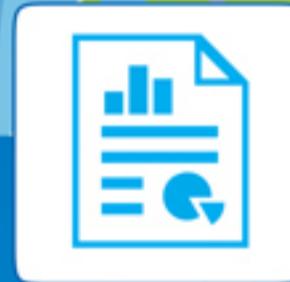




European  
Commission



# Evaluation of the Urban Waste Water Treatment Directive



EUROPEAN  
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PART 1/2

**COMMISSION STAFF WORKING DOCUMENT**

**EVALUATION**

**of the Council Directive 91/271/EEC of 21 May 1991, concerning urban waste-water  
treatment**

{SEC(2019) 448 final} - {SWD(2019) 701 final}

## Executive Summary

The Evaluation is based on a comprehensive literature review, including European Court of Auditor reports, implementation reports, the European Environment Agency's work, scientific studies and grey literature. Stakeholders were closely involved throughout the process: in addition to a 14-week public consultation, four expert workshops and a stakeholder conference were held. In addition, the Joint Research Centre modelled the effects of the Directive. In parallel, in cooperation with the OECD, the investment needs of the EU water supply and waste water sector and financing strategies for the sector were analysed.

The assessment of the Directive's **effectiveness** shows that it has been successful in reducing loads of the targeted pollutants from urban point sources (domestic/urban waste water and similar industrial pollution). Loads of biochemical oxygen demand, nitrogen and phosphorus in treated waste water fell across the EU by 61%, 32% and 44% respectively between 1990 and 2014. This has clearly improved the quality of EU water bodies. The Directive is also the main factor to ensuring that the EU's bathing water sites are safe and through the required treatment it reduces a number of non-targeted chemicals. Despite overall high levels of compliance at the time of the Evaluation, the implementation process was significantly delayed in some Member States, while a few Member States are still lagging behind. As shown in *Figure 1*, the remaining loads from urban sources come largely from **non-compliant agglomerations**.

The **main barriers to implementation** include Member States not prioritising the necessary investments in time to meet the deadlines, with problems often stemming from governance arrangements at central, regional and local level and, in particular, lack of resources and administrative capacity. To steer the implementation, the Commission provides **support** through funding, research and innovation programmes, and compliance promotion activities, whilst also conducting infringement procedures, whenever appropriate. The implementation of the Directive requires substantial and continuous investments in infrastructure. Its implementation is strongly supported by EU cohesion policy (EUR 38.8 billion for the waste water sector since 2000). Preliminary OECD estimates show that an additional EUR 253 billion has to be spent in the EU until 2030 to maintain or achieve full compliance. At the same time, Member States do not invest sufficiently in the renewal of infrastructure. To finance implementation, most Member States use a mix of water tariffs and public budget transfers. Water management in the EU is typically based on public and delegated private management models, with the water infrastructure generally being owned by public authorities. Whereas households are usually charged through the water bill, full cost recovery has not been achieved in the majority of the Member States. Under Article 9 of the WFD it is acceptable that households are supported through social schemes or subsidies. Water **affordability** can be an issue, which can be addressed nationally or locally by establishing social tariffs, or through other specific support.

One of the key reasons for the Directive's **effectiveness** is its overall **clarity and the simplicity of its requirements** allowing for straightforward enforcement. Nevertheless, it has not optimally addressed some important pressures in relation to waste water and that lead to remaining loads that could be avoided (see also *Figure 1*):

1. **Storm water overflows**, a sizeable remaining source of loads, are referred to only in a footnote in the Directive. The Court of Justice of the European Union has pointed out the need to develop guidance in this area. **Urban runoff**, which is only covered by the Directive in connection with combined sewage, is an increasingly important

source of pollution, and may contain heavy metals, plastics and microplastics. The loads from these two sources are increasing due to, among others, heavy precipitation becoming more frequent and intense under the changing climate.

2. Other remaining sources of loads result from the use of potentially mal-functioning **individual or other appropriate systems**. The Directive allows the use of these systems where a collection systems comes at disproportionate costs, and as long as these individual systems achieve the same level of environmental protection. But it is not clear on the extent to which this provision can be applied and how the functioning of these systems should be monitored.
3. Those **small agglomerations** or non-connected dwellings not completely covered by the Directive constitute a significant pressure on 11% of the EU’s surface water bodies.

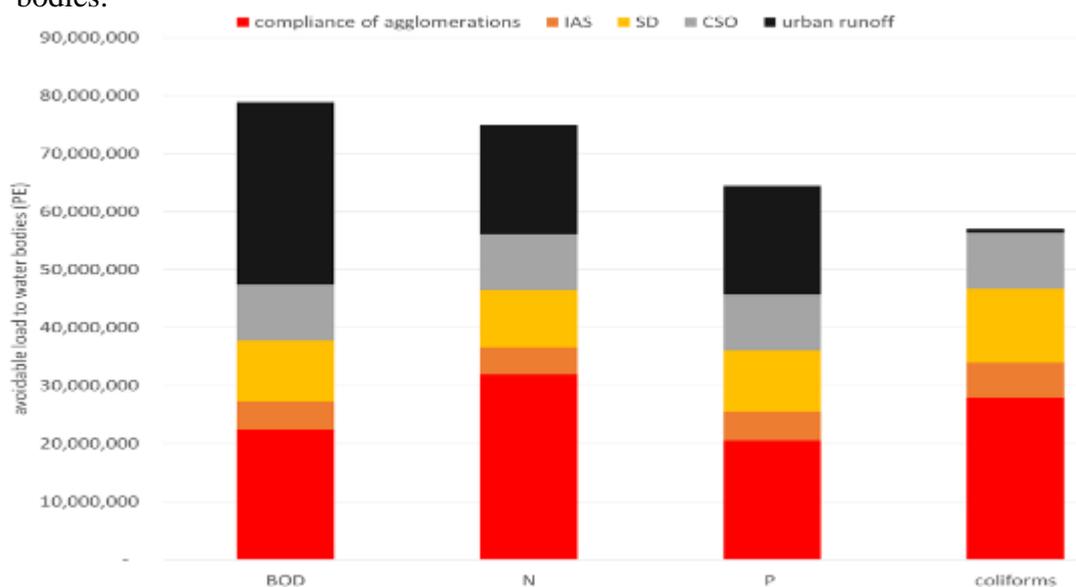


Figure 1 Remaining loads that can be avoided (SD=agglomerations <2 000 p.e., CSO=combined sewer overflows, IAS=individual or other appropriate systems); As comparison, the total urban waste water generated is about 612 mio p.e. Source: Pistocchi et al., 2019.

Another problem is that Member States seem to apply the criteria for identifying ‘sensitive areas’ differently, especially in the context of **eutrophication** and nutrient management. Although the Court intervened and established a definition, the assessment of 2014 reporting shows that Member States still have different approaches to designating these areas. Tackling these remaining sources of pollution and clarifying some provisions would enable benefits to be maximised, building on the already significant achievements in waste water collection and treatment.

In view of technological progress, some of the Directive’s provisions on information gathering and dissemination are less effective today than when it was adopted. **Monitoring** under the Directive has proven effective to demonstrate compliance. However, over time, research and innovation outcomes enable advances in monitoring methods allowing more efficient and accurate monitoring of both existing and emerging pollutants. A number of Member States – depending on local conditions – set stricter emission limit values than those minimum requirements set in the Directive. Further research is required to establish whether the provisions on e.g. the frequency of sampling provisions at waste water treatment plants to demonstrate compliance under the Directive are fit for purpose.

Although the **reporting** requirement has improved knowledge of waste water collection and treatment in the EU, some of these provisions are now outdated, compared to what

might be achieved by using digital technology. The Directive requires that Member States provide situation reports to keep the public informed. This has led to divergences in practice across the EU, and it is not always the case that relevant information is always made readily available to the public in a clearly comprehensible form. Since waste water collection and treatment account for about 60% of the water price, and the public consultation shows that the public are generally interested in both collection and treatment costs as well as investments, providing this type of information would be important.

In this Evaluation, the use of well-established cost functions enabled comparably robust assessments to be made of the implementation costs. Assessing benefits was more complex, as only some of them can be quantified and monetised. The **efficiency** analysis shows that even with very conservative assessments of benefits, the benefits outweigh the costs. Total EU capital and operation costs are estimated at EUR 18 billion p.a. in the EU, while (the quantifiable part of) benefits is estimated to amount to EUR 27.6 billion p.a at current implementation levels. Through its provisions on individual and other appropriate systems, the UWWTD includes a flexibility mechanism that allows taking into account local conditions and avoid cost ineffective investments. Whereas costs are incurred by users (e.g. households, some industries), benefits are of the advantage not just of users, but of a variety of stakeholders downstream, which might be in another region or Member State. **Administrative costs** are negligible compared to the capital and operational costs. In particular, the administrative burden linked to the monitoring and reporting requirements appears to be between low and moderate. Most of the costs are borne by Member States, their competent local authorities and the Commission.

The assessment of **coherence** shows that the Directive is **internally coherent** overall. The UWWTD works overall in synergy with **other EU water law** and contributes strongly to achieving the objectives of the Water Framework Directive, the Bathing Water Directive and the Drinking Water Directive. There are some limited overlaps in terms of what activities are covered by the UWWTD compared to the Industrial Emissions Directive. In general, there are also no issues of coherence with newer EU policies; **however, there may be some scope for improving the coherence of the UWWTD and climate and energy policies, such as the energy efficiency directive.**

The analysis of **relevance** and effectiveness shows the need for continued intervention not least because inappropriately treated or untreated urban waste water is still one of the main reasons why EU waters fail to achieve at least good status under the Water Framework Directive. Moreover, the scientific community, policy makers and general public see the growing evidence of **contaminants of emerging concern**, including pharmaceuticals and microplastics, in water bodies, as an increasingly important issue. The need for action on pharmaceuticals and microplastics was also noted in the Commission's 2019 Strategic approach to pharmaceuticals in the environment and its 2018 Plastics strategy. Plants covered by the UWWTD also receive significant amounts of industrial waste waters containing a range of chemical pollutants. Overall, the treatment required under the UWWTD reduces such pollutants of waste water to some extent, but does not target them directly. Some countries already have additional treatment in place, for instance Switzerland requires its priority plants to tackle micropollutants by 2040.

