numbers of water bodies. Table 3.2 shows that large numbers of records from a particular Member State can significantly impact the listing of “most frequently reported” substances failing a standard. Therefore, in terms of understanding the relevance of a pollutant at a European scale, a larger number of countries reporting a particular substance is indicative of more widespread issues.

Table 3.2: Priority substances where failure to achieve good chemical status occurs in over 100 waterbodies (out of a total of 111062 surface waterbodies)

Priority substance	Type / use of chemical	Number of waterbodies not achieving good chemical status	Number of Member States with waterbodies not achieving good chemical status for the listed substance	% contributed by one Member State if that dominates (% of WBs not achieving good chemical status)
Mercury *	Metal	45973	24	50%
Brominated diphenylethers *	Flame retardant	23331	8	99%
Benzo(g,h,i)perylene + Indeno(1,2,3-cd)pyrene *	PAH	3091	15	47%
Benzo(a)pyrene *	PAH	1630	12	65%
Fluoranthene	PAH	1390	14	40%
Cadmium	Metal	1014	20	--
Tributyltin *	Biocide	663	15	--
Nickel	Metal	654	20	--
Lead	Metal	462	19	--
Benzo(b)fluor-anthene+ Benzo(k)fluor-anthene *	PAH	460	10	41%
Isoproturon	Pesticide	199	8	45%
4-nonylphenol	Surfactant	188	10	52%
Anthracene	PAH	123	11	59%
Hexachlorocyclohexane	Pesticide	120	11	--
DEHP	Plasticiser	102	11	--

Note * shows where substance is a uPBT.
Source: Preliminary results based on WISE-SoW database) including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Some priority substances are causing few or no failures to achieve good chemical status, suggesting that efforts to control them have been effective [ref ch 6 / 1.5.2a chemicals report]. Those affecting fewer than 15 waterbodies are shown in table 3.3.

Table 3.3 Priority substances where good chemical status reported in all but 15 waterbodies or fewer (out of 111 062 surface water bodies)

Priority Substance	Type / use of chemical	No. of waterbodies where good chemical status not achieved	No. of Member States reporting that good chemical status not achieved
Pentachlorobenzene	Industrial	14	4
Trifluralin	Herbicide	12	6
Chlorfenvinphos	Pesticide	10	4
Atrazine	Herbicide	9	4
Dichloromethane	Industrial	8	4
Tetrachloroethylene	De-greaser, dry cleaning	6	3
Simazine	Herbicide	5	2
Alachlor	Herbicide	5	3
Chloroalkanes C10-13	Industrial	5	4
Trichloroethylene	Industrial	4	2

Trichlorobenzenes	Industrial	3	3
Pentachlorophenol	Pesticide, disinfectant	3	3
1,2-dichloroethane	Industrial	1	1
Carbon tetrachloride	Refrigerant, fire-fighting	1	1

Source: Preliminary results based on WISE-SoW database) including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

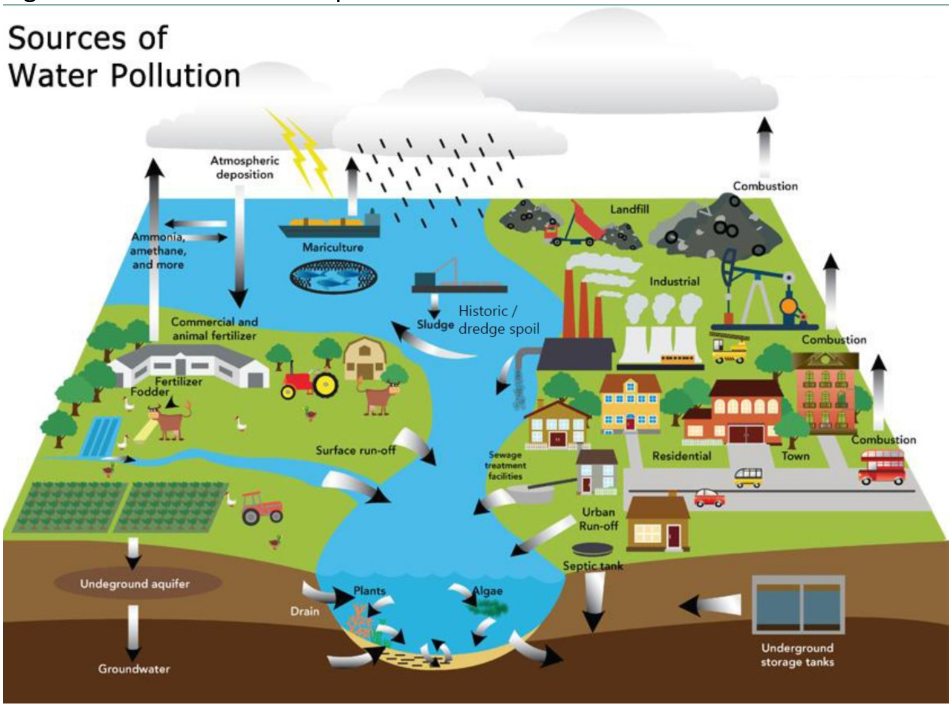
Further and detailed information on priority substance causing failure is available in WISE
- Surface water bodies: Priority substances Table – TableEU - graph

3.4 Chemical pressures

Priority substances are or have been emitted to water bodies through a range of pathways and from a variety of sources, including industry, agriculture, transport, mining and waste disposal, as well as from our own homes. Significant levels of some priority substances have built up from historic use and this legacy pollution may persist in water bodies long after polluted discharges and inputs have ended. In addition, some priority substances occur naturally, e.g. metals and PAHs, so achieving near natural, "background" concentrations is the objective for such substances.

Chemicals used in industrial processes and products sometimes enter sewers and, via waste water treatment plants, are discharged into water bodies. Burning of fossil fuels and waste leads to emission of some hazardous substances, and subsequent deposition from the atmosphere can be a major pathway for such substances to move long distances before they enter the water environment. Pesticides used in agriculture have been widely detected in groundwater and surface water. Mining can exert locally significant pressure upon the chemical quality of water resources in parts of Europe, particularly with respect to the discharge of heavy metals. Landfill sites and contaminated land from historical industrial and military activities can be a source of pollution for the aquatic environment. Shipping, harbour and port activities, and aquaculture can lead to the emission of a variety of chemical pollutants.

Figure 3.3 Sources of water pollution



Source: EEA, 2012

The major pressure reported by Member States as causing failure in good chemical status, was atmospheric deposition leading to contamination with mercury. Inputs from urban waste water treatment plants were less significant but led to contamination with PAHs, mercury, cadmium, lead and nickel.

Member States have reported an inventory of priority substances emitted into each river basin. The input most commonly recorded was that from waste water treatment plants, which may reflect the relative ease of monitoring such sources as compared with others, such as run-off or diffuse pollution (e.g. atmospheric deposition). The most frequently reported substances were the metals - mercury, lead, cadmium and nickel, which occurred in nearly all river basins (110 at May 2017) while all the priority substances were reported as being emitted into at least [25] river basin districts. The presence of a priority substance in a river basin, without causing many failures of chemical status, indicates that controls to maintain concentrations below the environmental quality standard are effective. All the priority hazardous substances were recorded as being emitted into some river basins, suggesting the cessation of emissions target for such substances remains challenging (WFD Art. 6(6)). (See also RBSPs in chapter 2.3 and discussion in chapter 6.)

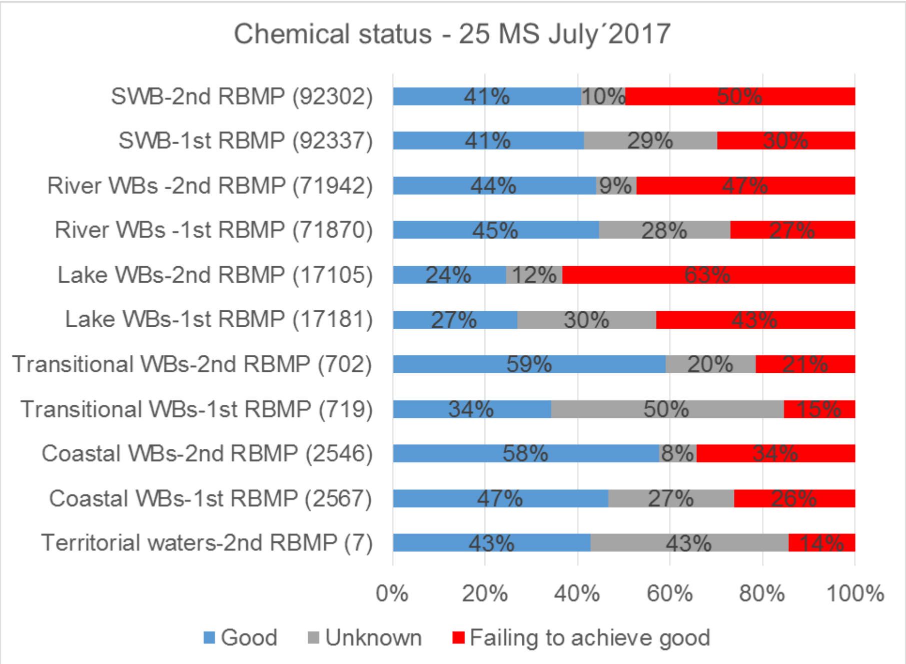
Further and detailed information on pressures and impact results is available in WISE

- Main pressures by category table,
- Main impacts by category table
- Detailed pressures table; point source pressures table, diffuse source pressures table and other pressures table

3.5 Changes between the first and second RBMPs

Comparison of the chemical status reported in the first and second RBMPs shows that the proportion of water bodies with unknown chemical status has dropped significantly. Chemical status has improved in transitional and coastal waters, remained similar in rivers and declined slightly in lakes (Figure 3.3). Thus, the knowledge on chemical status has improved, but, in return, a higher number of water bodies is classified as failing to achieve good chemical status.

Figure 3.4 Change in chemical status of surface water bodies by water category



Note: Proportion of surface water bodies in good and failing to achieve good chemical status. Overall percentage is different from that in Fig 3.2 owing to the need to compare similar water bodies in each period. Based on all water bodies in first and second RBMPs the change in unknowns is from 39 % to 16 %.
Source: Preliminary results based on WISE-SoW database) including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Further and detailed information on chemical status results is available in WISE

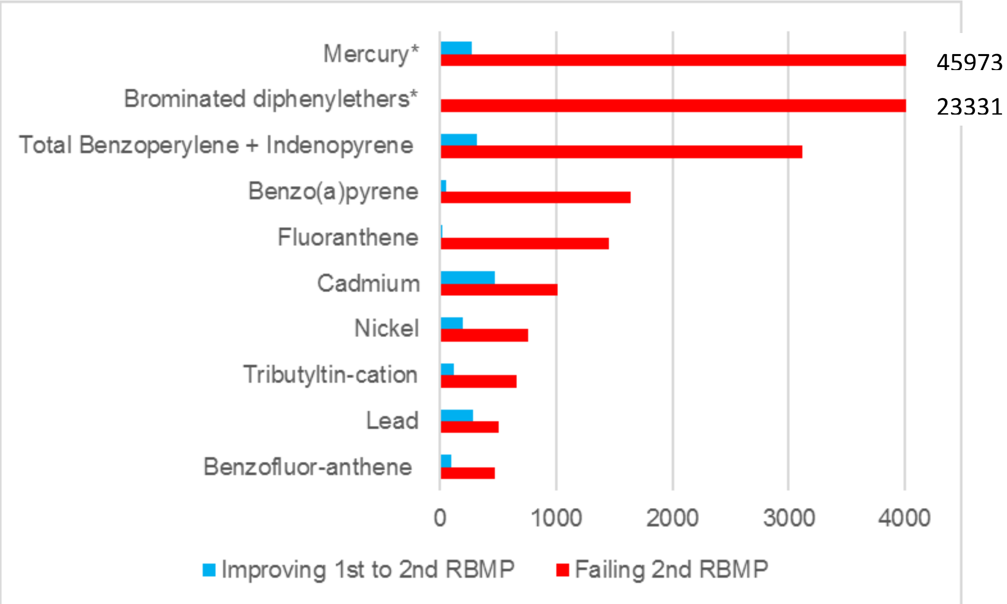
- Comparison of chemical status in first and second RBMP periods table* - graphEU - graphMS – MemberStates -

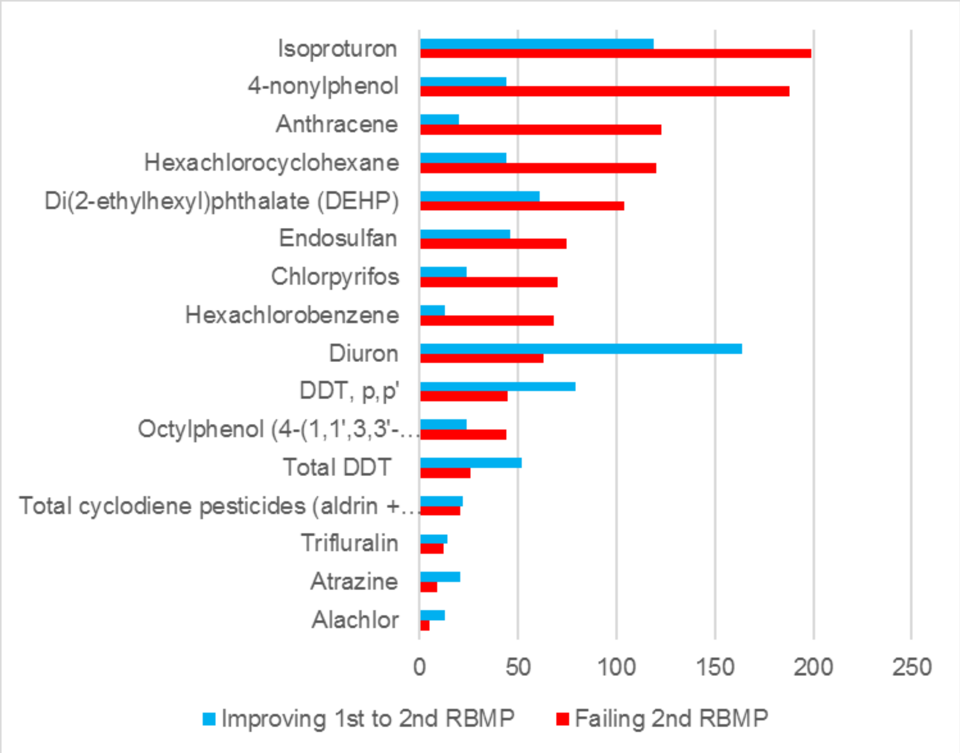
* draft dashboards;

However, Member States are making significant progress on tackling certain individual priority substances, excepting mercury, BDEs and PAHs. In several cases, a third of waterbodies improved between the first and second RBMP cycle for a particular priority substance (Figure 3.5).

For cadmium, nickel and lead, 969 water bodies improved in status during the first RBMP cycle compared to 2288 water bodies still failing in the second RBMPs. For pesticides (isoproturon, endosulfan, chlorpyrifos, diuron, DDT, total DDT, cyclodiene, trifluralin, atrazine, alachlor), 554 water bodies improved from failing to good compared to 525 water bodies failing to achieve good chemical status in the second RBMPs. If this development continues in the next RBMP cycle, the number of water bodies failing to achieve good status as a result of priority pesticides may become very low.

Figure 3.5: Numbers of water bodies where status of a priority substance has improved since first RBMP and the number failing in the second RBMPs.





Note: Member States have reported if a priority substance improved from failing to achieve good to good chemical status since the first RBMP. This is compared with the number of water bodies failing in the second RBMPs. The diagram has been split into two to account for differences in number of water bodies. Mercury and brominated diphenylethers were causing failure in 45973 and 23331 water bodies, respectively.
Source: Preliminary results based on WISE-SoW database) including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Chemicals designated in 2001 (and listed with EQS in 2008) as priority substances represent those recognised for a long time as being harmful to or via the aquatic environment. They are a small subset of the thousands of chemicals in daily use and in many cases restrictions have been in place for decades. More recent concerns, for example newly-identified harmful substances or issues such as toxicity of mixtures of chemicals, are not reflected in the list of priority substances relevant for the second RBMP reporting. However, some indication of the on-going challenge for chemicals is provided by reporting of certain countries which applied the new and revised standards under the Priority Substances Directive. These standards, which should be met in 2021, were applied by e.g. Sweden, where the revised biota standard for brominated diphenylethers (flame retardardants) was failed in all waterbodies; and Luxembourg, where the revised standard for fluoranthene (a PAH) was failed in all surface waterbodies.

4. Groundwater chemical status and pressures

Key messages

- 74 % of the area of EU groundwater bodies is in good chemical status.
- Agriculture is the main pressure causing failure of chemical status of groundwater, through pollution by nitrates and pesticides. Nitrates affect over 18 % of the area of groundwater bodies.
- In total 160 pollutants caused failure to achieve good status. Most pollutants were reported in few Member States, and only fifteen pollutants were reported by five or more Member States.
- There is only limited improvement in groundwater chemical status between the first and second River Basin Management Plans as a result of sustained pressure from agriculture and lag time in recovery.

4.1 Introduction

Groundwater provides a major source of drinking water for many EU citizens and provides the steady, base flow of rivers and wetlands. Maintaining this flow and keeping it free from pollution is vital for both humans and surface water ecosystems.

Pressures on groundwater chemical quality may arise mainly from diffuse pollution of nitrates and pesticides. Diffuse pollution, caused by nitrates applied to land in fertiliser or in manure and by pesticides, presents a significant and widespread challenge. Nitrogen pollution can also occur in areas where there is no sewerage system. Contaminated industrial sites, waste sites and old mines can lead to contamination by organic pollutants and metals such as arsenic, lead and copper. Pollutants may also be of natural origin, for example, when the bedrock contains high concentrations of metals and salts such as sulphates and fluorides. In coastal areas, saltwater may intrude into the groundwater aquifer where freshwater is abstracted e.g. for drinking water supply.

Once pollutants are in the groundwater, recovery can take years or even many decades, owing to residence times and slow degradation of pollutants. The time of recovery will depend on many factors such as the nature of the hydrogeological setting, the rate of groundwater recharge and the properties of the pollutant.

The Water Framework Directive requires Member States to designate separate groundwater bodies and ensure that each one achieves "good chemical status". The volume of the water bodies is addressed by groundwater quantitative status (chapter 5).

Good groundwater chemical status is achieved when the concentrations of pollutants:

- show no signs of saline intrusion in the groundwater body,
- do not exceed the applicable quality standards,
- do not result in failure of ecological or chemical status of associated surface waters nor any significant damage to terrestrial ecosystems which depend directly on the groundwater body, and

To be good quality groundwater, hazardous substances should be prevented from entry into groundwater and the entry into groundwater of all other pollutants – such as nitrate - should be limited. Additionally, Member States must prevent deterioration of status, reverse any significant and sustained upward trends in pollutant concentrations in groundwater, and, as with priority substances in surface water, progressively reduce pollution.

Chemical status in groundwater is assessed as good or failing to achieve good chemical status, according to compliance with EU standards of nitrates (50 mg/l[24]) and pesticides (0.1 µg/l individual; max 0.5 µg/l total), and with "threshold values" for other groundwater pollutants established by Member States. These threshold values can be set at groundwater body, national, river basin or international river basin level, with criteria[25] broadly requiring that:

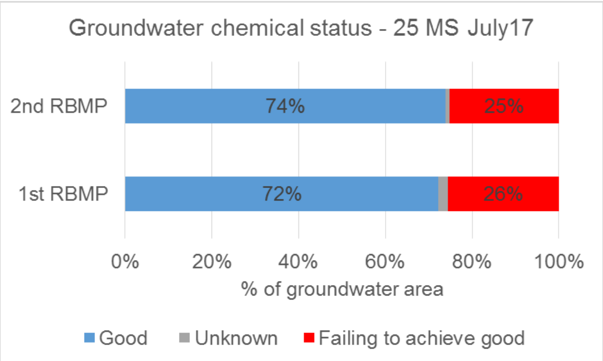
- Concentrations do not present significant environmental risk
- Provisions do not apply to high concentrations of naturally-occurring substances
- Should consider impact on, and interrelationship with, associated surface waters and directly dependent terrestrial ecosystems and wetlands;
- Shall take into account human toxicology and ecotoxicology knowledge.

4.2 Groundwater chemical status

Status in second river basin management plans

Reporting by Member States for the second RBMPs shows that 74 % of EU groundwater bodies (by area) are in good chemical status and 25 % fail to reach good chemical status, with 1 % where status is unknown (Figure 4.1).

Figure 4.1 Groundwater chemical status of groundwater bodies reported in first and second RBMPs



Note: Proportion of groundwater area in good and failing to achieve good chemical status. Total groundwater area (EU25) is 4.3 million km^2.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Further and detailed information on improvements in groundwater chemical status assessment is in WISE
- Monitoring of groundwater chemical status – number of monitoring sites (missing)
- Change in proportion unknowns: unknown chemical status
- Confidence in GW chemical status assessment Table and Graph*

* draft dashboards;

Member States should identify whether the chemical status of a groundwater body is at risk. The aim of the risk assessment is to assess the effort needed to meet good chemical status and prevent the deterioration of good status. In the second RBMP, the overall proportion of groundwater bodies not at risk of achieving good quality status was slightly lower at 69% than those in good chemical

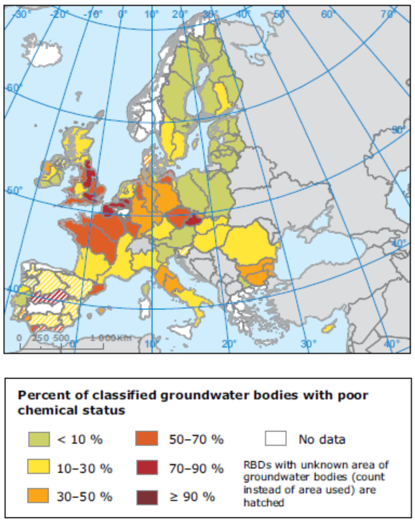
[24] Note, some Member States set more stringent nitrate standards (below 50 mg/l).
[25] Specific criteria are set out in Annex II of the Groundwater Directive REF

status (74%), although there was significant variation at country level, from no water bodies being at risk to 99% being at risk.

[To review: Lowest groundwater quality is focused in central and western Europe where there [is intensive agricultural production, and in some cases, where there was heavy industry (Figure/map 4.2.]

Figure 4.2 Map of river basin groundwater chemical status – currently 2012 map: will be updated

Map 5.1 **Chemical status of groundwater bodies per RBD — percentage of groundwater body area not achieving good chemical status**



An updated map has not been included – EEA is exploring different option on presenting the information on interactive map services. The map service should present chemical status per RBD for either the first or second RBMP with different filters and with pop-up windows with the results for the specific RBD. The RBD and subunit results are available by the below links in WISE.

Further and detailed information on groundwater chemical status results is available at in WISE
- Groundwater chemical status Table (EU & MS by geological formation) Table2; Graph*, Graph2 (MS comparison); MemberStates
- Comparison of groundwater chemical status Graph; GraphMS; MemberStates
- Groundwater at risk failing chemical status Groundwater area at risk*
- Groundwater area, expected good chemical status Table

* draft dashboards;

Intercomparability of groundwater chemical assessment

The range in good groundwater chemical status is from [38%] to 100%. As with RBSPs (chapter 2.3), Member States identify substances which pollute groundwater bodies and set “threshold values” at national level as a benchmark for good chemical status. This can lead to a range of approaches, for example, some Member States have considered threshold values for over 90 pollutants, while others have assessed status using fewer than 10. The monitoring of more substances could lead to a greater chance of failing to achieve good chemical status. In addition, the range of concentrations for which threshold values are set can vary quite widely and there are differences in methodologies for establishing threshold values and natural background levels. These factors together mean that caution should be applied when comparing groundwater chemical status between countries.

Change in status between first and second RBMPs

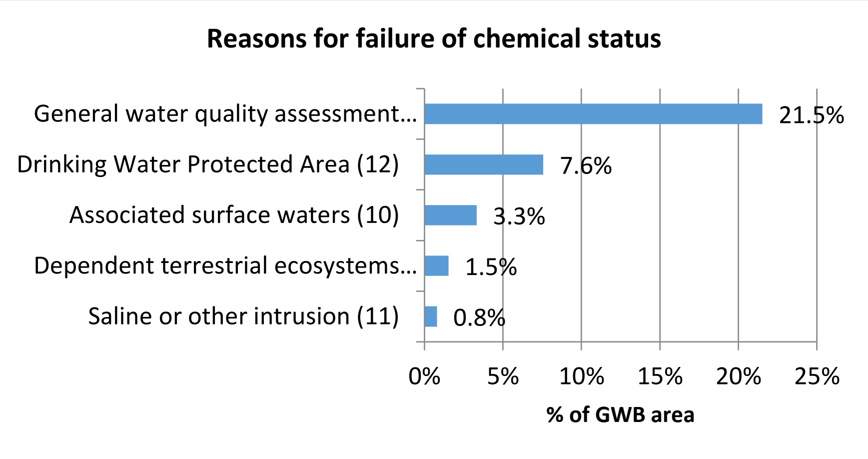
There has been little change in the chemical status of groundwater bodies since the first RBMPs, with an increase in good chemical status of 2% at EU level (Figure 4.1). This perhaps reflects the long timescales which may be involved in observing changes in groundwater quality after measures have been introduced to reduce pressures, or that effective measures have yet to be taken. There may also have been changes in the selection of relevant pollutants and changes in the threshold values, affecting direct comparison between the two RBMPs.

4.3 Reasons for failure to achieve good chemical status

Failure to achieve good chemical status was most frequently attributed to "general water quality". This reason considers significant impairment of human uses and significant environmental risk from pollutants across the groundwater body, but it does not include assessment of more stringent objectives, such as those for drinking water or dependent terrestrial ecosystems.

The second most frequent reason was failure owing to requirements for Drinking Water Protected Areas; other reasons were less significant (Figure 4.7).

Figure 4.7. Reason for failure of good chemical status by area (number of countries in brackets



Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania). Latvia reported all groundwater bodies in good chemical status.

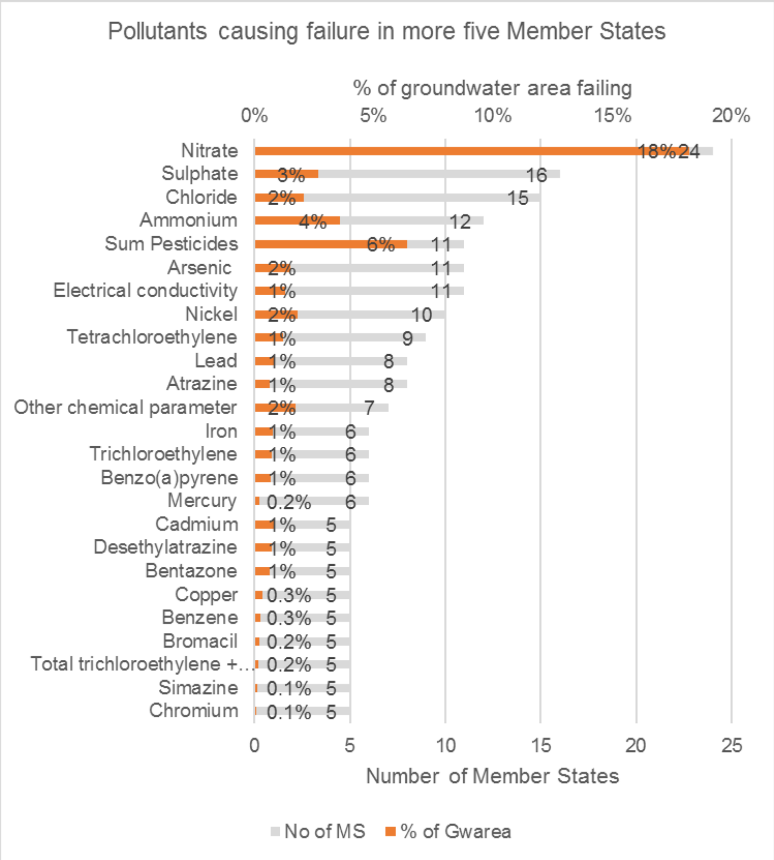
Further and detailed information on groundwater reason for failing chemical status is available in WISE
- Groundwater bodies: reasons for failure to achieve good chemical status Table - TableEU

Pollutants causing failure to achieve good status

In total, 160 chemicals were reported as causing poor chemical status. Some of these (iron, potassium, bicarbonate, calcium, magnesium, sodium and hardness) may be considered by some countries to characterise the natural background conditions of the aquifer and so in those places are not necessarily classified as anthropogenic pollutants. Electrical conductivity may be attributed to saline intrusions, where freshwater abstraction draws in saltwater, as only Member States with coastal areas reported this as a reason for failure.

The main pollutant causing failure to achieve good chemical status is nitrate. "Pesticides" are also reported as causing a large number of failures of good chemical status. Nitrate is the predominant groundwater pollutant throughout the EU (reported by 24 Member States causing failure in 18 % of groundwater area) (figure 4.3). Pesticides cause failure in 6.5 % of the groundwater bodies (by area).

Figure 4.3 Substances causing failure to achieve good chemical status in at least five Member States.



<needs to be updated with corrected EEA_00-00-0 other parameter & to change ”Sum pesticides” to ”Pesticides”>
Note: Pollutants causing failure in at least five Member States, shown by % of total GWB area
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

The list of substances most frequently leading to groundwater bodies not achieving good chemical status is dominated by substances used in agriculture (e.g. nitrate) and arising from salt intrusion (e.g. chloride). In addition, some industrial chemicals e.g. tetrachloroethylene, and metals arising from e.g. mining, contaminated sites and waste water, such as arsenic, nickel and lead, are causes of failure to achieve good chemical status.

Further and detailed information on groundwater pollutants including threshold values is available in WISE
- Number and name of groundwater pollutants per Member State [Table - TableEU - Graph]

Significant upward trend and trend reversal of pollutants

The Groundwater Directive requires that significant and sustained upward trends of pollutants should be identified and reversed. A significant trend is one that could lead to a groundwater body failing to meet its environmental objectives before 2021, if measures are not put in place to reverse it. Only a few countries reported any upward trend for the first RBMP, so comparison is difficult.

The total groundwater area with identified upward trend (9.9 % of groundwater area) is nearly double the area with a trend reversal (5.9 % of groundwater area).

Significant and sustained upward trends were identified for 58 pollutants, mainly for nitrate, which were detected in 19 Member States (Figure 4.4). Other substances with upward trends are similar to those in Figure 4.3.

In contrast, trend reversals were reported for 65 pollutants by 14 Member States (Figure 4.5), mainly for nitrates, sulphates, ammonium and chlorides.