As regards **circular economy** potentials, the UWWTD contains limited provisions on waste water and sludge reuse or recovery of valuable components. These have never been strictly enforced, partly due to the lack of strong harmonised standards at EU level and the potential risks to human health. The adoption of the Commission proposal on

water reuse will create further incentives to reuse water. Sludge reuse in agriculture is governed by the 1989 Sewage Sludge Directive, but over the past decades, Member States have either set stricter requirements than those imposed by the Directive or have simply banned sludge use in agriculture on public health grounds. The removal of pollutants from waste water can lead to polluted sludge and there is a risk of spreading these pollutants if contaminated sludge is used for agricultural purposes. Control at source of targeted pollutants would reduce treatment requirements. With regards to energy, the annual energy consumption of the waste water treatment sector is estimated at 0.8 % of all energy consumed in the EU. This is contrasted by a number of WWTPs in the EU being re-designed to be energy producers. The UWWTD and other EU water legislation have also created a strong basis for innovation. At the time of the Evaluation, eight out of the top 15 worldwide water businesses were based in the EU, showing clearly the global business leadership of this sector.

Lastly, the **EU added value** assessment, which included considering whether the UWWTD complies with the subsidiarity principle, shows wide recognition among stakeholders that the Directive is still needed, and that withdrawing it would have negative impacts. The Directive supports the protection of some 60% of EU transboundary water basins from the adverse effects of waste water discharges.

**In the future**, more attention should be given to both existing and emerging sources of pollutants with regards to environmental and human health perspectives, and, from the socio-economic perspective, to both sustainable investment strategies and affordability. To achieve this in a global and climate change context, continuous research and innovation efforts and investments are needed, in particular to develop advanced and resilient treatment and monitoring solutions, to enable cost-effective management of micropollutants and to better integrate circular systems for water/sludge reuse and recovery of components.

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## GLOSSARY

<i>Term</i>	<i>Explanation</i>
Agglomeration	<p>According to the UWWTD: ‘Agglomeration’ means an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point. (Article 2(4)).</p> <p>An agglomeration can be a city or municipality, but it can also be a number of smaller cities or towns clustered together.</p>
Biochemical oxygen demand	<p>According to the UWWTD: In the waste water discharge, biochemical oxygen demand (BOD) needs to be reduced to 25mg/l O<sub>2</sub> or a minimum reduction of 70-90% needs to be achieved. (Annex I).</p> <p>BOD is ‘the amount of dissolved oxygen used by microorganisms in the biological process of metabolising organic matter in water. The more organic matter there is (e.g. in sewage and polluted bodies of water), the greater the BOD; and the greater the BOD, the lower the amount of dissolved oxygen available for higher animals such as fishes. The BOD is therefore a reliable gauge of the organic pollution of a body of water. One of the main reasons for treating waste water prior to its discharge into a water resource is to lower its BOD—i.e., reduce its need of oxygen and thereby lessen its demand from the streams, lakes, rivers, or estuaries into which it is released.’ Britannica (2019a).</p> <p>BOD is most commonly expressed as milligrams of oxygen consumed per litre of samples over 5 days of incubation at 20°C – this is called BOD5 (Sawyer et al., 2003).</p> <p>In this text “BOD” means “BOD5”.</p>
Chemical oxygen demand	<p>The UWWTD states that chemical oxygen demand (COD) in the waste water discharge needs to be reduced to 125mg/l O<sub>2</sub>. Alternatively, a minimum reduction of 75% needs to be achieved. (Annex I).</p> <p>COD ‘is a second method of estimating how much oxygen would be depleted from a body of receiving water as a result of bacterial action. While the BOD test is performed by using a population of bacteria and other microorganisms to attempt to duplicate what would happen in a natural stream over a period of five days, the COD test uses a strong chemical</p>

	<p>oxidising agent (potassium dichromate or potassium permanganate) to chemically oxidise the organic material in the sample of waste water under conditions of heat and strong acid.’ (Woodard &amp; Curran, 2006).</p>
Collection system	<p>The UWWTD defines this as a system of conduits which collects and conducts urban waste water. (Article 2(5)).</p>
Combined sewers	<p>In the UWWTD: The UWWTD allows for the use of combined and separate sewers.</p> <p>Combined sewers: ‘Systems that carry a mixture of both domestic sewage and storm sewage are called combined sewers. Combined sewers typically consist of large-diameter pipes or tunnels, because of the large volumes of storm water that must be carried during wet-weather periods. They are very common in older cities but are no longer designed and built as part of new sewerage facilities.’ (Britannica, 2019b).</p>
Contaminants of emerging concern	<p>In the UWWTD: The UWWTD does not include a reference to contaminants of emerging concern.</p> <p>According to the Organisation for Economic Co-operation and Development (OECD) “<i>Contaminants of emerging concern (CECs) comprise a vast array of contaminants that have only recently appeared in water, or that are of recent concern because they have been detected at concentrations significantly higher than expected, or their risk to human and environmental health may not be fully understood. Examples include pharmaceuticals, industrial and household chemicals, personal care products, pesticides, manufactured nanomaterials, and their transformation products</i>’ (OECD, 2018).</p> <p>The <a href="#">Environmental Quality Standards Directive</a> explains <i>pollutants</i> of emerging concern. Recital 26 states that ‘emerging pollutants ... can be defined as pollutants currently not included in routine monitoring programmes at Union level but which could pose a significant risk requiring regulation, depending upon their potential ecotoxicological and toxicological effects and on their levels in the aquatic environment.’</p>
Diffuse sources	<p>The E-PRTR Regulation (EC) No 166/2006 gives the following definition of diffuse sources: “diffuse sources” means the many smaller or scattered sources from which pollutants may be released to land, air or water, whose combined impact on those media may be significant and for which it is impractical to collect reports from each individual source’. Diffuse sources include agricultural activities, some</p>

	<p>urban-related emissions, atmospheric deposition, and rural dwellings. Typically, they are more variable in space and time than point sources. (EC, 2012a).</p>
Eutrophication	<p>UWWTD definition: The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned. (Article 2(11)).</p>
Individual or other appropriate systems	<p>The UWWTD states that ‘where the establishment of a collecting system is not justified either because it would produce no environmental benefit or because it would involve excessive cost, individual systems or other appropriate systems which achieve the same level of environmental protection shall be used.’ (Article 3(1)).</p>
Microplastics	<p>According to the European Chemicals Agency (ECHA), ‘the term “microplastic” is not consistently defined, but is typically considered to refer to small, usually microscopic, solid particles made of a synthetic polymer. They are associated with long-term persistence in the environment, if released, as they are very resistant to (bio)degradation.’ (ECHA, 2019).</p>
More stringent treatment	<p>More stringent treatment or tertiary treatment is the third stage of treatment and can consist of nutrient removal, chemical or physical disinfection (by lagoons or microfiltration).</p> <p>In the UWWTD, table 2 in Annex I lays down the thresholds for nutrient reduction.</p>
Point sources	<p>According to Common Implementation Strategy Technical Report No. 28: ‘A point source is a single localised point of discharge of waste water containing one or more pollutant(s). The most important ones are industrial facilities, waste water treatment plants (although strictly speaking the plant itself is not the source), untreated sewage, waste disposal systems and mining sites.’ (EC, 2016).</p>
Population equivalent	<p>UWWTD definition: ‘1 p.e. (population equivalent)’ means the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day.’</p> <p>This means: 1 p.e. broadly corresponds to the average pollution release of one person in one day and describes the pollution load contained in waste water.</p>

Primary treatment	UWWTD definition: ‘Primary treatment’ means treatment of urban waste water by a physical and/or chemical process involving settlement of suspended solids, or other processes in which the BOD of the incoming waste water is reduced by at least 20% before discharge and the total suspended solids of the incoming waste water are reduced by at least 50%. (Article 2(7)).
Secondary treatment	UWWTD definition: ‘Secondary treatment’ means treatment of urban waste water by a process generally involving biological treatment with a secondary settlement or other processes in which the requirements established in Table 1 of Annex I are respected. (Article 2(8)).
Separate sewers	<p>The UWWTD allows for the use of combined and separate sewers.</p> <p>Separate systems: “New waste water collection facilities are designed as separate systems, carrying either domestic sewage or storm sewage but not both. Storm sewers usually carry surface runoff to a point of disposal in a stream or river. Small detention basins may be built as part of the system, storing storm water temporarily and reducing the magnitude of the peak flow rate. Sanitary sewers, on the other hand, carry domestic waste water to a sewage treatment plant. Pretreated industrial waste water may be allowed into municipal sanitary sewerage systems, but storm water is excluded.” (Britannica, 2019c).</p>
Storm Water Overflows	<p>A footnote in Annex I to the UWWTD contains states ‘...during situations such as unusually heavy rainfall, Member States shall decide on measures to limit pollution from storm water overflows. Such measures could be based on dilution rates or capacity in relation to dry weather flow or could specify a certain acceptable number of overflows per year.’</p> <p>As mentioned under combined sewers, these systems carry waste water and storm water. According to Britannica, ‘because wastewater treatment plants cannot handle large volumes of storm water, sewage must bypass the treatment plants during wet weather and be discharged directly into the receiving water. These combined sewer overflows, containing untreated domestic sewage, cause recurring water pollution problems and are very troublesome sources of pollution.’ (Britannica, 2019b).</p>
Surface water	Water Framework Directive definition: Inland waters, except groundwater; transitional waters and coastal waters, except in respect of chemical status for which it shall also include

	territorial waters. (Article 2(1)).
(Total) nitrogen	<p>UWWTD definition: Total nitrogen means: the sum of total Kjeldahl nitrogen (organic and ammoniacal nitrogen), nitrate-nitrogen and nitrite-nitrogen.</p> <p>The UWWTD requires a reduction of total nitrogen in waste water discharges to concentrations of 15 mg/1 N (10 000 - 100 000 p.e.) and 10 mg/1 N (more than 100 000 p.e.). (Annex I).</p> <p>Why nitrogen: Nitrogen is, together with phosphorus, one of the main nutrients in waste water. Nitrogen becomes ammonia/ammonium, creating an additional oxygen demand. This can lead to excessive plant and algae growth, which can then prevent other organisms from living and growing.</p>
(Total) phosphorus	<p>In the UWWTD: The UWWTD requires a reduction of total phosphorus in waste water discharges to concentrations of 2 mg/1 P (10 000 - 100 000 p. e.) and 1 mg/1 P (more than 100 000 p.e.). (Annex I).</p> <p>Why phosphorus: Together with nitrogen, phosphorus is one of the main nutrients in waste water. Phosphorus becomes ortho-phosphate, creating an additional oxygen demand. This can lead to excessive plant and algae growth, which can then prevent other organisms from living and growing.</p>
Urban waste water	The UWWTD defines ‘urban waste water’ as domestic waste water on its own or domestic waste water mixed with industrial waste water and/or runoff rain water. (Article 2(1)).