Figure 4.4. Pollutants with an upward trend by area of groundwater bodies

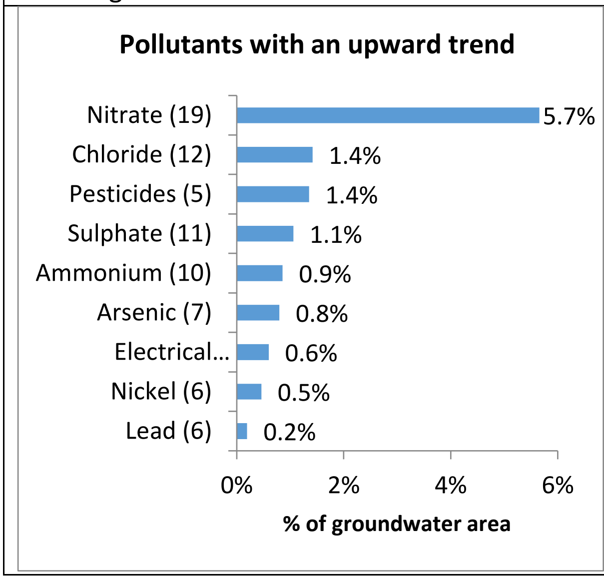
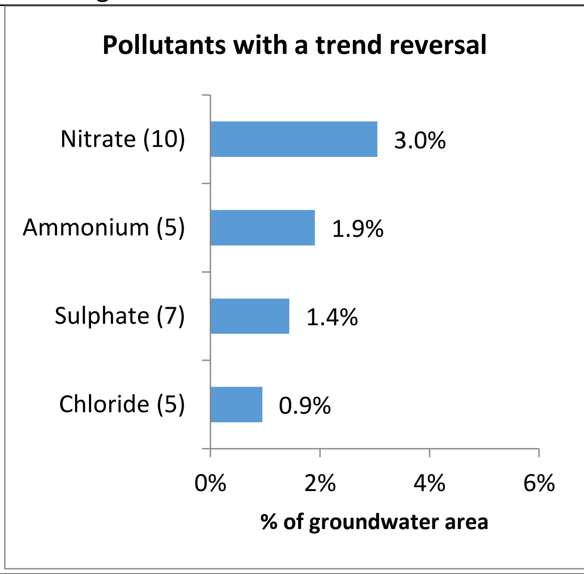


Figure 4.5. Pollutants with a trend reversal by area of groundwater bodies



Note Over 10 GWBs and over four countries shown - Number of countries in brackets
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

As groundwater chemical data for second cycle RBMPs were mainly collected during 2010 – 2012 and the effect of measures is likely to take time, increased trend reversal of existing pollutants may be expected in future years.

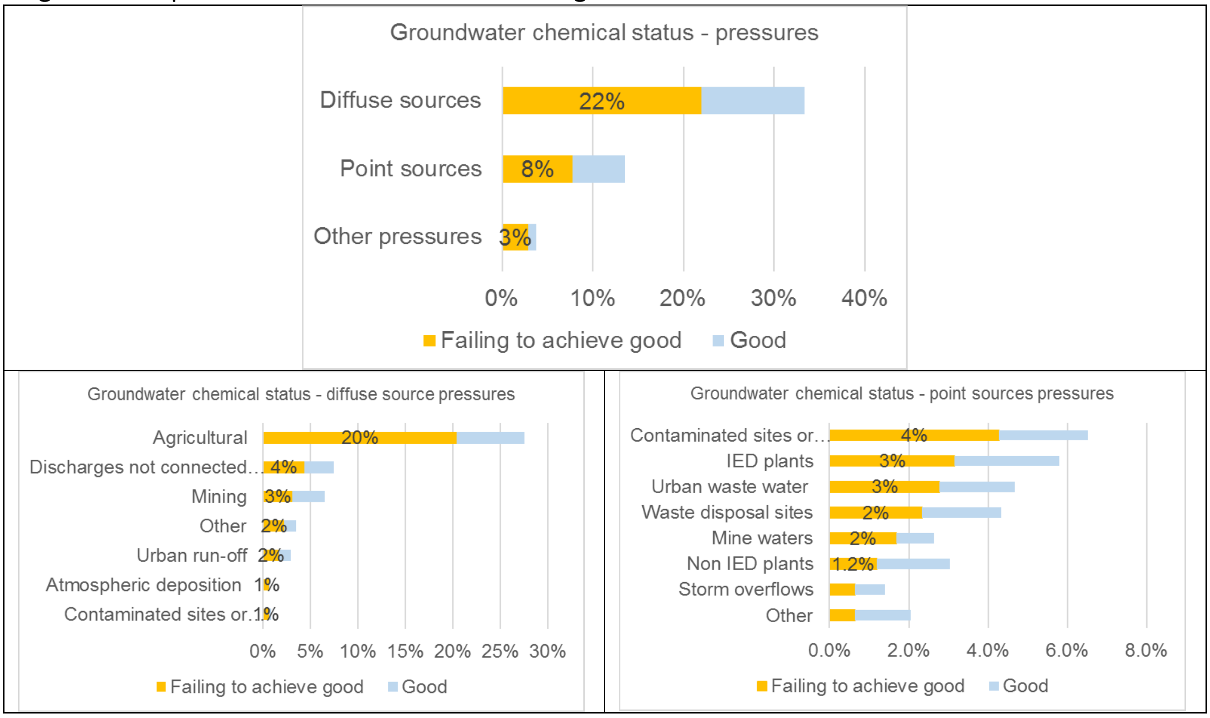
Further and detailed information on groundwater pollutants with upward trend or trend reversal is available in WISE

- Groundwater pollutants trend reversal
- Groundwater pollutants upward trend

4.4 Pressures on groundwater chemical status

Most countries report diffuse sources of pollution as being a pressure for groundwater (24 out of 25 Member States), while 20 reported point sources as a pressure. Diffuse sources affect 22 % of the groundwater bodies by area (Figure 4.7). Diffuse pollution from agriculture is the major pressure causing failure of good chemical status affecting 20 % of groundwater bodies (by area). Other pressures are of less significance (Fig. 4.7).

Fig 4.7 Main pressures identified in relation to groundwater chemical status



Note: Proportion of groundwater area affected by the main pressure groups and by detailed pressures for diffuse sources and point source pressures. Some Member States have reported groundwater bodies in good chemical status with diffuse or point source pressures, the proportion of these are indicated by light blue in the diagrams. Remark differences in the scale of the X-axis.

Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania). Latvia reported all groundwater bodies in good chemical status.

The main impacts were chemical (22 % of groundwater bodies by area) and nutrient pollution (19 %).

Further and detailed information on pressures and impacts in relation to chemical status is available in WISE

- Groundwater chemical status, main pressure groups [table](#)
- Groundwater chemical status, detailed pressures [point pollution sources](#), [diffuse pollution sources](#),
- Groundwater chemical status, significant impacts - [table](#)

5. Groundwater quantitative status and pressures

Key messages

- In the second RBMPs, around 90 % of the area of groundwater bodies is in good quantitative status. However, in the southern Member States of the EU, in particular Cyprus, Malta and Spain there are significant problems with the quantitative status of groundwater bodies.
- The main pressures causing failure of good quantitative status are water abstraction for public water supply, agriculture and industry.
- Groundwater quantitative status has improved by about 5 % since the first RBMP was reported..

5.1 Introduction

Groundwater is the water below the Earth's surface in the fractures of rock formations and in soil pore spaces. Groundwater aquifers are embedded in geological layers and the groundwater body is a distinct volume of groundwater within an aquifer(s).

Groundwater bodies are characterized by their geology and their productivity. More than half are porous aquifers, followed by fissured aquifers and are generally highly to moderately productive. Fractured aquifers including karst and local and limited aquifers are less common. Groundwater provides the steady, base flow of rivers and wetlands.

In overall of European water balance, groundwater aquifers receive around 11 % of total precipitation as deep percolation, but provides around 42 % of total water abstraction in Europe mainly for public water supply and agricultural activities. In Europe, about 50 % of drinking water is taken from groundwater (EEA, 2016). Many large cities are depending on water supply from groundwater resources.

The WFD requires good quantitative status to be achieved by ensuring available groundwater resource is not exceeded by the long-term annual average rate of abstraction. Accordingly, the groundwater level may not be subject to

- any diminution in ecological status of surface water linked with groundwater
- significant damage to groundwater dependent terrestrial ecosystems, nor
- any flow reversals that lead to saline or other intrusions do not impact groundwater quantitative status.

Groundwater bodies are classified in good, poor and unknown quantitative status. Change in status by area per country between the first and second RBMPs has been used to analyse the improvements in groundwater quantitative status. For groundwater bodies failing to achieve good quantitative status the reasons for failure, significant pressures and impacts are described.

Further and detailed information on improvements in groundwater quantitative status assessment is available in WISE

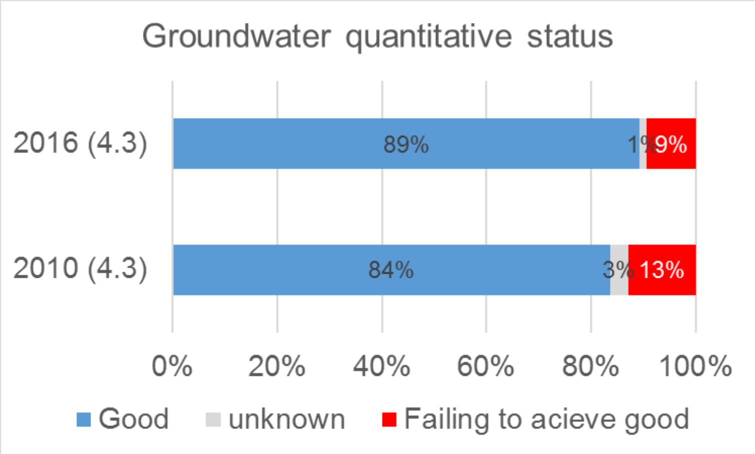
- Monitoring of groundwater quantitative status – number of monitoring sites (missing)
- Change in proportion unknowns: unknown quantitative status Table (EU & MS);
- Confidence in GW quantitative status assessment Table and Graph*

5.2 Groundwater quantitative status

Status in second RBMPs

Almost 90 % of the area of groundwater bodies have good quantitative status, 9 % of total area of groundwater bodies has failed to achieve good quantitative status, while around 1 % of the groundwater area have unknown status (Figure 5.1).

Figure 5.1 Groundwater quantitative status by area between the first and second RBMPs.



Note: The numbers in parenthesis show total area (in million km^2) of groundwater bodies.
Source: WISE-SoW database data from 25 Member States (except Greece, Ireland and Lithuania)

Six Member States have reported all groundwater bodies at good quantitative status, while Cyprus and Malta have reported the highest proportion of groundwater bodies failing to achieve good quantitative status (Table 5.1). Cyprus and Malta have 57 % and 80 % of their groundwater in poor quantitative status, while both countries are heavily depending on abstracting water from groundwater resources. For instance, Malta abstracts around 60% of total water needs from groundwater resources and similarly almost half of total water abstraction is from groundwater resources in Cyprus[26].

Around 14 Member States reported that between 75 % and 99 % of the total area of groundwater bodies are in good quantitative status, while this ratio was between 50 to 75 % in three Member States.

Table 5.1 Percentage of good quantitative status of groundwater bodies by area

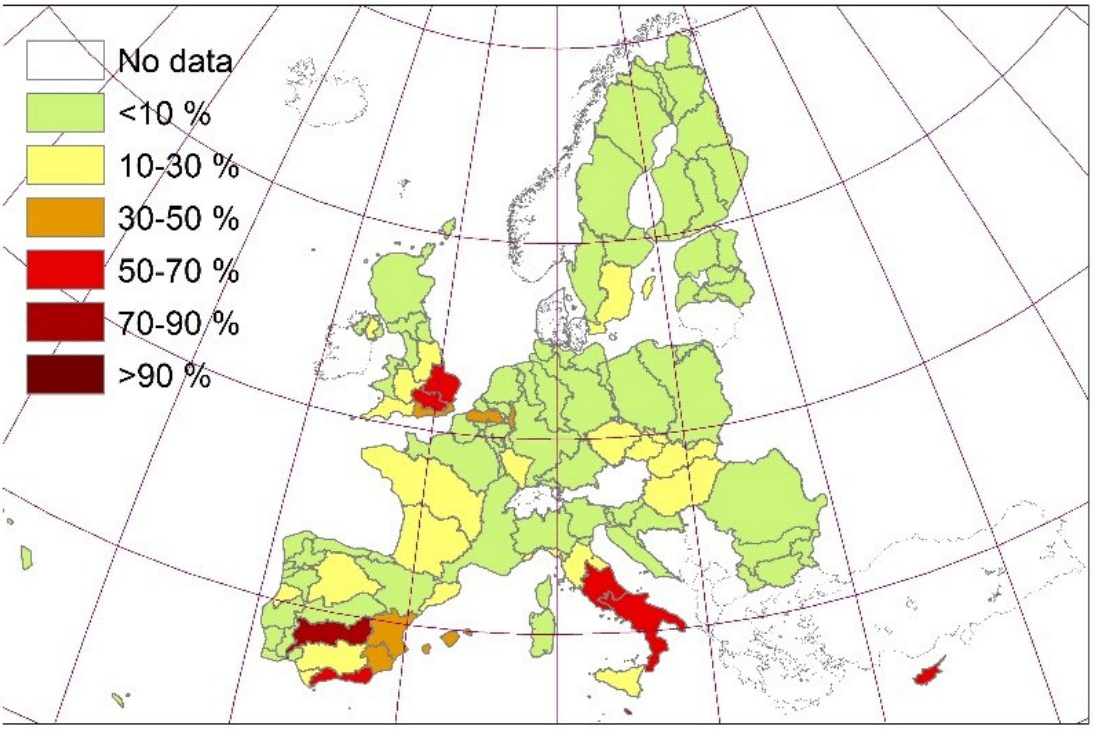
% GWBs in good quantitative status by area	Member States
100 %	Austria, Latvia, Luxembourg, Netherlands, Romania, Slovenia
75-100 %	Croatia, Denmark, Estonia, Bulgaria, Portugal, Germany, Poland, Finland, Sweden, Czech Republic, France, United Kingdom, Spain, Italy
50-75 %	Hungary, Slovakia, Belgium
<50 %	Cyprus, Malta

Source: WISE-SoW database data from 25 Member States (except Greece, Ireland and Lithuania)

In around 70 RBDs, all groundwater bodies are in good quantitative status. Only one RBD reported all its groundwater bodies failing to achieve good quantitative status (Map 5.2).

[26] Zal, N., Bariamis, G., Zachos, A., Baltas, E., Mimikou, M., 2017, Use of Freshwater Resources in Europe – An assessment based on water quantity accounts, ed. Künitzer, A.. ETC/ICM Technical Report 1/2017, Magdeburg: European Topic Centre on inland, coastal and marine waters, 75 pp.

Map 5.2 Percentage of the area of groundwater bodies not in good quantitative status in Europe's river basin districts in the second RBMP



Note: the map presents the results based on the data reported from 136 RBDs of 23 Member States (missing Denmark and Austria, - Greece, Ireland and Lithuania).Results for the map see Link

Change in status between the first and second RBMPs

Overall, more than 80 % of all groundwater bodies in Europe had good quantitative status in the first RBMPs. Around 5 % of improvement regarding good quantitative status has been observed between the first and second RBMPs, while failing to achieve good quantitative status has decreased from 13 % to 9 %. Knowledge on groundwater quantitative status has been substantially increased and now only around 1 % of groundwater bodies are in unknown status, and in total four Member States have groundwater bodies in unknown status. Around 70 % of quantitative status assessments have been marked as high or medium-level confidence.