## ABBREVIATIONS

<i>Term or abbreviations</i>	<i>Meaning or definition</i>
AMR	Anti-microbial resistance
BWD	Bathing Water Directive
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand

<i>Term or abbreviations</i>	<i>Meaning or definition</i>
DWD	Drinking Water Directive
CJEU	Court of Justice of the European Union
CSO	Combined sewer overflow
EC	European Commission
ECA	European Court of Auditors
ECHA	European Chemicals Agency
EEA	European Environment Agency
E-PRTR	European Pollutants Release and Transfer Register
EQS	Environmental quality standards
GHG	Greenhouse gas
GWh	Gigawatt hours
IAS	Individual or other appropriate system
IED	Industrial Emissions Directive
IPCC	Intergovernmental Panel on Climate Change
JRC	European Commission Joint Research Centre
MSFD	Marine Strategy Framework Directive
N	Nitrogen
ND	Nitrates Directive

<i>Term or abbreviations</i>	<i>Meaning or definition</i>
NVZ	Nitrates vulnerable zones
O&M	Operation and maintenance costs
OECD	Organisation for Economic Cooperation and Development
P	Phosphorus
p.e.	Population equivalent
PIE strategic approach	Strategic approach to pharmaceuticals in the environment
RBMP	River basin management plan
REACH	Registration, evaluation, authorisation and restriction of chemicals
RTC	Real time control
SIIF	Structured implementation and information framework
SSD	Sewage Sludge Directive
SVHC	Substance of very high concern
SWO	Storm water overflow
TSS	Total suspended solids
UWWTD	Urban Waste Water Treatment Directive
UWWTD EG	Urban Waste Water Treatment Directive Expert Group
WFD	Water Framework Directive

<i>Term or abbreviations</i>	<i>Meaning or definition</i>
WIND	What if no Directive scenario
Water Fitness Check	Fitness Check of the Water Framework Directive, the Groundwater Directive, the Environmental Quality Standards Directive, and the Floods Directive
WTP	Willingness to Pay
WSS	Water Supply and Sanitation
WWTP	Waste Water Treatment Plant

## 1. INTRODUCTION: PURPOSE AND SCOPE OF THE EVALUATION

The [Urban Waste Water Treatment Directive](#) (UWWTD) was adopted in 1991. Although the Directive does not include a requirement for its own review, developments over the past three decades call for its Evaluation. The Directive was partially subject to evaluation in the [Water Blueprint](#) of 2012 (EC, 2012a; EC, 2012b), which concluded that rates of compliance with the UWWTD needed to be improved through better investment and implementation plans. Thanks to the independent Evaluation presented here, the extent to which the Directive is working effectively has been analysed in depth. As part of the Regulatory Fitness and Performance programme (REFIT), it assesses whether the Directive is fit for purpose.

As set out in the Evaluation's Roadmap (EC, 2017), the Evaluation considers the entire Directive, the full period of its implementation, and all EU Member States. The Evaluation is closely coordinated with the [Water Fitness Check](#). It also takes into account the [Strategic approach to pharmaceuticals in the environment](#) (EC, 2019) and the [Plastics strategy](#) (EC, 2018), which require certain aspects of the UWWTD to be evaluated.

## 2. BACKGROUND TO THE INTERVENTION

### 2.1. Description of the intervention and its objectives

#### *Contextualisation: water pollution affecting the quality of water bodies*

Humans and all other living organisms need clean water to survive. Humans need clean water for drinking and sanitary purposes, as well as for economic activities such as energy production, manufacturing, transport, tourism and fishing. Water is central to most natural ecosystems, and polluted water bodies can lead to damaged aquatic and terrestrial environments no longer able to provide the ecosystem services that society depends on.

Water quality can be affected by point and diffuse pollution sources, such as industry, agriculture, transport (including shipping), households in urban and rural settings, and atmospheric deposition (*Figure 2*). In the EU, the main **point source of water pollution** is the discharge of untreated or inadequately treated urban and/or industrial waste water. Point sources are the main source of oxygen-consuming substances, hazardous chemicals and nutrients. The main **diffuse source of water pollution** is agriculture, which is responsible for the release of pollutants such as nutrients, pesticides, and faecal microbes (EEA, 2018a). Diffuse pollution from agriculture and forestry enters water bodies through the infiltration of the soil or runoff from land.

To ensure that urban waste water does not harm the environment, in the EU it is typically collected from households and some industries and treated in urban waste water treatment plants (WWTPs<sup>1</sup>). Some agglomerations may, for technical and/or economic reasons, have a partial collecting (or even treatment) system. Under the UWWTD, such systems are called individual or other adequate systems (IAS), which either collect waste water onsite (to be transported to a WWTP) or treat it locally before it is discharged.

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<sup>1</sup> In *Figure 2*, these are referred to as MWWTPs.

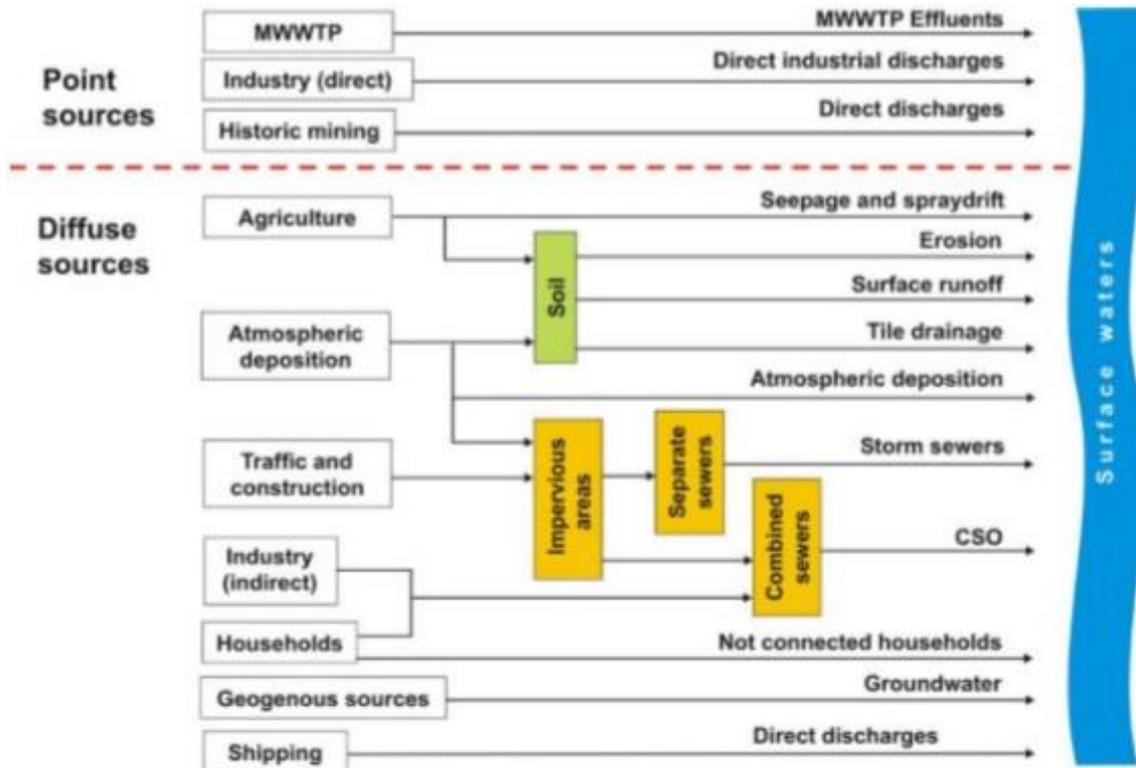
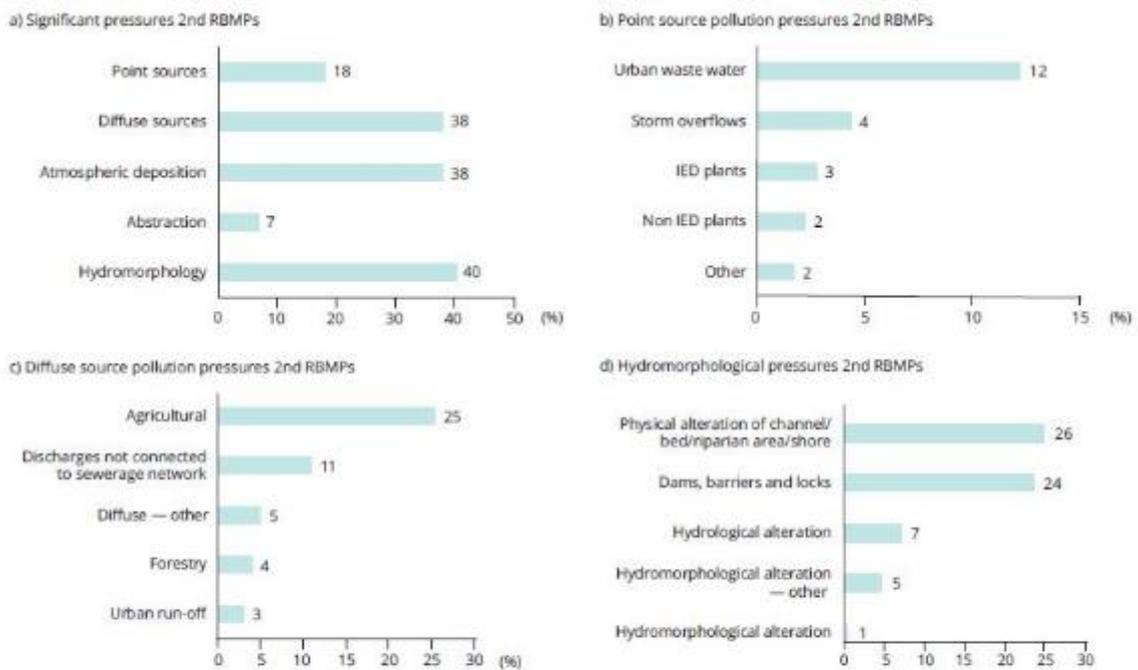


Figure 2: Sources and pathways. Fuchs et al. (2010). (MWWTP=WWTP in this text).