Further and detailed information on groundwater quantitative status results is available in WISE

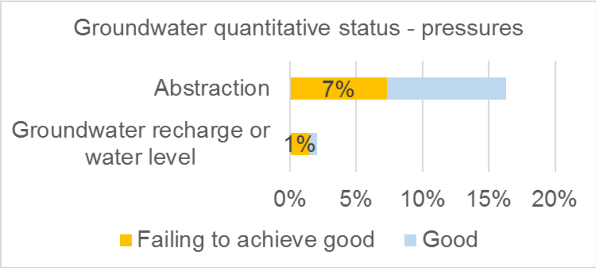
- Groundwater quantitative status Table (EU & MS); Table2 ; Graph*, Graph2 (MS comparison); MemberStates
- Comparison of groundwater quantitative status Graph; GraphMS; MemberStates
- Groundwater at risk failing quantitative status Table

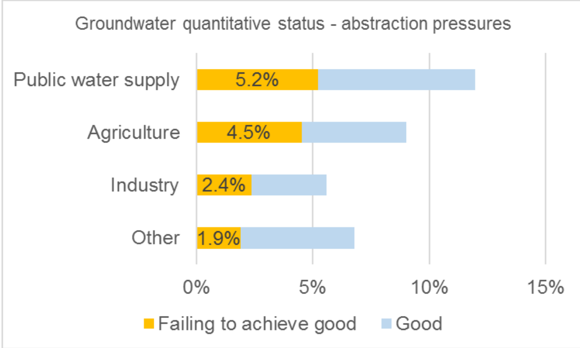
5.3 Pressure and impacts on quantitative status

In 10 % of the groundwater area which fails to achieve good quantitative status, the main reasons are lowered water table (75 %), deterioration of associated surface waters (24 %) and dependent terrestrial ecosystems (20 %) and saline intrusion (9 %). A groundwater body may have more than one reason for failure of good status.

The main pressures affecting groundwater bodies are abstraction and change in groundwater level (Figure 5.3). Over-abstraction is affecting 16 % of the total groundwater area. The main significant pressures causing failure of good quantitative status are water abstraction for public water supply, agriculture and industry.

Figure 5.3 Significant pressures causing failure to achieve good quantitative status.





Note: Data from 25 Member States of which 19 Member States have groundwater bodies failing good quantitative status
Source: WISE-SoW database data from 25 Member States (except Greece, Ireland and Lithuania)– September 2017.

The area of groundwater bodies affected by water abstraction for public water supply has decreased 7 % since the first RBMPs. On the other hand, water abstraction for industry and agriculture has increased 9 % and 8 % respectively (Table 5.2). The changes in pressures may be due to better understanding of the abstraction pressures during preparation of the second RBMPs, or due to actual changes in abstraction.

Table 5.2 Changes in abstraction pressure between first and second RBMPs for area of groundwater bodies failing to achieve good quantitative status.

RBMPs	Public water supply	Agriculture	Industry	Other
First	44 % (267)	24 % (148)	8 % (50)	23 % (142)
Second	37 % (225)	32 % (195)	17 % (100)	14 % (83)

Note: Total area of groundwater bodies (as percentage and absolute value within parenthesis - 1000 km^2) affected by abstraction pressure against total area of groundwater bodies failing to achieve good quantitative status.
Data from 23 Member States (missing Denmark and Austria, - Greece, Ireland and Lithuania) of which 18 Member States have groundwater bodies failing good quantitative status
Source: WISE-SoW database – July 2017.

A comparison of change in status indicates that almost all European groundwater bodies would achieve good quantitative status by 2027 based on the assessment of predicted status in the following RBMPs (Table 5.3).

Table 5.3 Outlook for the area of groundwater bodies failing to achieve good quantitative status in future RBMPs

	GWB quantitative status	
	GWBs	%
Good status 2015	3.86	89 %
Less stringent objectives already achieved	0.03	1 %
2016--2021	0.18	4 %
2022--2027	0.17	4 %
Beyond 2027	0.04	1 %
Unknown	0.03	1 %

Note: GWBs area of groundwater bodies in million km^2.
Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Further and detailed information on groundwater quantitative status results is available in WISE

- Groundwater quantitative status reason for failure [Table]
- Groundwater quantitative status main pressures [Table]
- Groundwater quantitative status detailed abstraction pressures [Table]
- Groundwater quantitative status main impacts [Table]
- Groundwater expected to be in good quantitative status [Table]

6. Overall status, progress achieved and future challenges

Key messages

- The second RBMPs provide a better understanding of the status and the pressures causing failure to achieve good status and the needed mitigation measures. Evidence has also improved through more and better monitoring of pollutants and quality elements.
- A higher proportion of water bodies are in good status (ecological, chemical and quantitative) in the second RBMPs than in the first RBMPs; however, there is also an increase in the proportion of surface water bodies failing to achieve good status, in part corresponding to a fall in the proportion whose status was unknown.
- Marked efforts have been made by Member States to improve water quality and hydromorphology. Some of the measures have immediate effect; others will result in improvement in the longer run. Results are usually visible at the level of individual quality elements or pollutants but often do not translate into an overall improved status.
- The analysis of the second RBMPs shows that there is progress in the status of single quality elements and single pollutants. In particular, ecological status has improved for many biological quality elements from the first to the second RBMPs.
- Without ubiquitous priority substances, in particular, mercury, only 4 % of surface water bodies failed to achieve good chemical status and only a few priority substances are responsible for poor chemical status in most Member States. Improvements in status for individual priority substances shows that Member States are making progress in tackling sources of contamination.
- Diffuse sources (62 %) and hydromorphological pressures (40 %) are the main significant pressures on surface water bodies, followed by point sources (21 %) and abstraction (7 %).
- Diffuse sources (41 %) and point sources (16 %) are the main pressures related to groundwater chemical status, while pressures from water abstraction (22 %) are the main cause of poor quantitative status.
- By now, many of the several thousand individual measures in the first RBMPs will have been completed and in the second RBMPs more measures are planned. <more text>

6.1. Current status and overall progress since the first RBMPs

The results in the previous chapters show that with the second RBMPs the quantity and quality of available evidence has grown significantly. Many Member States and RBDs have invested in better or new ecological and chemical monitoring programs, with more monitoring sites, more quality elements assessed and more chemicals analysed. These improvements in monitoring and assessment mean that the status classification results are now a better interpretation of the general health of the water environment.

Groundwater status across Europe is generally better than surface waters (Figure 6.1). Good chemical and quantitative status was achieved for 70 % and 86 % of groundwater bodies. Around 40 % of surface water bodies have good ecological and 41 % good chemical status.

Compared to the first RBMPs, there are for all four measures of status[27] a higher proportion of water bodies in good status in the second RBMP. However, there are also for surface waters a higher proportion of water bodies in less than good status. Both the changes in proportion of good and less than good status is due to improved knowledge of the water environment (i.e. fewer water bodies have unknown status).

[27] Surface water ecological and chemical status; and groundwater chemical and quantitative status.

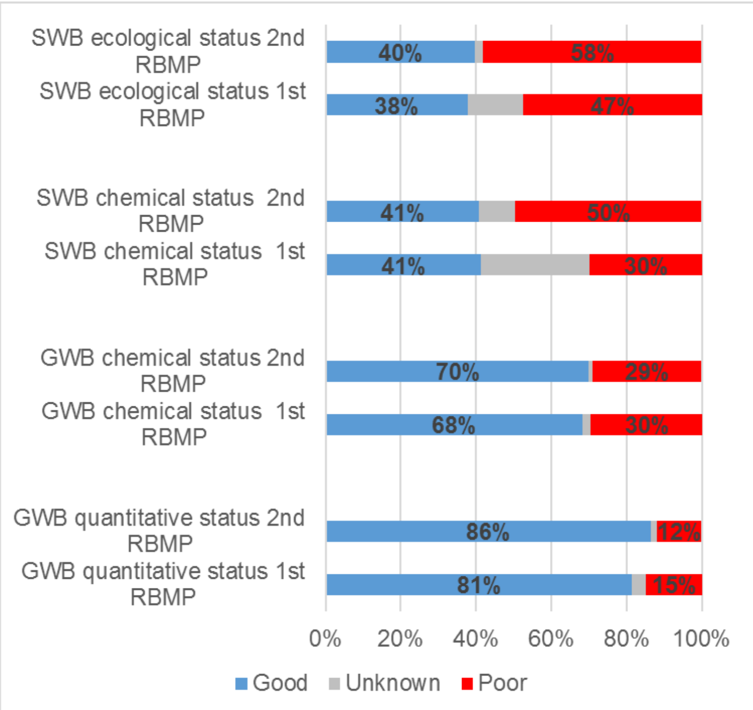
The analysis of the second RBMPs shows that there is progress in the status of single quality elements and single pollutants. In particular, ecological status has improved for many biological quality elements from the first to the second RBMPs.

For chemical status, a very low proportion of surface water bodies (3 %) are reported to fail to achieve good status if ubiquitous substances, especially mercury, are omitted, and in most Member States only a few priority substances (mainly heavy metals like cadmium, lead and nickel) are responsible for the poor chemical status observed. Improvement in status for several priority substances shows that Member States are making progress in tackling sources of contamination.

There are several possible explanations for the limited improvements in overall status from the first to the second RBMPs.

- First, additional biological and chemical monitoring was put in place after 2009 and the classification methods were improved, and in some cases, stricter standards or standards in another matrix than water (biota) were introduced.
- Second, for some water bodies some quality elements have improved in status, but there has been no improvement in the overall status.
- Third, the second RBMPs generally show status classification up to 2012/13 and at that time, many measures were only in the process of being implemented and there may be a lag time before the pressures are reduced and there are improvements in status.
- Finally, some pressures may have been unknown in 2009; and the measures implemented may not have been sufficient and as effective as expected at reducing all the pressures.

Figure 6.1 Comparison of status (ecological, chemical and quantitative status) in the first and second RBMPs.



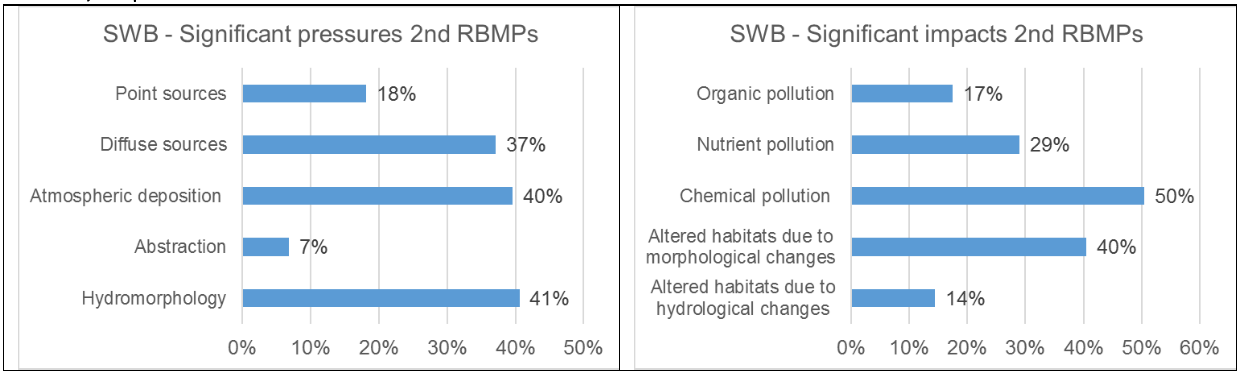
Notes: Ecological status: Good = High and good ecological status/potential and Failing to achieve good is moderate, poor and bad status. Only water bodies that are comparable between the two cycles of RBMPs (WISE evolution type nochange, change, changecode) are compared. Status for surface water bodies is based on count of water bodies (92 346 water bodies), while status of groundwater bodies is by the area of groundwater bodies (3.04 million km^2).
Source: Preliminary results based on WISE-SOW database – 25 Member States 2017.

Pressures and impacts causing failure to achieve good status

For surface water bodies, the main significant pressures are hydromorphological pressures (41 %), atmospheric deposition and diffuse source pollution (37 %), followed by point source pollution (18 %) and water abstraction (7 %) (Figure 6.2). Atmospheric deposition is mainly reported for water bodies failing good chemical status due to mercury.

The main impacts on surface water bodies are chemical pollution (50 %), followed by altered habitats due to morphological changes (40 %) and nutrient pollution (29 %).

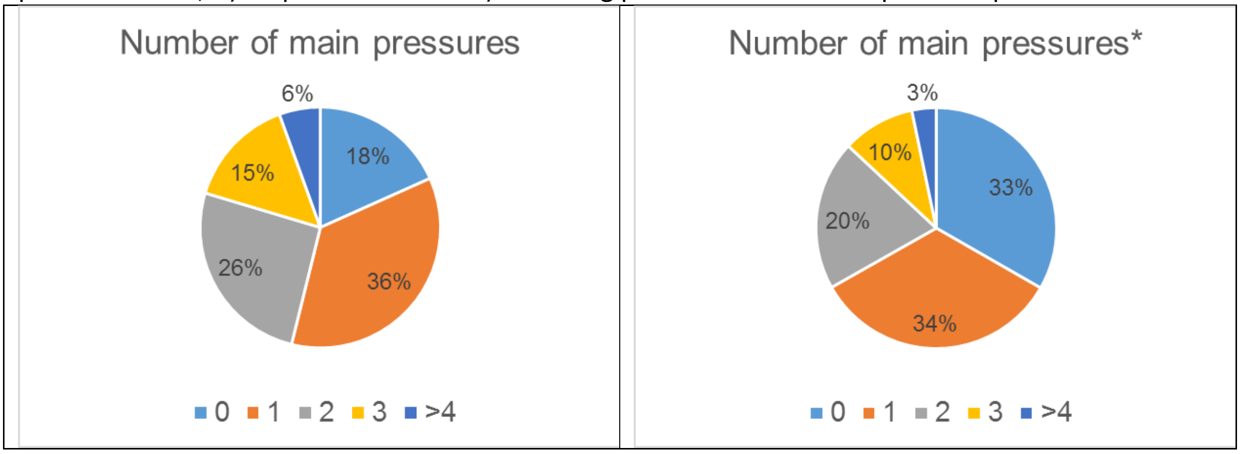
Figure 6.2: Overview of the proportion of surface water bodies having A) main significant pressures and B) impacts in the second RBMPs.



Note: Pressures from diffuse sources do not include atmospheric deposition. The diagrams show the proportion (%) of water bodies affected by each pressure and impact type for the second RBMPs, considering only water bodies which have been classified with respect to ecological status (106 329 water bodies) .
Source: Preliminary results based on WISE-SOW database – 25 Member States 2017.

Around 18 % of surface water bodies had no identified significant pressures, while 36 % of surface water bodies are affected by 1 pressure, and 39% are affected by multiple (more than one) significant pressures (Figure 6.3). Diffuse pollution and hydromorphology is the most common combination of two-pressures in rivers and lakes (respectively ca. 62 % and 71% of WBs with two-pressures combinations), followed by point and diffuse pollution. In contrast, the most common combination in transitional and coastal waters is point and diffuse source pollution (59 % of transitional and coastal water bodies with two-pressures combinations). Excluding pressures from atmospheric deposition one third of the water bodies are having pressures compared to 40 % of water bodies are in high and good ecological status.

Figure 6.3. Proportion of surface water bodies impacted simultaneously by single, multiple or no pressures at all; A) All pressures and B*) excluding pressures from atmospheric deposition.