In EU countries, use is made both of collecting systems designed to collect both urban waste water and rainwater (combined sewers) and of separate systems that collect waste water and storm water separately. Urban runoff can enter a combined collecting system where it mixes with urban waste water, and can subsequently be treated at a WWTP, before the treated effluent is discharged directly into the receiving water bodies. After heavy rainfall, these systems typically do not convey the entire flow of runoff and waste water to the WWTP. For these instances, there are built-in overflows that allow the system to discharge the untreated, diluted rain/urban waste water mix into water bodies. Urban runoff can contain a wide variety of pollutants, including metals, urban pesticides and abrasions from tyres.

Water bodies in the EU are **seriously affected by pollution from diffuse and point sources** (Figure 3). According to Member State reporting, only 40% of surface water (i.e. water in rivers, lakes and coastal water bodies) is in good ecological status, while only 38% is in good chemical status. Across the EU, 38% of surface water bodies fall short of good ecological status because of diffuse sources of pollution, of which agriculture is reported to be the most significant one. Atmospheric deposition affects 38% of surface water bodies, with mercury being the main pollutant responsible for failure to achieve good chemical status. Point sources affect 18% of surface water bodies. Urban waste water is the most significant of these, directly followed by emissions from industry (EEA, 2018b).



**Notes:** Proportion of water bodies with specific pressures; for example, point sources affect 18 % of water bodies, and the main point source pressure is discharges from urban waste water treatment plants, which affect 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 %. IED plants are industrial emissions covered by the Industrial Emissions Directive (EC, 2018e).

**Source:** Results are based on WISE-SoW database including data from 25 Member States (EU-28 except Greece, Ireland and Lithuania).  
 Surface water bodies: Significant pressures.

Figure 3 Proportion of water bodies affected by a) main pressures, b) detailed point source, c) diffuse source and d) hydromorphological pressures. EEA (2018b).

Agriculture and livestock account for roughly a third of the organic matter (BOD) loads entering EU water bodies: other sources include industry and forestry (Figure 4). The relative significance of the sources varies considerably across Member States: in those countries where urban waste water is still not dealt with adequately, it plays a relatively more significant role than in those that treat it appropriately.

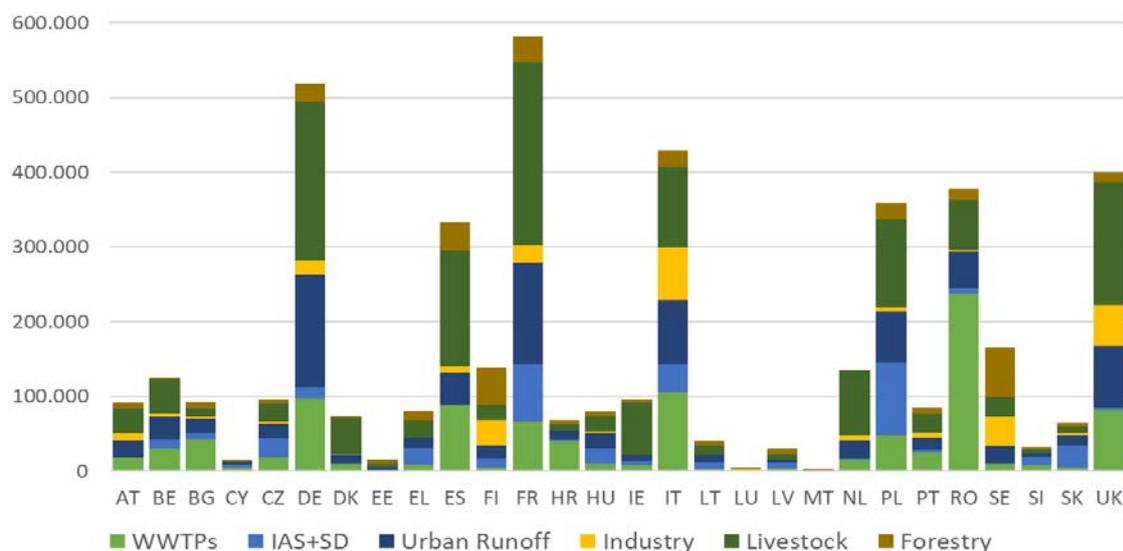
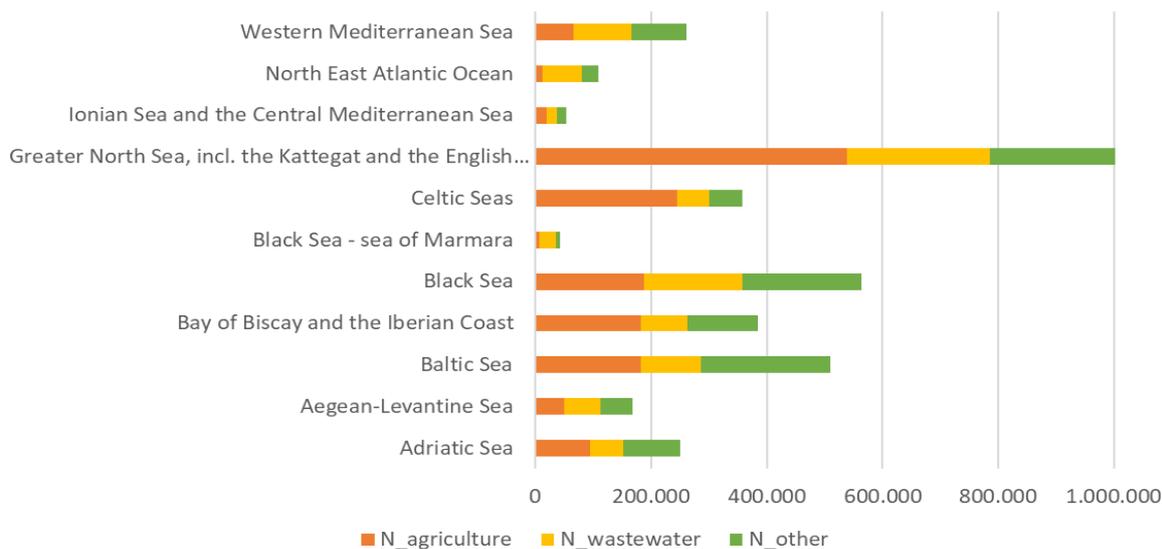


Figure 4 Loads of BOD (tonnes/year) to EU water bodies by source in 2014 (Vigiak et al., 2019); 'IAS+SD' = IAS + agglomerations < 2 000 p.e.

As regards nutrients, fertiliser use accounts for about one third to a half of all nitrogen (N) loads entering European regional seas (*Figure 5*). Nitrogen loads via waste water are the main sources of nitrogen only for the Greater North Sea and the Celtic Seas, whereas in all other cases other sources predominate.



*Figure 5 Loads of N (tonnes/year) to EU regional seas by source (tonnes per year) in 2014.*

For phosphorus (P) the situation is slightly different from N. Waste water is still one of the main sources, and agriculture is comparatively less significant (see Pistocchi *et al.*, 2019).

### ***UWWTD as intervention***

Adopted in 1991, the UWWTD has as the **objective** protecting the environment from the adverse effects of urban waste water discharges (Art. 1). Its intervention logic is shown in *Figure 6*. Back in 2002, the Court of Justice of the European Union ruled that the objective does not only refer to the protection of the aquatic environment but also includes the wider environment and human health (Case [C-280/02<sup>2</sup>](#)). The Directive addresses Member States and sets out EU-wide rules for the establishment of waste water infrastructure, minimum treatment standards and requirements on monitoring, reporting and information provision.