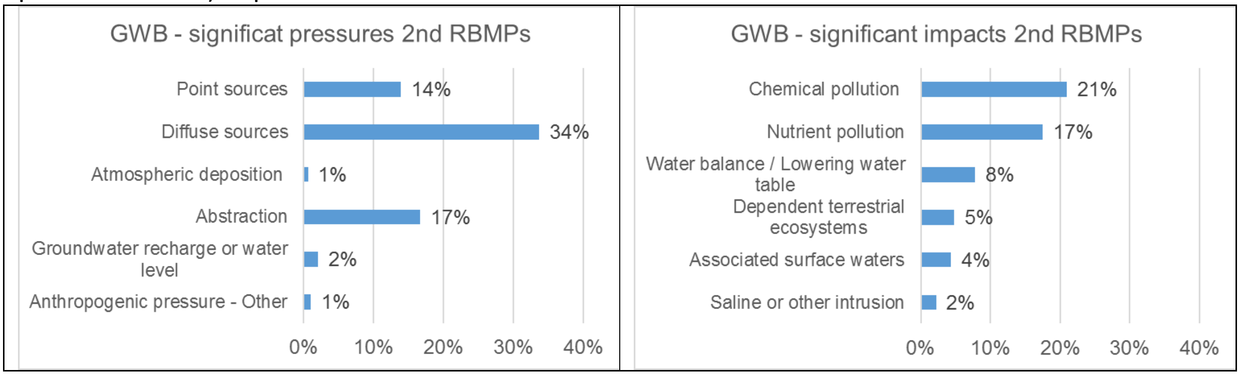


Note: The diagram without pressure from atmospheric deposition gives a better indication of proportion of water bodies affected by no pressure or multiple pressures in relation to ecological status.
Source: Preliminary results based on WISE-SOW database – 25 Member States 2017.

With regard to groundwater, the main pressures for chemical status are diffuse source (34 % of groundwater area) and point source (14 %) pollution, while for groundwater quantitative status; the main pressures are from water abstraction (17 %) (Figure 6.4).

The primary impacts on groundwater are related to chemical pollution (21 % of groundwater area), followed by nutrient pollution (17 %), while different impacts are identified in relation to quantitative status.

Figure 6.4: Overview of the proportion of the area of groundwater bodies having A) main significant pressures and B) impacts in the second RBMPs.



Note: Pressures from diffuse sources do not include atmospheric deposition. The diagrams show the proportion (%) of groundwater area affected by each main pressure and impact for the second RBMPs (4.3 million km^2).
Source: Preliminary results based on WISE-SOW database – 25 Member States 2017.

From the first to the second RBMPs there is an increase in the proportion of water bodies being affected by significant pressures. Statements in the digital versions of the RBMPs indicate (e.g. Swedish RBMPs) that this is not due to an actual increase in pressures, but is due to a better knowledge of the pressures affecting the water bodies. In contrast, there is evidence that some pressures have decreased during the first RBMP cycle, which is leading to improved water quality (see section 6.2) and improvements in hydromorphology (see section 6.3).

Implementation of measures

The WFD requires an assessment of the significant pressures in a river basin, and where a water body is not in good status, a targeted Program of Measures (PoMs) needs to be developed. The first RBMPs already contained many kinds of measures. The types of measures frequently reported by Member States were construction or upgrade of urban waste water treatment plants, encouraging best practice measures in agriculture to reduce nutrient pollution, implementing measures to improve river continuity and habitat quality, ensuring adequate drinking water protection, as well as research projects to improve the knowledge base and reduce uncertainty (EC, 2015[28]).

In December 2012, Member States reported on their progress in implementing the PoMs from the first RBMPs. Already in 2012, the challenge of fully implementing all measures was obvious, as only around a quarter were reported as completed. In 2012, the implementation of most measures (66 % of basic and 54 % of supplementary measures) was still ongoing, while the implementation of other measures had not even started (11 % and 17 % for basic and supplementary measures, respectively).

The interim progress report of Member States on the PoM in 2012 indicated that in the majority of RBDs, basic measures would not be sufficient to tackle these key pressures and supplementary

[28] http://ec.europa.eu/environment/water/water-framework/impl_reports.htm

measures would need to be taken. Especially supplementary measures have been reported as necessary to tackle the main pressures on EU water bodies, namely diffuse pollution from agriculture and hydromorphological pressures. In the same time, only 10 % of the supplementary measures for hydromorphology and diffuse pollution sources had been completed by 2012 (75 % were ongoing and 15 % had not yet started) (EC, 2015[29]).

By now, many of the several thousand individual measures in the first RBMPs will have been completed (to be updated based on EC, 2018). However, some measures have been delayed or even not started mainly due to funding constraints, while other measures have been difficult to implement.

In the following sections (6.2 Pollution and water quality; and 6.3 Hydromorphology and water abstractions), an overview of the main issues/pressures is provided (point sources, diffuse sources, chemicals, hydromorphology, and water abstractions), along with examples of key measures that have been implemented in recent years because of the first RBMPs.

6.2 Pollution and water quality

A range of pollutants in many of Europe's waters threatens aquatic ecosystems and may raise concerns for public health. These pollutants arise from a range of sources including agriculture, industry, households and the transport sector. They are emitted to water via numerous diffuse and point pathways. Once released into freshwater, pollutants can be transported downstream and ultimately discharged to coastal waters, together with direct discharges from cities, industrial discharges and atmospheric deposition polluting coastal waters.

Clean unpolluted water is essential for our ecosystems. Aquatic plants and animals react to changes in their environment caused by changes in water quality. Pollution takes many forms: 1) faecal contamination from sewage makes water aesthetically unpleasant and unsafe for recreational activities such as swimming; 2) many organic pollutants, including sewage effluent as well as farm and food-processing wastes, consume oxygen, suffocating fish and other aquatic life; 3) excess nutrients can create eutrophication, a process characterised by increased plant growth, problematic algal blooms, depletion of oxygen, loss of life in bottom water, and undesirable disturbance to the balance of organisms present in the water; and moreover, 4) pollution through hazardous substances and chemicals can threaten aquatic ecosystems and human health.

Reducing pollution to meet the objectives of the WFD requires that several other directives and regulations are implemented. These include the Urban Waste Water Treatment Directive, the Nitrates Directive, the Directive on Sustainable Use of Pesticides, the Industrial Emissions Directive and the Regulation on the registration, evaluation, authorization and restriction of chemicals (REACH), which all play a key role in tackling point and diffuse source pollution.

Point source pollution

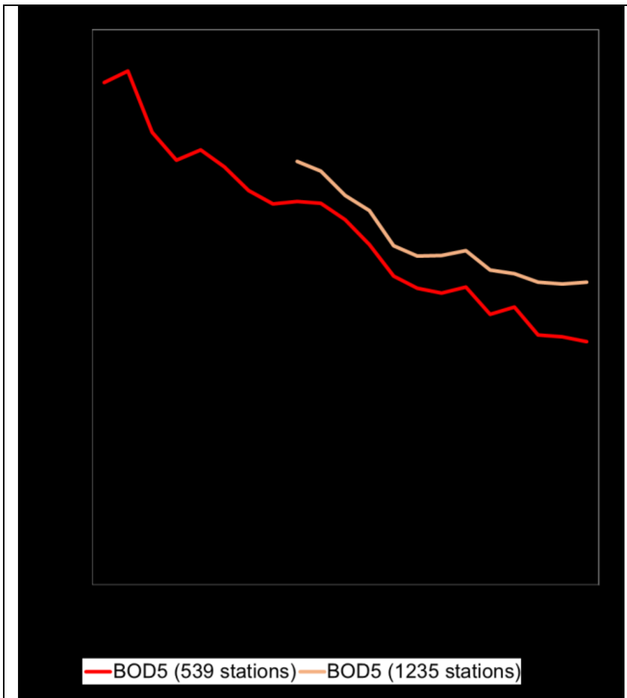
The point source pressures for surface waters are related to effluent discharges of pollutants from urban waste water followed to a lesser degree by discharges from storm water, industries sites and aquaculture, while the point source pressures affecting groundwater is more related to leaching of hazardous substances from landfills and contaminated sites. During the last century, increased population growth and increased waste water production and discharge from urban areas and industry resulted in a marked increase in water pollution from point sources.

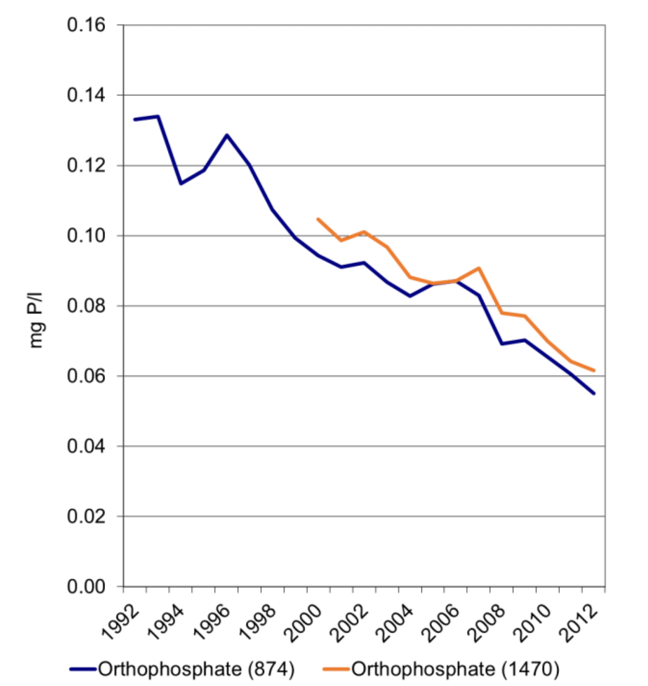
In the second RBMPs, Member States identified 21 % of surface water bodies being affected by point source pollution pressures, with transitional and coastal waters more affected than rivers and lakes. The main driver for point source pollution in the second RBMPs is urban waste water, being the source for around 70 % of surface water bodies affected by point sources. Furthermore, point sources from contaminated sites are a significant pressure for 14 % of groundwater body area.

[29] http://ec.europa.eu/environment/water/water-framework/impl_reports.htm

Downward trends in concentrations of water pollutants associated with urban and industrial wastewater are evident in most of Europe's surface waters (Figure 6.5). This is also reflected in the quality of EU bathing waters, which has improved significantly since 1990 (EEA, 2016[30]). In 2016, more than 96 % of bathing sites had good water quality (EEA, 2017[31]). Concentrations of pollutants associated with waste water discharge such as BOD, ammonium and phosphate in European rivers and lakes have decreased markedly over the past 25 years (Figure 6.5).

Figure 6.5: Trend in Biological Oxygen Demand (BOD) and orthophosphate in European rivers.





Note: The diagram depicts two-time series: the longer time series has fewer stations (539) and the shorter time series has more (1 235). Source: Link.	Note: The diagram depicts two-time series: the longer time series has fewer stations (874) and the shorter time series has more (1 470). Source: Link.

Measures for improved wastewater treatment

Over the past few decades, clear progress has been made in reducing emissions into surface waters. Implementation of the Urban Waste Water Treatment Directive (91/271/ EEC), together with national legislation, has led to improvements in wastewater treatment across much of the European continent[32, 33]. These positive trends are due to increased connection to sewers, improvements in wastewater treatment and reduction of substances at source such as lowering the phosphate content in detergents. Table 6.1 illustrates some examples of point source measures implemented during the past years.

Table 6.1: Examples of measures on reducing point source discharges

River basin district or country	Measures
Danube iRBD	Sewer systems and urban waste water treatment plants have been constructed,

[30] https://www.eea.europa.eu//publications/european-bathing-water-quality-2015

[31] https://www.eea.europa.eu/publications/european-bathing-water-quality-in-2016

[32] EEA, 2016, European water policies and human health — Combining reported environmental information, European Environment Agency (https://www.eea.europa.eu/publications/public-health-and-environmental-protection).

[33] CSI024 https://www.eea.europa.eu/data-and-maps/indicators/urban-waste-water-treatment/urban-waste-water-treatment-assessment-4

	upgraded or extended at almost 900 agglomerations (2009-2015 - ICPDR 2015)
Bucharest, Romania	After start of UWWTP operation in 2011, concentrations of organic and nutrient pollution indicators have significantly decreased (2011-2015 – EEA 2016)
St. Petersburg, Russia	After start of UWWTP operation in St. Petersburg in 2005, inputs of nutrients in the Eastern Gulf of Finland significantly decreased; also, several UWWTP enhanced in Poland and Latvia in recent years
Germany	Total phosphorus discharges have decreased by ca. 70% from 1983 until 2014 (UBA 2018).

Sources: ICPDR 2015; http://www.icpdr.org/main/activities-projects/river-basin-management-plan-update-2015
EEA 2016: Rivers and lakes in European cities. EEA Report No 26/2016. https://www.eea.europa.eu/publications/rivers-and-lakes-in-cities.
HELCOM: St. Petersburg http://www.portofhelsinki.fi/en/emagazine/baltic-sea-recovering
UBA 2018: Einträge von Nähr- und Schadstoffen in die Oberflächengewässer.
https://www.umweltbundesamt.de/daten/wasser/fliessgewaesser/eintraege-von-naehr-schadstoffen-in-die#textpart-1

Diffuse source pollution

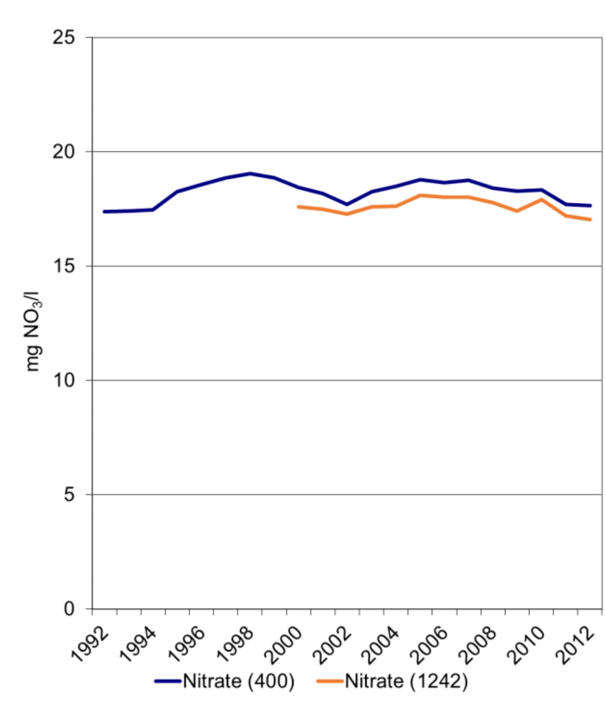
In Europe, diffuse source pollution is mostly due to excessive emissions of nutrients (nitrogen and phosphorus) and chemicals such as pesticides. In the second RBMPs, Member States identified that diffuse pollution affects 37 % of surface water bodies[34] and 34 % of the area of groundwater bodies. Agricultural production is a major source of diffuse pollution affecting 68 % of water bodies affected by diffuse pollution pressures[35]. Further drivers include rural dwellings (emissions from households not connected to sewage systems), run-off from urban areas and forested land. Nutrient enrichment causes eutrophication, which in turn leads the loss of aquatic biodiversity and reduction of fish stocks. Excessive nutrient enrichment can be dangerous for human health, e.g. due to toxic algal blooms, and impair the use of drinking water and bathing.

The average nitrate concentration declined by 20 % in European rivers between 1992 and 2012, while already in 2011 groundwater nitrate concentrations almost returned to the levels in 1992 (Figure 6.6). The decline in nitrate concentration reflects the effects of measures to reduce agricultural emissions of nitrate, as well as improvements in wastewater treatment. Decreasing trends are more visible in rivers as they react fairly quickly to changes in nutrient surplus; in contrast, the comparatively long residence time of groundwater may cause delays in recovery in the order of years to decades between the application of nutrient control measures and measurable improvements in water quality.

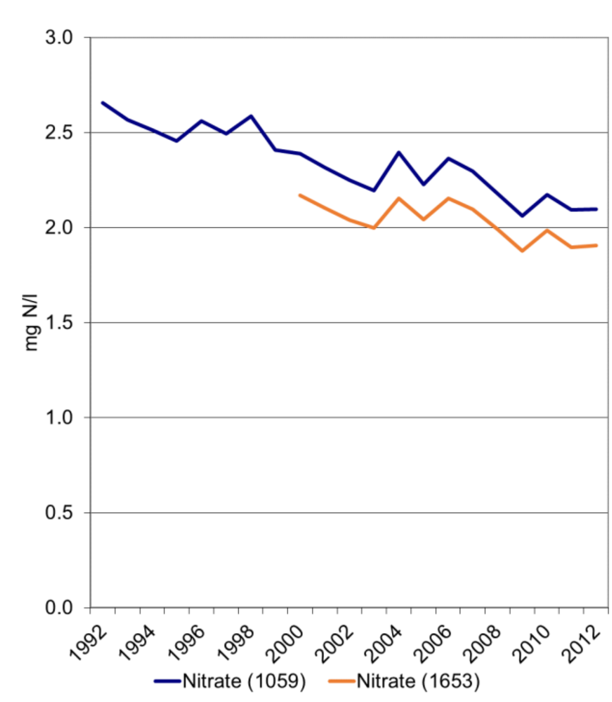
[34] Not including water bodies affected by atmospheric deposition.

[35] https://tableau.discomap.eea.europa.eu/t/Wateronline/views/WISE_SOW_PressuresImpacts/SWB_Pressures/kristensen@eea.dmz1/SWdiffusesourcepressures?:embed=y&:showAppBanner=false&:showShareOptions=true&:display_count=no&:showVizHome=no

Figure 6.6: Trend in water quality – nitrate in rivers and groundwater



Note: The diagram depicts two-time series: the longer time series has fewer stations (400) and the shorter time series has more (1242).
Source: [Link]



Note: The diagram depicts two-time series: the longer time series has fewer stations (1059) and the shorter time series has more (1653).
Source: [Link]

Measures to reduce diffuse nutrient pollution.

EU action on curbing diffuse nutrient pollution has a long history[36, 37]. Measures taken in the last decades have resulted in a reduction of mineral fertilizer used and nutrient surpluses of agricultural origin have progressively decreased in the EU (Figure 6.7). Between 2000 and 2013, agricultural nitrogen surplus decreased by 7 % in the EU, while phosphorus surplus have decreased by 50 %[38].

Nevertheless, the overall level of fertilization remains high in parts of Europe. Large variations in the nitrogen and phosphorus surplus exist between Member States[39] and, on average fertiliser use has started increasing again in the last years.

Nutrient balances at river basin level are now used in several countries in order to define nutrient load reduction targets to support the achievement of WFD objectives. Member States have taken measures at the national level or at the level of the river basin (e.g. general binding rules, taxes, manure surplus management), while other measures are more local (e.g. protection of specific drinking water areas).

Some Member States have also focused action in “priority catchments” at higher risk of nutrient enrichment. These catchments tend to receive a greater level of awareness-raising campaigns and investments.

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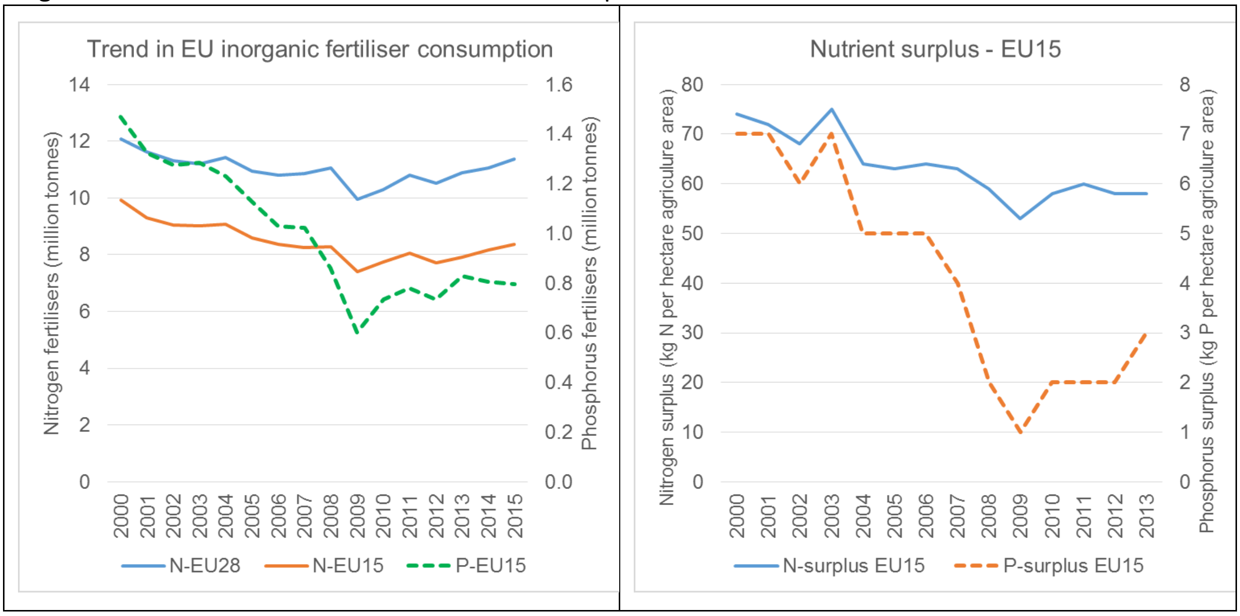
[36] Ibisch, R., Austnes, K., Borchardt, D., Boteler, B., Leujak, W., Lukat, E., Rouillard, J., Schmedtje, U., Lyche Solheim, A., Westphal, K. (2016). European assessment of eutrophication abatement across land-based sources, inland and coastal waters. European topic centre on inland, coastal and marine waters, European Environment Agency.

[37] EC. 2009: CIS guidance N° 23 - Eutrophication Assessment in the Context of European Water Policies https://circabc.europa.eu/sd/a/9060bdb4-8b66-439e-a9b0-a5cfd8db2217/Guidance_document_23_Eutrophication.pdf.

[38] EC 2016: CAP monitoring and evaluation indicators 2014-2020, Cap Context indicators. Water quality https://ec.europa.eu/agriculture/cap-indicators/context_en

[39] Eurostat Gross Nitrogen Balance indicator http://ec.europa.eu/eurostat/statistics-explained/index.php/Agri-environmental_indicator_-_gross_nitrogen_balance

Figure 6.7: Trend in fertiliser use and nutrient surplus.



Note: Only long-term trend is available for the EU15 Member States (mention MS), except for N-fertiliser use, however EU15 accounts for the majority of fertiliser use (80 %) in the EU28.
Source : Eurostat http ://ec.europa.eu/eurostat/en/web/products-datasets/-/AEI_FM_USEFERT & http ://ec.europa.eu/eurostat/en/web/products-datasets/-/AEI_PR_GNB

During the implementation of the first RBMPs, there were several examples of Member States strengthened action on reduction of nutrient pollution from agriculture (Table 6.2). Member States are implementing different kinds of measures, e.g. farm-level nutrient planning, setting fertiliser standards (e.g. timing), using appropriate tillage, using nitrogen-fixing and catch crops, setting aside buffer strips, and using crop rotation.

Other measures include livestock management through improved feeding (reduced phosphate compounds) and reduced grazing, as well as optimised manure management (increased manure storage, reduced use), and manure surplus management. Manure storage, in particular, can improve timing of application to minimise risks of excessive leaching to the water environment.

Several Member States are also supporting targeted green infrastructure such as constructed wetlands, sediment boxes and run-off ponds that capture and retain nutrient losses through agricultural drainage. River restoration and less-intensive land uses such as afforestation are also increasingly recognised as effective means to tackle diffuse pollution pressures as they increase nutrient retention and recycling.

Despite on-going action to curb diffuse pollution from agriculture, the European Commission estimated recently that measures taken under the Nitrates Directive were not enough to tackle significant pressures from diffuse sources to reach good ecological status[40, 41].

[40] EC, 2013: COM/2013/0683final.
[41] EC 2015; http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0120&from=EN

Table 6.2: Examples of measures on reducing pollution from diffuse sources

River basin district or country	Measures
Baltic Sea	The Nordic countries (Denmark, Finland and Sweden) and Baltic States (Estonia, Latvia and Lithunia) have introduced a wide range of measures to reduce diffuse pollution from agriculture (Andersen et al. 2014)
Nitrate Directive implementation NW-EU Member States	The impact of the Nitrate Directive implementation in the North-Western EU Member States has been reviewed for the period 1995-2008. The most significant environmental effect of the implementation of the NiD since 1995 is a major contribution to the decrease of the soil N balance (N surplus). This decrease is accompanied by a modest decrease of nitrate concentrations since 2000 in fresh surface waters in most countries (Grinsven et al. 2012).
Denmark	A series of policy action plans have been implemented since the mid-1980s with significant effects on the surplus, efficiency and environmental loadings of N. Over the last 30 years the N-leaching from the field root zone has been halved, and N losses to the aquatic and atmospheric environment have been significantly reduced. However, there is still a major challenge in complying with the EU Water Framework and Habitats Directives (Dalgaard et al. 2014)
Leipzig, Germany	Reduction of groundwater nitrate concentration from 40 mg to 20 mg per litre by incentivising organic farming and implementing hydrological measures in drinking water protected areas (BMUB/UBA, 2016)
Schleswig Holstein, Germany	Nitrogen use has in some cases halved (i.e. from 120 to 60 kilograms per ha) at the level of individual farms (BMUB/UBA, 2016)
French Loire-Bretagne RBD	Identification of priority catchments and focus on drinking water protected areas. Increase in the number of balanced manure plans on phosphorous from 53% to 81% between 2009-2012 (Loire-Bretagne RBMP 2015)
Ireland	In addition to application standards required by the Nitrates Directive, no organic or chemical fertiliser nor soiled water can be applied when heavy rain is forecast within 48 hours or when the ground slopes steeply and there is a risk of water pollution (Amery and Schoumans 2014)

Source: Andersen et al. 2014 Mitigating diffuse nitrogen losses in the Nordic-Baltic countries. http://www.sciencedirect.com/science/article/pii/S0167880914002990
Grinsven et al. 2012: Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive: a benchmark study. https://biblio.ugent.be/publication/3072131
Dalgaard et al. 2014: Policies for agricultural nitrogen management—trends, challenges and prospects for improved efficiency in Denmark. http://iopscience.iop.org/article/10.1088/1748-9326/9/11/115002/meta
BMUB/UBA, 2016 Water Framework Directive The status of German waters 2015. https://www.umweltbundesamt.de/publikationen/water-framework-directive
Loire-Bretagne RBMP 2015
Amery, F. and O.F. Schoumans, 2014. Agricultural phosphorus legislation in Europe. Merelbeke, ILVO, 45 p.

Chemical pollution

In the WFD, the risks and impacts from pollution with chemical substances contribute to three different status assessments: 1) surface water chemical status based on priority substances (chapter 3); 2) ecological status as regards River Basin Specific Pollutants (chapter 2) and groundwater chemical status (chapter 4).

The main findings were:

- The percentage of surface water bodies in good chemical status within the EU is 38 %, while 46 % are not achieving good chemical status and 16 % of the water bodies have unknown chemical status. In many Member States, relatively few substances are causing failure to achieve good chemical status. Mercury causes failure in a high number of water bodies. If widespread pollution by ubiquitous substances including mercury is disregarded, the proportion in good chemical status improves to 78 % of all surface water bodies, and 4 % do not achieve good chemical status (16 % has unknown status). The main pressures leading to failure of good chemical status are atmospheric deposition and discharges from urban waste water treatment plants.

- Several Member States (Austria, Belgium, Germany, Sweden, Luxembourg and Slovenia) have extrapolated the results for failure to reach good chemical status to all water bodies, because the environmental quality standard for mercury was exceeded in all monitoring samples.
- At EU level, only 5 % of water bodies failed to achieve good status due to River Basin Specific Pollutants (RBSPs) identified by the Member States, with zinc and copper being the main RBSPs causing failure.
- 74 % of the area of groundwater bodies in the EU is in good chemical status. Of the 160 pollutants causing failure to achieve good status, 15 are reported by more than five Member States. Nitrate is the predominant groundwater pollutant throughout the EU followed by pesticides. In addition, salt intrusion (e.g. chloride), some chemicals used industrially e.g. tetrachloroethylene, and/or metals, such as arsenic, nickel and lead, are causing problems in some Member States. Agriculture is the main pressure causing failure of groundwater chemical status, and other significant pressures are discharges not connected to a sewerage system and pollution from contaminated sites or abandoned industrial sites.

Chemical pollutants are or have been emitted to water bodies through a range of pathways and from a variety of sources, including industry, agriculture, transport, mining and waste disposal, as well as from our own homes. Significant levels of some priority substances have built up from historic use and this legacy pollution may persist in water bodies long after pollutant discharges and inputs have ended.

Information regarding the sources and emissions of many pollutants remains incomplete, limiting the scope for identification and targeting of appropriate measures.

Effect of regulation of chemicals

Contamination caused by chemical pollutants is a major environmental concern in European waters and consequently is addressed by a number of EU legislative measures and policies. Reducing hazardous substances in water requires implementation of the current legislation, but also the adoption of more sustainable production and use of chemicals, both in Europe and beyond.

Improved efforts to retain these chemicals in waste water treatment plants with better waste water treatment should go hand in hand with clear efforts to reduce them at source. Such measures can range from raising consumer awareness, to encouraging industries to adjust the composition of their products, to, over the longer term, fundamentally reviewing our use of chemicals and product design – for instance, moving towards products, which can be easily repaired or recycled[42].

Reducing the emissions of priority substances and phasing out priority hazardous substances – The WFD requires the adoption of measures to control the discharges, emissions and losses of priority and priority hazardous substances to the aquatic environment – progressive reduction in the case of priority, cessation or phasing out in the case of priority hazardous substances. Declines have been observed in the occurrences of some pesticides (e.g. atrazine and diuron), (see section 3.5). This decline relates to banning or restrictions on their use, while the effects of measures may take time as some are persistent and will stay in waters for decades.

Land contaminated with pollutants, for example, at abandoned mining areas, old industrial sites or old fuel stations can cause damage as the pollutants slowly leach into the water environment. Appropriate remedial actions are removal of contaminated material to be treated or incinerated, settling ponds, and local treatment plants.

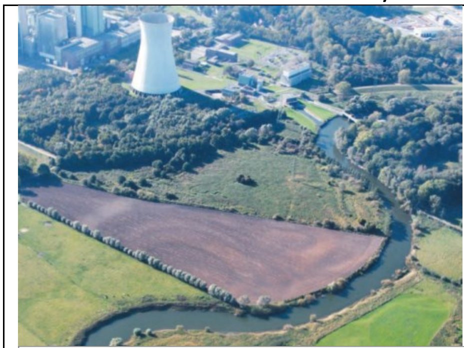
Table 6.3: Examples of measures on regulating chemicals

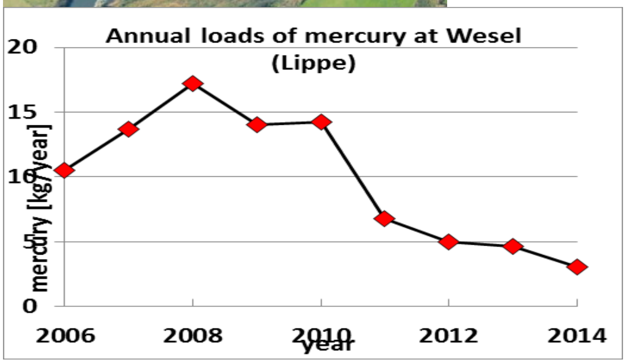
[42] E.g. https://www.ellenmacarthurfoundation.org/assets/downloads/New-Plastics-Economy_Catalysing-Action_13-1-17.pdf

River basin district or country	Measures
EU	The *Sustainable Use of Pesticides Directive*[43] is an important instrument to help achieve good water status. It reduces the risks and impacts of pesticides on human health; on the environment; and promotes Integrated Pest Management.
France	The French Ministry of Agriculture has implemented the Ecophyto Plan aimed at reducing agricultural pesticide use by 50% by 2018. Environmental taxes on sales of pesticides ("redevances pour pollutions diffuses") have been introduced in order to achieve this objective.
England	In England one of the measures in the first RBMPs has been a £25m investigation program by the water industry with the focus to gain improved understanding of risks arising from wastewater treatment works discharges.