The main actions required by Member States are the collection of waste water in urban agglomerations of at least 2 000 population equivalents (p.e.) (Art. 3) and the application of secondary treatment to reduce oxygen consuming substances which are measured by biochemical oxygen demand (BOD) and chemical oxygen demand (COD) parameters (Art. 4). Member States are also required to designate sensitive areas (Art. 5). These areas can be designated according to three criteria: (a) areas that are eutrophic or at risk of becoming eutrophic; (b) surface waters that serve as catchment areas for drinking water; and, (c) areas where further treatment is needed to ensure that the objectives of other Directives are met. When discharging treated waste water in these sensitive areas or

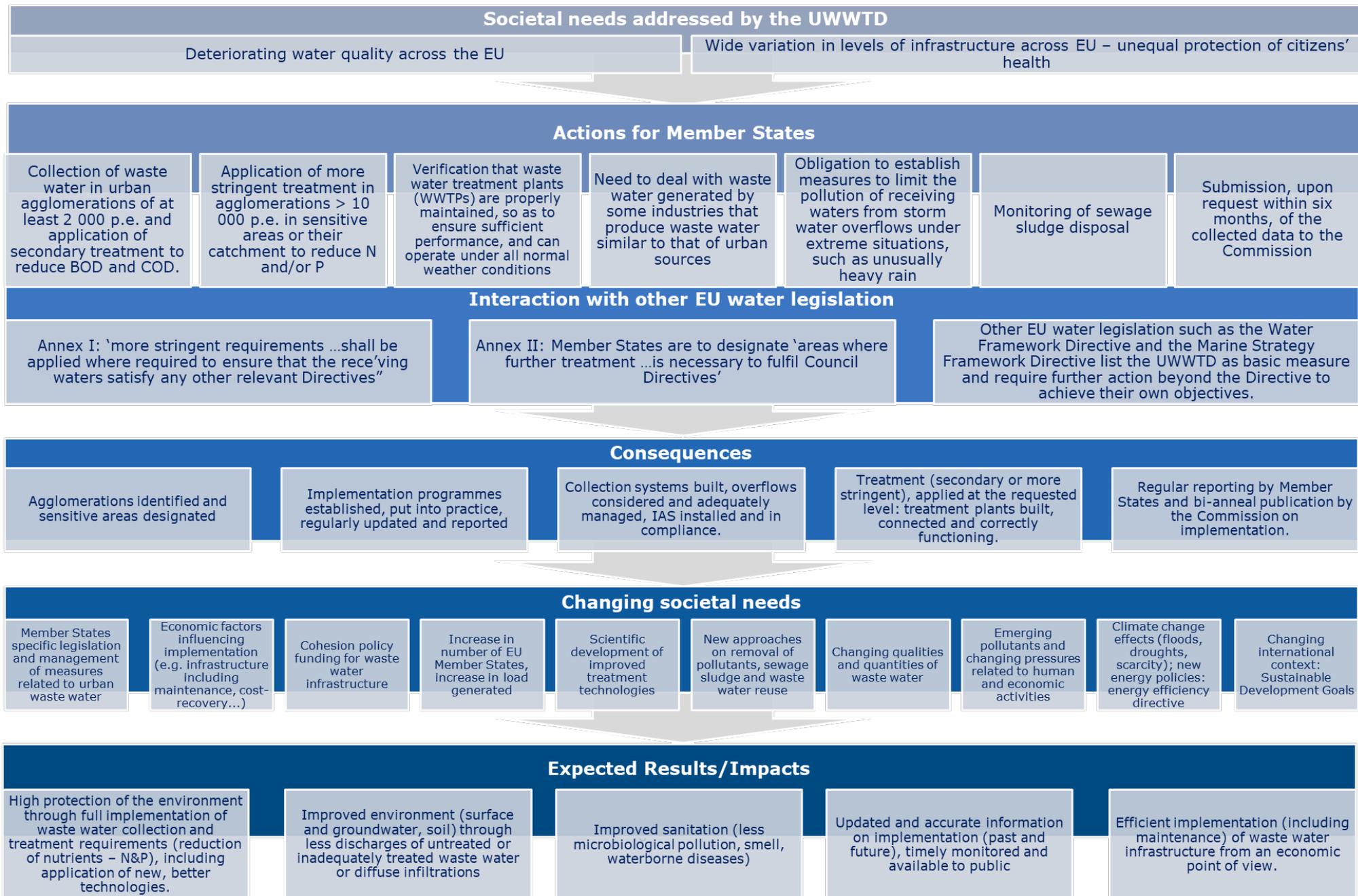
<sup>2</sup> Judgment of the Court (Second Chamber) of 23 September 2004. Commission of the European Communities v French Republic. Failure of a Member State to fulfil obligations - Directive 91/271/EEC - Urban waste water treatment - Article 5(1) and (2) and Annex II - Failure to identify sensitive areas - Meaning of "eutrophication" - Failure to implement more stringent treatment of discharges into sensitive areas. Case C-280/02.

their catchments, Member States are required to apply more stringent treatment in agglomerations above 10 000 p.e. If these sensitive areas are designated under criterion (a), Member States are expected to reduce N and/or P loads (Art. 5). The reduction levels for sensitive areas designated under criteria (b) and (c) are to be derived from other water legislation, e.g. the Drinking Water Directive or the Water Framework Directive. Member States can also designate less sensitive areas in marine water bodies. They are required to review the identification of sensitive areas at least once every four years.

Member States are also required to ensure that WWTPs are properly designed, constructed, operated and maintained, so as to ensure that they perform properly. They must also be able to operate under all normal weather conditions, taking seasonal loads into account (Art. 10). Furthermore, the UWWTD states that certain industrial food processing sectors producing biodegradable industrial waste water, similar in composition to urban waste water, are to be dealt with under this Directive (Art. 13). The Directive also contains an obligation to establish measures to limit pollution from storm water overflows under extreme situations, such as unusually heavy rain (Art. 3(2)). It further requires the monitoring of sewage sludge disposal (Art. 14). In terms of reporting and information provision, the UWWTD requires Member States to submit information stemming from the monitoring provisions under Art. 15 within six months upon request. The Commission subsequently publishes an implementation report based on this data (Art. 17). Member States also need to inform the public of how they deal with urban waste water (Art. 16). The UWWTD sets out clear deadlines on the implementation of the different provisions. For Member States which joined after 2004, these deadlines were negotiated as part of the Accession Treaties (see [implementation deadlines](#)). Based on the data submitted by Member States, the Commission publishes an implementation report at two-yearly intervals<sup>3</sup>, which covers one year of results. The [9th implementation report](#), published in 2017, is based on 2014 data from Member States. Publication of the 10th report, based on 2016 data, is scheduled for early 2020.

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<sup>3</sup> European Commission (n.d.) [Implementation reports](#) 1-9: Until 1994, Member States were required by Art. 17 to communicate information to the Commission. Owing to Member States' delays in providing the necessary data, the Commission did not publish the first report until 2000 ([1st implementation report](#)).



## The UWWTD in the context of other EU (water) legislation

EU water legislation has been in place since the 1970s, when legislation such as the original Bathing Water and the Drinking Water Directive was adopted. In the 1990s, pollution-focused Directives such as the UWWTD and the [Nitrates Directive](#) (dealing with water pollution from nitrates used for agricultural purposes) were adopted. Since then, EU water policy has been further expanded through the adoption of the [Water Framework Directive](#) (WFD) and its daughter Directives (the [Groundwater Directive](#) (GWD) and the [Environment Quality Standards Directive](#) (EQSD)). The WFD establishes a holistic approach to water management and environmental protection, with a focus on river basin planning. It states that Member States need to protect **good ecological and chemical status in their water bodies (or achieve such status)**, and preserve their water bodies against deterioration. Complementing the WFD, the [Marine Strategy Framework Directive](#) (MSFD) establishes a common approach and objectives to protect the marine environment against damaging human activities. Water policy has also been further developed through the revision of the [Bathing Water Directive](#) (BWD) and the recent [Drinking Water Directive recast](#) proposal (DWD) (2018). This EU water *acquis* was developed to deliver a comprehensive approach to the various sources of known water pollutants that were of concern at the time (*Figure 7*).

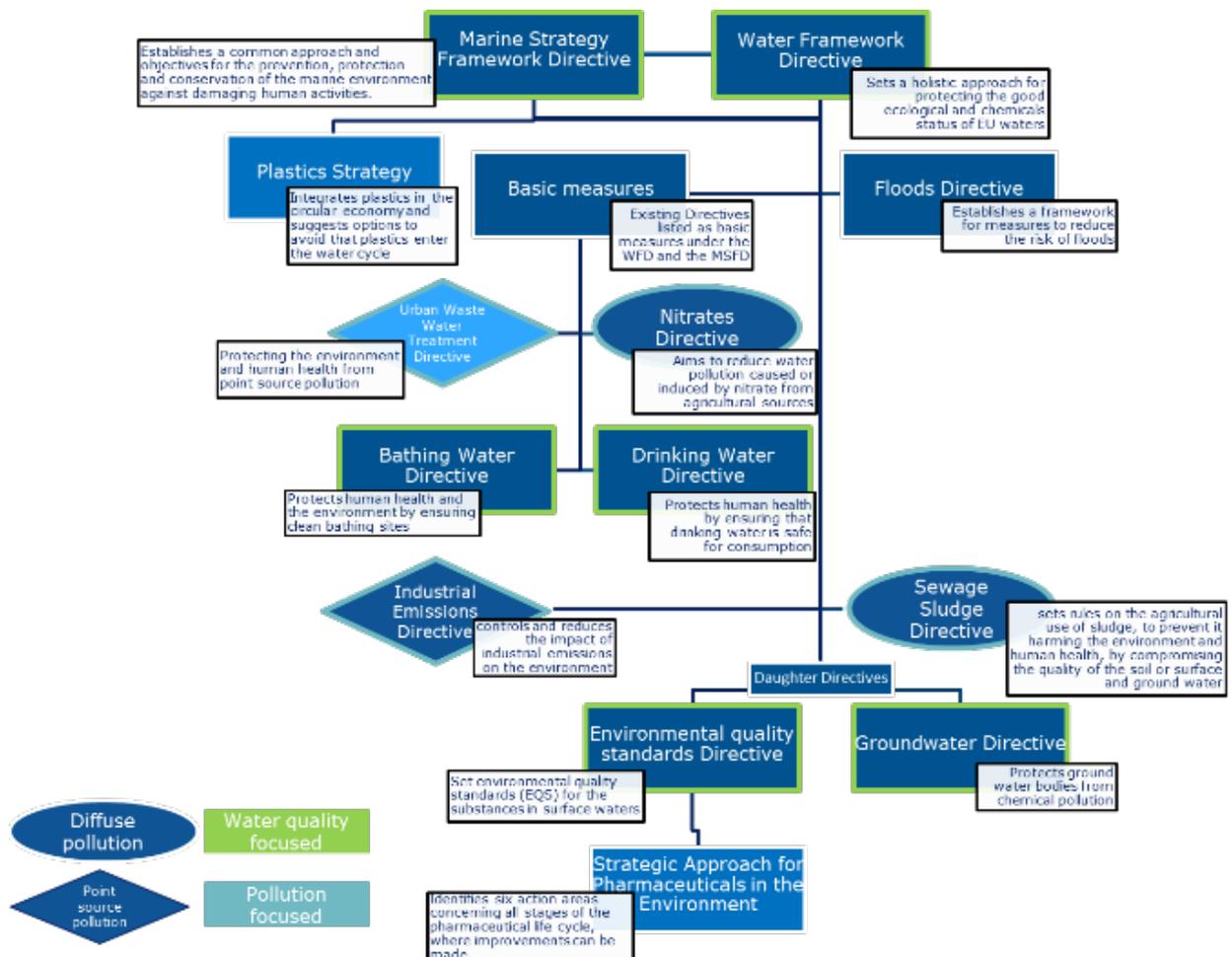


Figure 7 EU water legislation

The UWWTD plays an important role in the EU water *acquis* and lays down the minimum requirements for urban waste water collection and treatment. Annex I to the UWWTD states that ‘more stringent requirements ...shall be applied where required to ensure that the receiving waters satisfy any other relevant Directives’. It further specifies