Missing sources

Text box: Reduction of mercury in the River Lippe, North Rhine-Westphalia





http://wrrl.flussgebiete.nrw.de
Data: LANUV NRW

The River Lippe is a tributary of the Rhine, with rural catchment upstream of Hamm, industrial and mining catchment downstream.
EQS for mercury was not being achieved, so in 2012 additional monitoring programmes were started to better characterize discharges and status. Improved data were used in modelling, showing the pollutant pathways

- Industrial discharger and power plants: 30 – 45%
- Municipal sewage plants: 6 – 12 % (more than 90 plants)
- Diffuse sources: 30 – 45%

Pollution permits were revised for power plants and the chemicals park, rain water systems improved and the chlor alkali production process [closed down]. These actions led to reduction in mercury load between 2008-14.

6.3 Altered habitat and hydrology including water abstraction

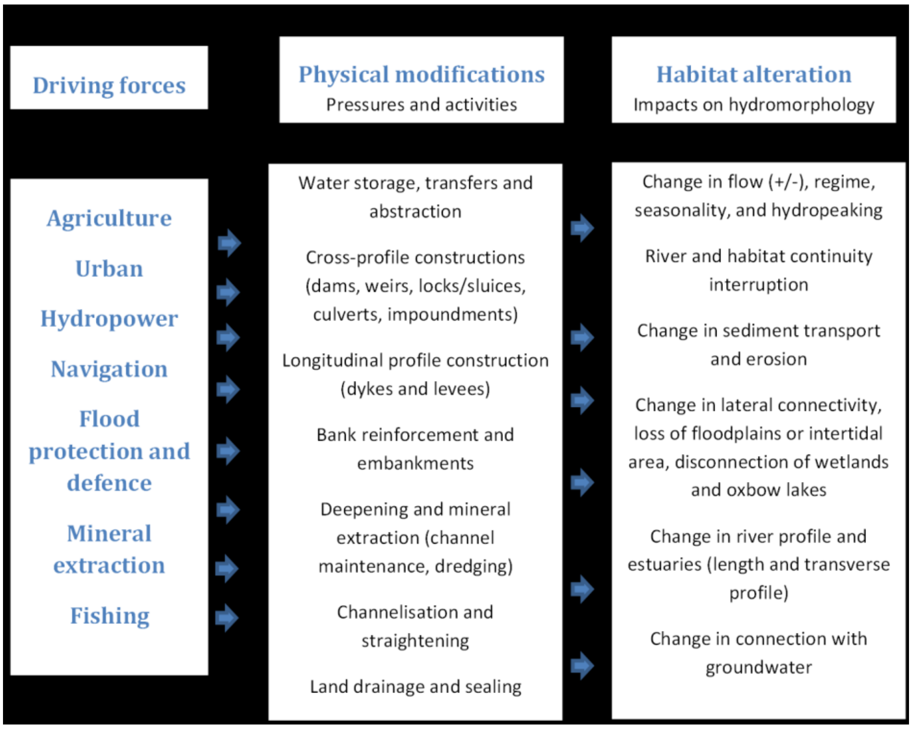
For decades, humans have altered the shape of water bodies and flow of river courses in order to facilitate farming of the land, facilitate navigation, construct hydropower plants and protect settlements and agricultural land against flooding. For these purposes, rivers have been straightened, channelized and disconnected from their floodplains; land has been reclaimed; dams and weirs built, embankments reinforced and groundwater levels lowered. These activities have resulted in altered habitats, changed flows, interruption of river continuity, loss of floodplain connectivity and severe impacts on the status of the aquatic environment. These changes have caused damage to the morphology and hydrology of the water bodies, i.e. to their hydromorphology.

[43] Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides. OJ L 309, 24.11.2009

Hydromorphological pressures

Hydromorphological pressures are the second most commonly occurring pressure on surface waters after diffuse sources, affecting 40% of all surface water bodies. The main impact in the context of reporting, which is relevant to hydromorphological pressures, is "altered habitats".

The most common hydromorphological measures applied in the first RBMPs include fish passes for upstream migration, removal of barriers, establishment of ecological flow, remeandering, reconnecting of backwaters, restoration of bank structure, instream structures (large wood, boulders) and, in some cases, sediment transport management (P&M study, DG ENV, 2012).



The hydromorphological pressures are briefly reviewed and examples on the recent implementation of some of these key hydromorphological measures in European countries are given below.

Barriers, obstacles and transverse structures - examples of measures to make barriers passable

More than half (53%) of the water bodies impacted by hydromorphological pressures are affected by physical structures which impact longitudinal continuity (barriers, dams, locks). Barriers are mainly used for hydropower, flood protection and irrigation purposes. However, for the majority of barriers reported in the second RBMPs, the driver or water use served by the barrier is unknown or even obsolete.

There are several hundred thousand barriers and transverse structures in European rivers. Some of them are large dams for hydropower production or irrigation storage reservoirs, but the majority are smaller obstacles. Obstacles in rivers cause disturbances and have impacts on river continuity, which vary according to the height of the barrier and location. A major impact on a river could be caused by a single, very damaging structure or by the accumulated effects throughout the length of the river of a series of small structures, which may have only a small impact individually.

Several European river basins have master plans or conservation plans for restoring the population of threatened fish species and restoring river continuity. These plans are often the basis for the RBMP measures against obstacles and transverse structures. Table 6.4 illustrates examples of measures implemented during recent years (first RBMP cycle).

Table 6.4: Examples of measures on making barriers passable.

River basin district or country	Measures
Rhine iRBD	480 measures aimed at improving river continuity have been implemented from 2000 to 2012 (ICPR 2015).
Danube iRBD	More than 120 fish migration aids have been constructed, whereas 667 barriers remain unpassable out of a total 1,030 barriers (2009-2015 - ICPDR 2015).
Elbe iRBD	Continuity are completed for 60 locations and planned for 88 locations for the priority network in the iRBD (2009-2015 - ICPE 2015).
France, Rhône RBD	208 out of 788 priority barriers have been made passable (2010-2015 - Rhône RBD 2016).
France, Seine RBD	254 out of 5474 barriers have measures to improve river continuity implemented (2013-2015 - Seine RBD 2016)
Austria	More than 1000 barriers were made passable for fish (2009-2015 - Austria national RBMP 2015)
The Netherlands	Around 600 barriers have been made passable from 2008 to 2015 (Kroes et al. 2015)
UK, England-Wales	229 obstructions across England and Wales have been made passable. (2009-2014 - Nasco.int, 2015 papers)
UK – Scotland RBD	Fish access to 70 water bodies secured by the removal of barriers to fish migration – out of 306 water bodies impacted by migration barriers (2009-2015 - Scotland RBMP)

Source ICPR: River basin management plan 2015. Available at http://www.iksr.org/en/water-framework-directive/river-basin-management-plan-2015/index.html – Section 7.1.1 Restoration of biological river continuity, increase of habitat diversity.
ICPDR 2015; http://www.icpdr.org/main/activities-projects/river-basin-management-plan-update-2015
Rhône Mediterranée district 2016: Tableau de bord adopté par le comité de bassin du 27/05/2016. http://www.rhone-mediterranee.eaufrance.fr/gestion/sdage2016/tableau-de-bord.php
ICPE 2015: Aktualisierung des Bewirtschaftungsplans nach Art. 13 WRRL. https://www.fgg-elbe.de/berichte/aktualisierung-nach-art-13.html
Seine RBMP 2016: Tableau de bord http://www.eau-seine-normandie.fr/mediatheque/Dossier_partage/INSTITUTIONNEL/SDAGE_2016_2021/TdB_SDAGE_2016_CB-4.2_big.pdf
Austria national RBMP 2015: https://www.bmlfuw.gv.at/wasser/wisa/fachinformation/ngp/ngp-2015/text/textdokument_ngp2015.html
Kroes et al. 2015: Fish Migration Possibilities in the Netherlands; State of the Art (Barriers, Solutions, Monitoring). http://scholarworks.umass.edu/fishpassage_conference/2015/June24/25
UK, England-Wales http://www.nasco.int/pdf/2015%20papers/CNL_15_43.pdf
Scotland 2nd RBMP: https://www.sepa.org.uk/environment/water/river-basin-management-planning/the-current-plans/

Hydromorphological pressures other than continuity interruption and examples of measures

Except for physical structures which interrupt longitudinal continuity (via barriers on the river network), humans have made many other physical changes to rivers, lakes and estuaries. Examples are changes to the size and shape of natural river channels for land drainage and navigation, modifications to beds (via either concrete or change in sedimentation/erosion), the banks and shores of water bodies. These modifications alter natural flow levels and sediment dynamics in surface water bodies and lead to the loss of habitats and recreational uses.

Almost 60 % of the water bodies which are impacted by hydromophological pressures are affected by physical alterations in the channel, bed, riparian zone or shore. The main drivers for the physical alterations reported for water bodies in the second RBMPs are flood protection and agriculture.

Restoration of bank structures, reconnection of backwaters or floodplains and wetland restoration are among the most common measures applied to achieve hydromorphological improvements. In many rivers, habitat quality at the river banks is poor due to bank fixation. Removal of bank fixation is a prerequisite for many other measures like re-meandering or widening as well as initiating later channel migration and dynamics. Also tree-planting and/or preserving riparian zones aim to reverse the impacts of land use change by improving channel stability, aquatic habitat and terrestrial biodiversity.

Especially, wetlands and the floodplains play an important role in the ecological integrity of aquatic ecosystems and they are of significant importance when it comes to ensuring/achieving good ecological status of adjacent water bodies. Wetlands/floodplains also play a significant role for flood retention. The current situation for European floodplains is critical with 95% of the original floodplain area converted to other uses. Many of the remaining European floodplains are far from pristine and have lost most of their natural functions. For example, of the former 26 000 km² of floodplain area along the Danube and its major tributaries, about 20 000 km² are isolated by levees (summary by Tockner et al, 2008).

Reconnecting backwaters, such as oxbows and side channels, and wetlands aims to restore the lateral connectivity between the main river channel, the riparian area and the wider floodplain and to re-vitalise natural processes.

Also activities for the implementation of the Floods Directive and the elaboration of the Flood Risk Management Plans can significantly contribute to the restoration of disconnected wetlands and floodplains. Table 6.5 illustrates examples of measures implemented during the last years.

Table 6.5: Examples of measures address other hydromorphological pressures.

River basin district or country	Measures
Rhine iRBD	Reactivation of floodplains from ca. 80km² in 2005 rising to ca 125 km² in 2012. Increase of structural diversity of banks from ca. 50 km bank length in 2005 to ca. 100 km bank length in 2012 Reconnection of alluvial areas from ca. 35 areas reconnected in 2005 to 80 alluvial areas reconnected in 2012. (2005-2012 – ICPR 2015).
Danube iRBD	More than 50,000 ha of wetlands/floodplains have been partly or totally reconnected, and their hydrological regime improved respectively (2009-2015 - ICPDR 2015).
Austria	Ca. 250 water body restructuring activities were carried out to improve hydromorphological conditions in the largest waters of the so-called priority restoration zones (2009-2015 - Austria national RBMP 2015)
France, Rhône RBD	Morphological restoration works carried out on more than 160 km of rivers. Wetland restoration increased from 7 332 ha restored in 2010 to 16 069 ha restored in 2015. (2010-2015 - Rhône RBD 2016)
UK Scotland RBD	Physical conditions of 36 water bodies improved out of 255 water bodies affected by modifications to their beds, banks or shores (2009-2015 Scotland 2nd RBMP)

Source ICPR: River basin management plan 2015. Available at http://www.iksr.org/en/water-framework-directive/river-basin-management-plan-2015/index.html – Section 7.1.1 Restoration of biological river continuity, increase of habitat diversity.
ICPDR 2015; http://www.icpdr.org/main/activities-projects/river-basin-management-plan-update-2015
Austria national RBMP 2015: https://www.bmlfuw.gv.at/wasser/wisa/fachinformation/ngp/ngp-2015/text/textdokument_ngp2015.html
Rhône Mediterranée district 2016: Tableau de bord adopté par le comité de bassin du 27/05/2016. http://www.rhone-mediterranee.eaufrance.fr/gestion/sdage2016/tableau-de-bord.php
Scotland 2nd RBMP: https://www.sepa.org.uk/environment/water/river-basin-management-planning/the-current-plans/

Hydrological alterations including examples of measures (ecological flows)

Hydrological alterations are pressures that alter the flow regime and/or the water levels of surface and groundwater. Where water flows and levels are not in a good condition, this can affect the abundance and diversity of aquatic plants and animals by reducing the extent, quality, diversity and connectivity of aquatic habitats.

The main pressures on flows and levels are from water abstractions (for public water supply, agriculture or industry) and reservoirs used mainly for hydroelectricity generation and irrigation. Impounded river sections may also be the result of barriers on rivers, which serve uses other than hydropower. Impoundments – in addition to interrupting river/habitat continuity – alter the upstream flow conditions of rivers. A specific type of hydrological pressure related to hydropower comes from hydropeaking activities. Hydropeaking relates to hydropower generation for the provision of peak electricity supply resulting in artificial water level fluctuations.

Hydrological alterations (mainly due to hydropower) affect 17% of the surface water bodies impacted by hydromorphological pressures. One of the key measures to mitigate hydrological impacts from water abstractions or hydromorphological pressures is the establishment of ecological flows. Table 6.6 illustrates examples of ecological flow (or minimum flow) measures implemented during the last years (first RBMP).

Table 6.6: Examples of measures related to E-flows.

River basin district or country	Measures
Austria	Minimum flow was ensured for ca. 200 residual water stretches (2009-2015 – Austria 2nd RBMPs 2015).
Danube iRBD	Ecological flow requirements for the achievement of GES/GEP have already been achieved for 13 out of 144 significant water abstractions identified in the Danube international RBD (2009-2015 - ICPDR 2015)
Spain	Minimum flow was ensured for 3200 water bodies this is an increase of more than 800 water bodies since the first RBMPs (2009-2015 – Spain 2nd RBMPs 2017).

Source: Austria national RBMP 2015: https://www.bmlfuw.gv.at/wasser/wisa/fachinformation/ngp/ngp-2015/text/textdokument_ngp2015.html
ICPDR 2015; http://www.icpdr.org/main/activities-projects/river-basin-management-plan-update-2015
Spain 2017: Summary of Spanish River Basin Management Plans.
https://servicio.magrama.gob.es/es/agua/temas/planificacion-hidrologica/summaryrbmp2ndcycledraft_tcm7-448674.pdf

Water abstractions

Water scarcity and droughts are an increasing problem in many areas of Europe, at least seasonally. The environment needs water to sustain aquatic ecosystems and ecosystem services. Excess water abstraction affects surface and groundwater, altering the hydrological regime and degrading ecosystems, leading to severe ecological impacts that affect biodiversity and habitats, but also the quality of water and soils (e.g. affecting temperature in water, reducing the dilution capacity for pollutants, or salt-water intrusions).

Total water abstraction decreased by around 7 % between 2002 and 2014[44]. Agriculture and public water supply are the main pressures on renewable water resources. Agriculture accounts for 36 % of total consumptive water annual use. In summer, this increases to about 60 %. The share of agriculture in EU water abstraction (24%) has wide variations: in Southern countries the share is 65% (up to 80%), mostly used for crop irrigation. In the spring of 2014, this sector used 66 % of the total water used in Europe. Around 80 % of total water abstraction for agriculture occurred in the Mediterranean region. The total irrigated area in southern Europe increased by 12 % between 2002 and 2014, but the total harvested agricultural production decreased by 36 % in the same period in this region. In 2013, the total irrigable area in the EU-27 was 18.7 million ha, representing an increase by 13.4 % compared to 2003 (Eurostat 2016[45]). The area actually irrigated in 2013 was 10.2 million ha. The highest shares of irrigable areas at country level are expectedly found in some southern Member States: in Greece and Malta shares of 44.9 % and 38.6 % were registered respectively. Cyprus, Italy and Spain followed with 34.9 %, 33.9 % and 31.1 % respectively.