that Member States need to designate sensitive areas that are subject to eutrophication or at risk thereof, that are drinking water catchment areas, or that are ‘areas where further treatment ...is necessary to fulfil Council Directives’ (Annex II). Furthermore, the UWWTD is a basic measure under the WFD and MSFD. Both these framework directives state that if measures taken under the UWWTD are not sufficient to achieve the objectives of the WFD and the MSFD, Member States need to take other appropriate measures, such as adapting treatment levels or the way in which they deal with storm water overflows. The implementation of the UWWTD is also crucial to achieving the BWD’s and DWD’s objectives, as inadequately treated waste water discharges can pollute bathing water sites and drinking water sources.

The UWWTD is also important for the implementation of the [Sewage Sludge Directive](#) (SSD), which deals with the reuse of sludge for agricultural purposes. As the SSD uses one of the outputs of the UWWTD, it is very dependent on this output being appropriate for its own purposes.

More recently, the Commission adopted the [European strategy for plastics in a circular economy](#) (‘Plastics Strategy’) and the [Strategic approach to pharmaceuticals in the environment](#) (‘PIE Strategic Approach’). These strategies highlight the potential role of the UWWTD (and waste water treatment more generally) as a means to tackle end-of-pipe contaminants of emerging concern, such as microplastics and pharmaceuticals.

Furthermore, the EU has taken action on a number of other issues relating to urban waste water discharges, in the context of its strategy to boost a [circular economy](#). The need for sufficient water quantities is reflected in the recently adopted [EU Energy Strategy and Energy Union](#).

## **2.2. Baseline and point of comparison**

At the time when the UWWTD was drawn up and adopted, there was no impact assessment requirement. For this Evaluation, it was therefore necessary to develop a retrospective baseline for 1990, based on Eurostat and OECD data (Annex 4, [Baseline by Member State](#)). Following assessment, this is considered to be the best available data for the 1990 baseline. The 9th implementation report (2014 data) can be used to demonstrate the achievements resulting from the adoption and implementation of the UWWTD.

When the Directive was adopted, the levels and extent of Member States’ waste water infrastructure varied widely; for example, some capital cities were not yet connected to treatment facilities. Levels of population with treatment varied between 11% and 94% (*Figure 8*).<sup>4</sup>

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<sup>4</sup> Figure 7 compares OECD’s 1990s figures on ‘population with treatment’ and Article 4 (2014 data) reporting under the UWWTD. Given that these data come from different reporting processes, they are not entirely comparable, but they are used here to give a general picture of population with treatment in different years.

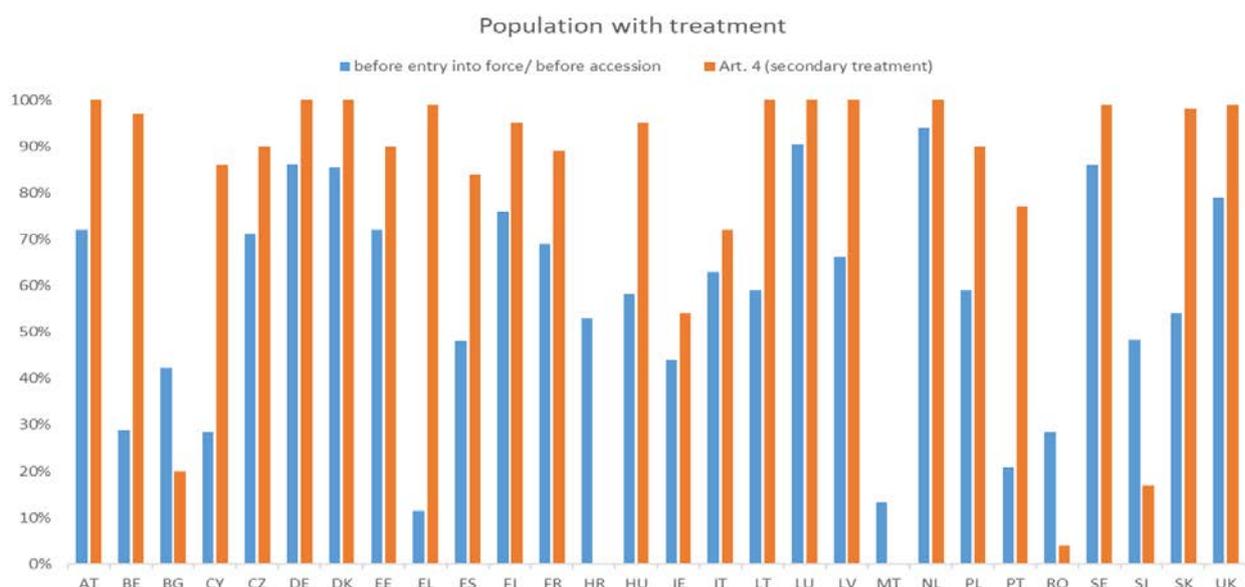


Figure 8 Population with treatment, blue = 1990s, orange = 2014

In the early 1990s, EU-level estimates for the loads of BOD in discharged urban waste water were about 3.7 million tonnes/year, N loads from urban waste water releases were about 1.0 million tonnes/year and P stood at about 0.2 million tonnes/year. These releases of pollution into EU water bodies were causing intolerable conditions and thus reducing the amenity value of rivers, lakes, estuaries and coasts. This was the background against which the UWWTD was adopted. Other EU legislation on water quality sets other standards for certain parameters, depending on the protection goals (Table 1), which may differ from those of the UWWTD. Assessing the UWWTD’s impact on the extent to which the protection goals of other directives are met provides a measure of the Directive’s success.

Parameter	Protection goal		
	Aquatic Ecosystems (WFD)	Drinking Water (DWD)	Bathing Waters (BWD)
N	X	X	
P	X		
BOD	X		
Microbiological	X	X	X
Chemicals	X	X	

Table 1 High level summary of water quality parameters corresponding to selected EU water legislation

In terms of the water quality situation in the early 1990s, BOD concentrations in rivers averaged almost 4 mg/l across the Member States, N concentrations were 2.5 mg/l or more, and P concentrations in rivers stood at about 0.12 mg/l, according to monitoring data provided by Member States (EEA, 2019a). As regards bathing water sites, only

about 52% of inland waters and about 80% of coastal bathing waters met the required standards in the 1990s (EEA, 2015).<sup>5</sup>

Since data from the 10th reporting (reported data for 2016) were not available during the Evaluation’s analysis stage, the analysis is based on 2014 data. The [state of play](#) section, however, reflects some data from 2016. Baseline population figures connected to treatment (*Figure 8*) and levels of BOD, N and P have provided the basis for an assessment of whether the Directive’s general objectives (load reductions and improving water quality in relation to waste water) have been achieved since the UWWTD’s adoption. Thus, indicators for success are reduction of loads and achievements in terms of protecting or improving water quality.

Furthermore, two hypothetical ‘What if no Directive’ (WIND) scenarios were developed. The WIND scenarios represent the state in which waste water treatment in the EU would hypothetically have remained had there been no UWWTD. This involves making some assumptions about how much progress the Member States would have made with national approaches to collecting and treating waste water if there had been no Directive. For these scenarios, it is assumed that some Member States would have reached similar levels of collection and treatment as under the UWWTD, whereas others would be in an intermediate situation between the 1990s baseline and current implementation levels, depending on their specific capacity to plan, invest in, and manage WWTPs. Analysis considers the following four scenarios: 1991 baseline, 2014 reported progress and the two WIND scenarios.

### 3. STATE OF PLAY

According to the forthcoming 10th implementation report, based on 2016 data, there are about 23 600 ‘agglomerations’ in the EU as defined under the UWWTD for 2 000 p.e. and above. These agglomerations generated a total load of 612 million p.e., mostly corresponding to urban waste water and runoff, but also to some from industrial sources.

To assess compliance with the Directive, the assessment currently focuses on meeting the requirements of three Articles (Articles 3-5 inclusive) at agglomeration level. Compliance with Articles 4 and 5 (treatment stages) is not possible if compliance with Article 3 (collection system) is not ensured. The same applies to Articles 4 and 5; compliance with Article 5 is not attainable unless Article 4 is implemented. Overall **compliance** with the UWWTD is now well advanced on average across the EU, with compliance rates for these three articles ranging from 80% to 100%. However, exceptions remain with lower values that need improvement, such as compliance results at EU13 level for Articles 3-5, and for Article 5 at EU28 level (*Table 2*).

<b>Compliance rates</b>	<b>Article 3 (collection)</b>	<b>Article 4 (secondary treatment)</b>	<b>Article 5 (more stringent treatment)</b>
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<sup>5</sup> In the 1990s, the predecessor of the current BWD was in place and reporting was slightly different. Overall, Member States’ compliance with the mandatory values for **coastal bathing waters** was slightly below 80% in 1990. For guideline values, it was at 68%. Compliance with mandatory values in EU **inland bathing waters** stood at 52% in 1990. The rate of compliance with guide values was slightly above 36%. Source: EEA (2015).

<b>EU15</b>	99 %	91 %	91 %
<b>EU13</b>	76 %	73 %	66 %
<b>EU28</b>	95 %	88 %	86 %

Table 2 Compliance rates with UWWTD according to 10th report

Figure 9 displays overall compliance rates by Member State, showing the diversity of compliance rates that is not apparent from the EU average. Clearly, many countries have implemented the Directive well by now, whereas a few others are lagging behind.

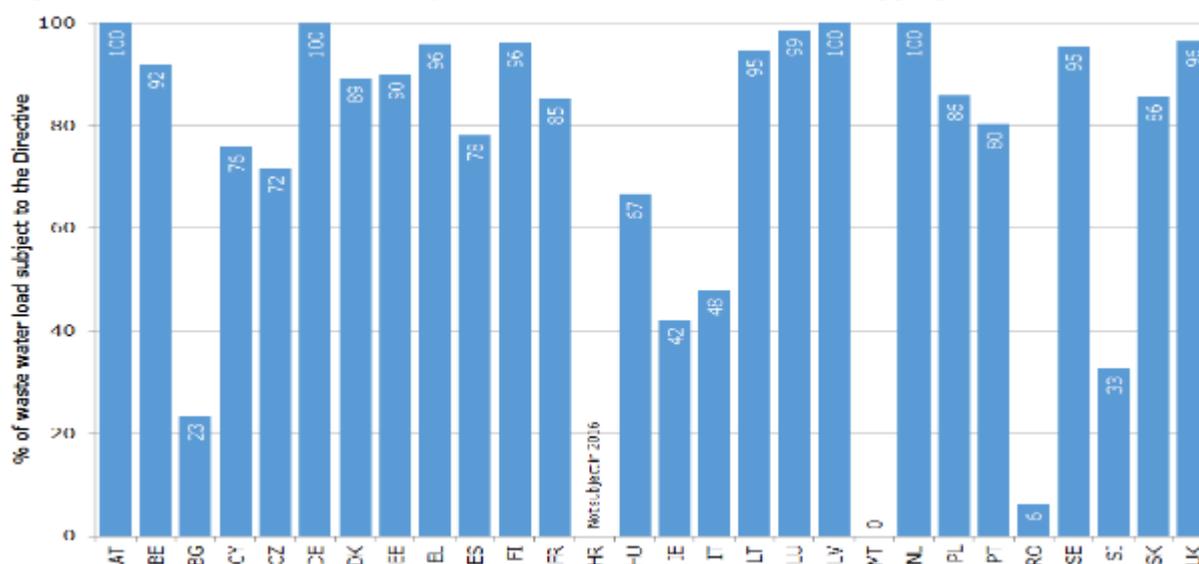


Figure 9 Compliance rates per Member States (2016).

The situation is slightly different when ‘distance to target’<sup>6</sup> is considered, which shows good (low) rates in general (10% or below), except for more stringent treatment (Table 3).

Distance to target	Collection	Secondary treatment	More stringent treatment
<b>EU15</b>	0 %	6 %	5 %
<b>EU13</b>	6 %	10 %	15 %
<b>EU28</b>	1 %	6 %	7 %

Table 3 Distance to target according to 10th report

The EU compliance rate with **Article 3 (collection of waste water)** is high, averaging 95.1%. The rates are very high in 21 Member States (95%-100%), while three still have low rates below 70% (RO, BG and SI). Some countries (SK, EL and HU) make extensive

<sup>6</sup> The term ‘**distance to target**’ means the effort needed to achieve compliance with the Directive for each requirement (by article). The target is to have all waste water collected and treated.  
Collection: the **total** load of waste water **that is not adequately collected**/ addressed through IAS.  
Treatment: the **total** load of **collected** waste water that is not adequately treated because the water does not meet the requirements for discharge set in the Directive.

use (above 10% of total load) of IAS. Overall, 6.2 million p.e. are not properly collected (1.2% of total EU load) and therefore not properly treated either.

88% of EU waste waters are considered to comply fully with **Article 4 (secondary treatment)**. Twelve Member States have compliance rates between 95% and 100%, while five (IE, MT, RO, BG and SI) still have to make significant efforts to reach compliance, with rates below 70%. Some 46.2 million p.e. do not meet the performance requirements of secondary treatment (9.4% of the total EU collected load that requires this treatment).

**More stringent treatment (in terms of the rate of compliance with Article 5)** is applied to waste water discharged in areas covering more than three quarters of EU territory. Fifteen Member States apply it throughout their territory, whereas the other 13 have identified parts of their national territory as “sensitive”. The compliance rate for more stringent treatment (applicable to agglomerations discharging into “sensitive” areas with more than 10 000 p.e.) is about 76%. Overall, there is still a large difference between Member States, with rates ranging from below 70% to full compliance, and only five countries between 95% and 100%. Significant efforts are still needed in several countries with rates below 70% (BG, CZ, ES, IE, IT, MT, RO and SI). This equals about 17.6 million p.e. not meeting the performance requirements of more stringent treatment (17.3% of the total EU collected load that requires this treatment).

The Commission has taken legal action with a view to ensuring correct and timely implementation of the UWWTD. Infringement proceedings have been taken against nearly all EU15 countries, with over 40 CJEU rulings<sup>7</sup>. More than 30 horizontal cases are pending, some of which involve the EU13 countries that joined after 2004. The most frequent issue is Member States’ failure to meet the requirements of Articles 3-5 by the required deadlines.

#### 4. METHOD

The Evaluation, which follows the Better Regulation guidelines, assessed all impacts associated with the Directive quantitatively and/or qualitatively, to the extent possible. The approach used was based on five criteria: effectiveness, efficiency, coherence, relevance and EU-added value. Analysis was based on a list of 27 Evaluation questions (see Annex 4, [Overview: mapping of evaluation questions](#)), which were outlined in the Evaluation [Roadmap](#). The roadmap was subject to a feedback mechanism.

On the basis of feedback on the roadmap and the Commission’s experience of implementing this Directive, European Court of Auditors (ECA) reports, and previous Commission studies on aspects of the UWWTD, **12 key issues** were identified that enabled the assessment of the five evaluation criteria to be substantiated. These key issues were **discussed in the early stages of the Evaluation** with a number of major stakeholders and validated in this process. The findings on the key issues are included in the report where most appropriate (see Annex 4, [Overview: mapping of Evaluation questions](#)). To avoid losing any valuable information, cross-referencing is used throughout the document.

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<sup>7</sup> Thirty-five rulings under Article 258 and seven rulings under Article 260 (June 2018).

An external contractor supported the Evaluation by developing key issue studies and an Evaluative support study. **Unless otherwise stated, all data used in this report come from these studies. Modelling results are taken from the Joint Research Centre’s Science for Policy report (see Annex 3, [JRC modelling](#)) (Figure 10).**

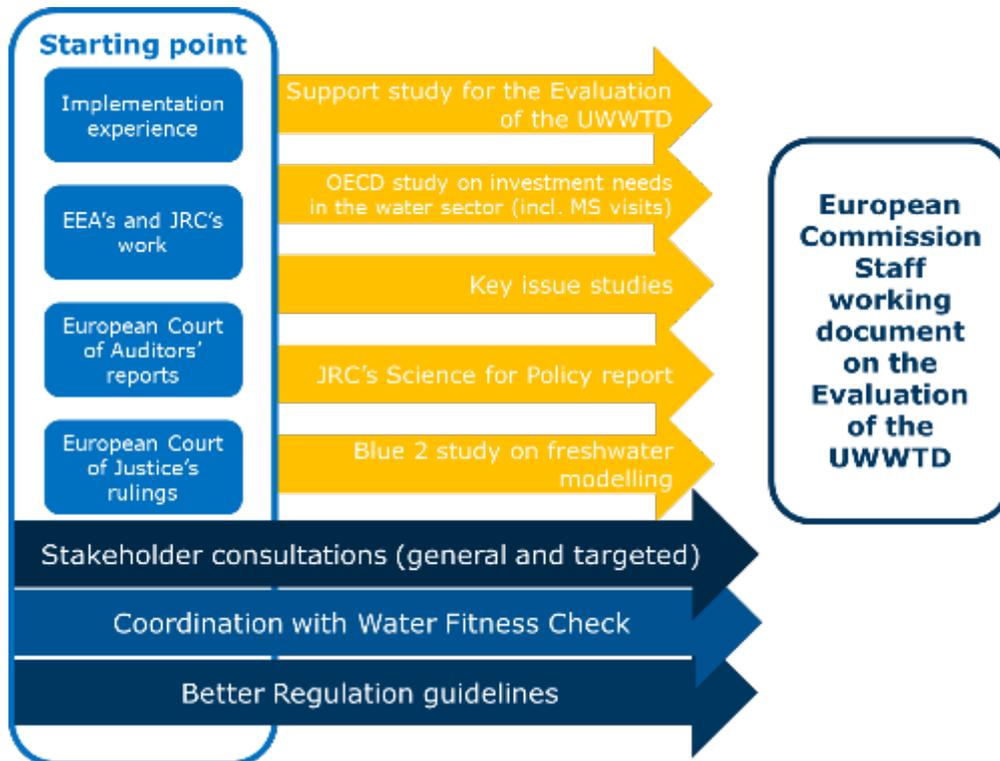


Figure 10 Evaluation process

#### 4.1. Literature review

An extensive literature review was conducted, encompassing scientific studies, ECA reports, ongoing and past Commission studies (e.g. Blue2 (EC, 2018a), the joint OECD study on investment needs in the EU water sector), the work and databases of the European Environment Agency (EEA), the JRC’s work, and national studies where available. These findings were triangulated with results from modelling approaches and stakeholder consultations.