Water abstractions are a key pressure on many water bodies, in particular during temporary drought phenomena or in water scarcity prone areas. Abstractions are a significant pressure for 7 % of surface water bodies in the second RBMPs with a higher regional importance in southern Europe

[44] https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-2/assessment-2
[45] Agriculture, forestry and fishery statistics — 2016 edition
http://ec.europa.eu/eurostat/documents/3217494/7777899/KS-FK-16-001-EN-N.pdf/cae3c56f-53e2-404a-9e9e-fb5f57ab49e3

(e.g. in Spain, Italy and France). In the case of groundwater, abstractions (mainly for agriculture and public water supply) and artificial recharge are the main pressures of groundwater bodies in poor quantitative status.

Measures to reduce impact of over abstractions

In the past, European water management has largely focused on increasing supply by drilling new wells, constructing dams and reservoirs, desalination, large-scale water-transfer infrastructures, etc. However, as Europe cannot endlessly increase water supply. Demand measures could include the use of economic instruments; water loss controls; water-reuse and recycling; increased efficiency of domestic, agricultural and industrial water use; and water-saving campaigns supported by public education programs. Water savings will bring additional benefits, for example by reducing pollution discharges and energy consumption.

Water efficiency — wasting less water and increasing the productivity per volume — is essential for building resilience into our systems and adapting to climate change. Water efficiency is an economic and environmental opportunity that serves sectors and functions that use water, helps economic growth and at the same time safeguards the environment. To realise a boost in water efficiency, both technological development and improved governance for water is needed, together with monitoring methodologies such as 'environmental accounting'.

The WFD obliges Member States to implement water-pricing policies that provide adequate incentives to use water resources efficiently. Water pricing and metering together with water saving measures have been highly effective in changing consumer behavior in many countries (Text box).

Text Box: Pricing and non-pricing measures for managing water demand in Europe [46]

Based on a study of a set of case studies it was found that European Union water policies encourage Member States to implement better management practices. Notably, water pricing policies (levies or tariffs on water use, for example) in combination with other measures, like encouraging the use of water saving devices on shower heads or taps, or education and awareness campaigns. A mix of the two has been used across Europe with varied results. The assessment concludes that national and local water management strategies should focus on designing the most effective combination to get the best results in reducing household water consumption and improving efficient use. The demand for water continues to increase, especially for domestic consumption. Increased intensity and frequency of droughts and water scarcity were identified as the key challenges for five (Cyprus, France, Italy, Romania, and Spain) of the eight countries studied. Overexploitation of groundwater resources was also cited, as demand for water rises not only for residential and tourist sectors but also others like industry and agriculture.

Various practices can be implemented to ensure that agriculture uses water more efficiently. These include changing the timing of irrigation so that it closely follows crop water requirements, adopting more efficient techniques such as sprinkler and drip irrigation systems, and implementing the practice of deficit irrigation; an optimization strategy in which irrigation is applied during drought-sensitive growth stages of a crop.

Leakage of water from supply systems in parts of Europe is substantial, and countries face major challenges in the construction and maintenance of water-related infrastructure. Investing in detection and repairing leaks is important.

[46] Dige, G., De Paoli, G., Agenais, A.L., Strosser, P., Anzaldua, G., Rouillard, J., Tröltzsch, Hinzmann, M. (2016). Pricing and non-pricing measures for managing water demand in Europe. Report for the European Environment Agency.

Additional water supply infrastructures — such as water storage, water transfers or use of alternative sources — may be considered when other demand options have been exhausted. Water reuse can have two important benefits: It effectively increases the available water resources and it minimizes wastewater outflow. Treated wastewater is currently reused in some southern European countries, primarily for irrigation — crop cultivation, public gardens, parks and golf courses.

Drought management is an essential element of water resource policy and strategies. Drought Management Plans (DMP), based on the characterization of possible droughts in a basin, their effect, and possible mitigation measures, should be prepared on a river basin scale and before emergency schemes have to be applied. DMPs, by promoting sustainable water use, are closely linked with the WFD objectives.

Land management and land-use planning are essential to the management of water resources in water-scarce areas. Important wetlands, which help to store water, have been drained throughout Europe. One priority should be to retain rainwater where it falls, enabling water infiltration, through the re-establishment of wetlands and increased recharge of aquifers.

6.4 Outlook – what will the status be in 2021, 2027 and beyond[47]

There are two options to look on the future status accessed by Member States in the second RBMPs

- First, the proportion of water bodies in at least good status in 2021, can be predicted based on the water bodies in 2015 failing to achieve good status (ecological, chemical and quantitative) and not having exemptions.
- Second, Member States have in the reporting of the second RBMPs been asked to indicate the expected time (2021, 2027 or beyond 2027) to achieve good status for water bodies failing to achieve good status in 2015.

In the following, results on the improvements expected over the second RBMP cycle and beyond are listed.

Future status predicted based on water bodies without exemptions

The table below lists the proportion of all surface water bodies (SWBS) already in High/Good ecological status/potential; the numbers failing to achieve good status with or without exemptions and the water bodies with unknown status. The results show that based on SWBs with “no exemptions”, improvements in ecological status over the second RBMP cycle are expected to be limited (3.3 %).

Table: Surface water bodies in at least good status, with and without exemptions. <Similar results may be produced for chemical and quantitative status>

	Ecological status	
	SWBs	%
High/Good (2013)	40710	39.8%
No exemptions	3354	3.3%
Exemptions	55601	54.2%
Unknowns	2675	2.6%
Total	102340	

Source: Preliminary results based on WISE-SoW database including data from 24 Member States (EU28 except Denmark, Greece, Ireland and Lithuania). Denmark reported a small number of water bodies with exemptions but have a relative high proportion of surface water bodies with unknown status.

[47] *Section to be drafted in coordination with DG ENV and partly based on Compliance assessment*

Member States reporting expected time when water bodies will be in good status

For water bodies failing to achieve good status (in 2015), Member States have indicated in their reporting the year (2021, 2027 or beyond 2027) by when they are expected to achieve good status: The results are summarised below

- In 2015, 43 % of all surface water bodies were in high/good (H/G) ecological status. The H/G percentage is expected to increase to 64 % and 94 % in 2021 and 2027, respectively.
- For chemical status, 51 % of surface water bodies were expected to be in good status in 2015, this is expected to increase to 53 % and 77 % in 2021 and 2027, respectively. Member States have identified more than 20 % of the surface water bodies with less stringent objectives.
- In 2015, 71 % of the area of groundwater bodies were in good chemical status. The percentage is expected to increase to 94 % in 2027.
- For groundwater bodies, a high proportion (89 %) of the area of groundwater were in good quantitative status already in 2015, and in 2027 98 % are expected to be in good status.

Table: Status (ecological, chemical and quantitative) in 2015 and the proportion expected to be in good status in 2021 and 2027. All surface water bodies (by count) and groundwater bodies (weighted by area)

	Ecological status		**SWB chemical status**		**GWB chemical status**		**GWB quantitative status**	
	SWBs	%	SWBs	%	GWBs	%	GWBs	%
At least good status 2015	47255	43 %	55116	51 %	3.19	71 %	3.86	89 %
Less stringent objectives already achieved	1508	1 %	22825	21 %	0.07	2 %	0.03	1 %
2016--2021	23280	21 %	2484	2 %	0.11	3 %	0.18	4 %
2022--2027	34586	31 %	25875	24 %	0.72	17 %	0.17	4 %
Beyond 2027	1902	1 %	545	1 %	0.16	4 %	0.04	1 %
Unknown	1407	2 %	1419	1%	0.06	1 %	0.03	1 %

Note: GWBs area of groundwater bodies in million km^2.

Source: Preliminary results based on WISE-SoW database including data from 25 Member States (EU28 except Greece, Ireland and Lithuania).

Further and detailed information on status in 2021, 2027 and beyond is available in WISE

- Ecological status Table
- Surface water chemical status Table
- Groundwater chemical status Table
- Groundwater quantitative status Table

6.5 Integrated water management

Water is an essential resource for human health, agriculture, energy production, transport and nature, but securing sustainable management of water and of aquatic and water dependent ecosystems and securing that enough water of high quality is available for all purposes, remains a key challenge within Europe and in our time.

The results from the second RBMPs show that European waters remain under multiple pressures from water pollution, over-abstraction and structural change from multiple sectors and human activities. These pressures affect the good functioning of water-related ecosystems, contribute to biodiversity loss, and threaten the long-term delivery of ecosystem services and benefits to society and the economy. To ensure sustainable management of water resources, further policy action will be needed to improve the coherence between economic, societal and environmental goals.

Several European policies are in place in support of the EU Water Framework Directive, which together with the Floods Directive, Groundwater Directive, Environmental Quality Standards Directive, Urban Waste Water Treatment Directive, Groundwater Directive, and Nitrates Directive provides powerful and essential tools for managing water quality in the European Union.

Sustainable and integrated water management plays a substantial role in the UN 2030 Agenda for Sustainable Development, the European Union's (EU) 7th Environment Action Programme (7th EAP)[48], and the achievement of the EU's Biodiversity Strategy[49]. Based on the review of the first RBMPs, the 'Blueprint to safeguard Europe's water resources'[50] has called for increased implementation of integrated water management in Europe. Three areas offering substantial opportunities to improve implementation and support to the achievement of WFD objectives are highlighted below.

Protection of Europe's aquatic ecosystems and their services

Many opportunities exist for improving implementation and maximizing synergies between environmental policies relevant for the protection of the water environment. In particular, EU policies on water and the marine environment, nature and biodiversity are closely linked, and together they form the backbone of environmental protection of Europe's ecosystems and their services.

The nature directives (Birds (2009/147/EC) and Habitats (92/43/EEC))[51], the Biodiversity Strategy 2020, the Marine Framework Strategy Directive and the Water Framework Directive aim at ensuring healthy aquatic ecosystems, while at the same time ensuring a balance between water and nature protection and the sustainable use of natural resources. The implementation and knowledge generation via the directives partly run in parallel, and not enough coordination between the processes exist[52]. There is thus much scope for more integration concerning monitoring, objectives and targets, and planning processes.

[48] EC (2014), The 7th Environment Action Programme (EAP). http://ec.europa.eu/environment/action-programme/

[49] EC, DG Environment (2012), EU Biodiversity Strategy to 2020 — towards implementation. http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm

[50] EC, DG Environment (2012), Blueprint to safeguard Europe's water resources. http://ec.europa.eu/environment/water/blueprint/index_en.htm

[51] http://ec.europa.eu/environment/nature/legislation/index_en.htm

[52] CIS (Common Implementation Strategy) 2015. A starter's guide: Overview on the main provisions of the Birds and Habitats Directives, the Water Framework Directive and the Marine Strategy Framework Directive: similarities and differences. November 2015. Available on CIRCABC.

The use of management concepts such as the ecosystem services approach and ecosystem based management can offer ways to improve coordination by setting a more common language and framework to evaluate trade-offs between the multiple benefits that healthy water bodies offer[53, 54].

Restoring degraded water ecosystems

Until the last 20 to 30 years, the focus of physical water management in many parts of Europe was on providing flood protection, facilitating navigation, and ensuring the drainage of agricultural land and urban areas.

Nowadays, water management increasingly includes ecological concerns, working with natural processes. This is in line with the objective of the 7th EAA *'to protect, conserve and enhance the Union's natural capital*'. It is also consistent with Target 2 of the EU's Biodiversity Strategy that *aims to ensure maintenance of ecosystems and their services by establishing green infrastructure and restoring at least 15% of degraded ecosystems by 2020*. This target means that degraded aquatic ecosystems must also be restored. Synergies between policies can be important in restoring aquatic ecosystems.

Restoring aquatic ecosystems such as 'making room for the river', river restoration or floodplain rehabilitation, 'coastal zone restoration projects' and integrated coastal zone management has multiple benefits for the water ecosystems. The EU-wide Green Infrastructure Strategy[55] includes rivers and floodplains as important elements. The strategy aims to reconnect existing nature areas and improve the overall quality of ecosystems. It also includes Natural Water Retention Measures (NWRMs)[56] that aim to increase soil and landscape water retention and groundwater recharge.

Integration of water aspects into sector policies[57]

To meet the objectives of the WFD i.e. all water bodies to have good status, river basin authorities will have to address the pressures affecting water bodies. Managing water in a green economy means using water in a sustainable way in all sectors and ensuring that ecosystems have the quantity and quality of water needed to function. It also means fostering a more integrated and ecosystem based approach involving all relevant economic sectors and society.

Recent policy reviews[58] have shown that there is still much scope to further mainstream environmental policy actions into sectoral policies such as the agriculture, energy, transport and other sectors in order to reduce the driving forces leading to aquatic biodiversity loss. This integration throughout the river basin is enhanced by, for example, public participation and stakeholder involvement.

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[53] Blackstock, KL, Martin-Ortega, J & Spray, CJ 2015, Implementation of the European Water Framework Directive: what does taking an ecosystem services-based approach add? in J Martin-Ortega, RC Ferrier, IJ Gordon & S Khan (eds), Water ecosystem services: a global perspective. International Hydrology Series, Cambridge University Press, Cambridge, pp. 57-64, Launch of UNESCO CUP Publication, Edinburgh, United Kingdom, 27 May.

[54] Rouillard, J., Lago, M., Abhold, K., Roeschel, L., Kafyeke, T., Klimmek, H. and Mattheiß, V., 2016. “Synergies and Differences between Biodiversity, Nature, Water and Marine Environment EU Policies: Aquacross Deliverable 2.1 http://aquacross.eu/outputs

[55] EC, DG Environment (2013), Strategy on green infrastructure. http://ec.europa.eu/environment/nature/ecosystems/index_en.htm

[56] EC, DG Environment (2013), Natural water retention measures. http://ec.europa.eu/environment/water/adaptation/ecosystemstorage.htm

[57] EEA SOER2015 Hydrological systems briefing https://www.eea.europa.eu/soer-2015/europe/hydrological-systems

[58] Rouillard, J., Lago, M., Abhold, K., Roeschel, L., Kafyeke, T., Klimmek, H. and Mattheiß, V., 2016. “Synergies and Differences between Biodiversity, Nature, Water and Marine Environment EU Policies: Deliverable 2.1 Aquacross Deliverable 2.1 http://aquacross.eu/outputs

Agricultural production has become increasingly intensive with high inputs of fertilisers and pesticides, leading to high pollutant loads to the water environment. In northern Europe, many lowland agricultural streams were straightened, deepened and widened to facilitate land drainage and to prevent local flooding. Water storage and abstraction for irrigated agriculture have changed the flow regime of many river basins and lowered groundwater levels, particularly in southern Europe. To achieve good status, it will be essential to address agricultural pressures, while maximising the beneficial effects of good land management.

It is recognized that poorly planned and managed forests can exert a pressure on the water environment. Environmental problems can arise if woodland is poorly managed or planted in unsuitable locations. Well planned and managed forest can be of significant benefit to the local and global environment and may play an active role in rehabilitating degraded and contaminated land, act as a sink for or protect against potential sources of diffuse pollutants and, arguably, reduce flood risk.

Some activities related to energy production such as hydropower, use of cooling water and growing energy crops result in pressures on water management.

<*This section will be further updated based on results from Commissions WFD implementation reports*>