##### *The EEA<sup>8</sup> and water quality information*

The EEA provides extensive information and analysis on water and the marine environment, covering topics such as industrial emissions into water, chemicals in water, and bathing water<sup>9</sup>. The Agency also provides access to vast amounts of information through its data and map viewers. The data viewers compile information provided by Member States reporting under the various water directives and information provided voluntarily under agreements among countries.<sup>10</sup> The EEA’s analyses and data portals

<sup>8</sup> The EEA covers the EU 28 Member States + Iceland, Lichtenstein, Norway, Switzerland and Turkey.

<sup>9</sup> EEA (n.d.b), [Water and marine environment articles](#).

<sup>10</sup> EEA (n.d.c) [Water and marine environment data and maps](#).

provide Europe-wide overviews of water quality development over time, plus analysis on pollution sources and underlying factors for improvement.

#### *OECD study on investment needs in the EU water sector*

In 2017 DG ENV launched a cooperation project with the OECD to assess investment needs associated with UWWTD, DWD and the Floods Directive in the EU Member States.<sup>11</sup> This analysis provides a comparative overview of investment needs and assesses possible financing sources (i.e. tariffs, taxes, transfers). Following the analysis, joint OECD-Commission workshops were held in 9 Member States. These workshops hosted discussions among all relevant stakeholders in efforts to find solutions for the future. The analysis and the workshops have provided a wealth of information on financial needs associated with the UWWTD and on practical implementation problems. The cooperation project is due to finish in February 2020. Some preliminary findings have already fed into the Evaluation.

#### **4.2. Stakeholder consultation**

The Commission set out a joint [Consultation strategy](#) for this Evaluation and the Water Fitness Check (Water FC) (EC, 2018b). The main stakeholders identified were consulted by different means (see Annex 2, [Stakeholder consultation](#)).

##### ***Public consultation***

A 14-week [online public consultation](#) was held between July and October 2018. Comprising one general section and another specifically for experts, it was available in all 23 official EU languages. There were 608 replies, half of them from citizens. The two largest stakeholder groups responding were associations and WWTP operators. Replies came from 24 of the 28 Member States, with stakeholders in Germany and Spain accounting for the lion's share.

##### ***Targeted consultation***

In March 2018 **individual interviews** were held with nine stakeholders representing major stakeholder groups, to **discuss and check the key issues**.

Four **expert workshops** were held<sup>12</sup>. They focused on selected topics identified as particularly relevant and difficult to assess through a review of the literature:

- Pollutants of emerging concern
- Storm water overflows (SWOs) and IAS
- Costs and benefits of the UWWTD
- Technical modelling workshop on the combined sewer overflow (CSO) model.

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<sup>11</sup> OECD/ European Commission (forthcoming) – [Estimating investment needs and financing capacities for water-related investment in EU member states](#)

<sup>12</sup> The minutes of the technical expert workshops and the stakeholder conference, and presentations given at these events, are available on Circabc: [Evaluation Study 2018](#).

These workshops fed into the Evaluation as they served to identify further information, to check the correctness and relevance of the identified evidence, and to validate preliminary findings.

On 16 November 2018, a **stakeholder conference** was held on the premises of the Committee of the Regions to share the preliminary findings of the support study and some initial results from the public consultation. The conference validated the findings and some further information emerged which was incorporated during the finalisation of the Evaluation.

Participants in all stakeholder activities included Member State authorities, other institutions (e.g. World Bank, OECD), NGOs, industry associations and the scientific community.

As part of the OECD study on investment needs in the water sector, nine Member State visits were organised to discuss findings on investment needs and future financing options.

In addition to the technical workshops, **the Member States were consulted in writing** on some specific aspects of the modelling (management measures in place for storm water overflows (SWO) and information on IAS) for which limited data were available. Member States also received the preliminary results of the cost and benefit assessments. They were asked to provide feedback on findings for their country or to add to the identified information.

### **4.3. Modelling**

#### ***Science for policy – the effects of the UWWTD***

The JRC's modelling of the effects of the UWWTD for this Evaluation, described in the Science for Policy report 'Water quality in Europe: effects of the Urban Waste Water Treatment Directive', enabled the reduction of pollutant loads (BOD, N and P)<sup>13</sup> in treated waste water over time to be assessed. The modelling results show the effects of the UWWTD only and filter out the impact of other legislation. The modelling also estimated subsequent improvements in water quality associated with the UWWTD's effectiveness, against different water quality standards based on various other water directives that benefit from the UWWTD's existence (e.g. WFD, DWD, BWD). The JRC used the [Geospatial Regression Equation for European Nutrient losses model](#) (GREEN+ model), which was developed to estimate annual N and P loads and performed source apportionment at pan-European level. The JRC extended the model to include BOD, chemicals and coliform bacteria. This model includes both point sources (WWTPs, industries, and paved areas) and diffuse sources (fertilisers, atmospheric deposition, and scattered dwellings).

A 1990 baseline for waste water treatment for each Member State was established and used as a point of comparison the present levels of waste water treatment based on data from the 9<sup>th</sup> implementation report. The following scenarios were also modelled: full implementation, impact of individual and other appropriate systems, impact of CSO. There were also two scenarios looking at what would have happened without the Directive ('What-if-no-Directive' (WIND)).

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<sup>13</sup> It was not possible to model COD.

To establish the WIND scenarios, two different sets of weights were used (WIND1 and WIND2, see Annex 3, [WIND](#)). These scenarios are quantified in a simplified way as a weighted average of the two scenarios (baseline and pre-directive), as is usual in statistical data fusion.

Details of the modelling exercise are set out in Annex 3, [Science for Policy](#), and in the Science for Policy report on the subject.

### *Costs-benefit assessment*

**Only three benefits were quantified and monetised at EU level:** benefits of nitrogen reduction as a proxy for water quality and health, the reduction of micro-biological pollutants as a proxy for bathing water quality, and the cost savings of moving from individual to central collection systems. It was not possible to monetise the reduction of

**Benefit modelling:** At the time of the Evaluation, there was no single established methodology to assess the benefits associated with the UWWTD and waste water treatment in general.

However, stakeholder consultations and research findings show that urban waste water treatment helps provide many environmental, social and economic benefits.

For both, costs and benefits, the estimates developed for this study should not be interpreted as economic reality. Rather, they provide indicative ranges of the order of magnitude of the costs and benefits associated with the UWWTD.

Further efforts should be made in future to establish a thorough benefit methodology.

BOD, COD or P or the removal of non-targeted chemicals across all Member States. For the first two benefits, a damage cost approach based on a benefits transfer from willingness to pay studies was used. For the move to more collection through centralised collection systems, the costs saved by not having to maintain individual or other appropriate systems were assessed.

To assess the **costs associated with implementing the Directive**, two separate and established cost functions were used, one for

collection systems and one for the different treatment levels, derived from the FEASIBLE model.<sup>14</sup> The cost functions were adjusted to Member States' price levels in 2014. Costs were annualised with a discount rate of 4%, as suggested in the Better Regulation guidelines. A lifetime of 25 years is assumed for WWTPs and a lifetime of 50 years for collection systems. Costs were broken down into capital (CAPEX) and operation and maintenance (OPEX) costs.

Cost correction factors were used to ensure that only costs and benefits attributable to the UWWTD and its influence on how Member States deal with urban waste were taken into account. Results were produced for the 2014 implementation levels and for full implementation.

In response to the written consultation, Member States that have a national cost assessment and that responded to the consultation reported that the overall order of magnitude is correct, but also stressed that cost assessments are challenging even at national level.

For details of the methodology, see Annex 3, [costs and benefits](#) and the key issue report.

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<sup>14</sup> These cost functions were discussed at the cost and benefit workshop. Other institutions, such as the OECD and World Bank, confirmed that they use these functions. They are considered to be fairly stable overall.

#### 4.4. Limitations and robustness of findings

**Water quality is very complex**, as it can be characterised in different ways and is subject to many external factors (e.g. geology, catchment type). **There are many sources of water pollution. Waste water discharges are only one kind, along with pollution from industry, agriculture, and atmospheric deposition.** The impact of pollutant releases varies according to the type of water body receiving the pollution, but also depends on the ecosystems affected and the use to which the water may be put downstream (bathing sites, drinking water production, etc.) This made it difficult to **assess all environmental and health benefits** in quantitative and monetary terms. There is a lack of published sound methodologies linking improvement in water quality to quantitative effects on health and ecosystems. Although treating waste water brings health benefits (see [benefits](#)), these are indirect (improvement of raw water used for drinking water production, improvement of water quality for bathers). Moreover, they can hardly be attributed solely to the UWWTD, given the existence of other related legislation (BWD and DWD). It was also not possible to assess benefits relates to tourism and the impact on the economy.

Although the Directive has been in place for 28 years, long enough for a good evidence base to have been gathered, there is a lack of EU-wide comparable data on certain topics. Comparably sound data were found on connection rates and treatment levels. Data of limited comparability were found on IAS and SWOs, a shortcoming addressed by conducting an additional written consultation of the Member States. Extrapolations and/or assumptions, based on expert judgement, were used to complement the available evidence base. It was necessary to make a few different assumptions about the impact of the Directive compared to the baseline to model water quality and assess costs and benefits. Such differences are not thought to alter the conclusions drawn from the assessment.

Any assumptions and identified uncertainties are highlighted in this document and its annexes, and in the Science for Policy report, the Evaluative support study and the related key issue studies. Since all information and results from modelling exercises were triangulated against each other as far as possible, the overall robustness of the findings can be confirmed.

## 5. ANALYSIS

### 5.1. Effectiveness

**Evaluation question:** To what extent has the UWWTD reached its objectives and what factors impact on its effectiveness?

Evidence shows that, as expected, the Directive has led to reductions of BOD, N and P loads released from urban waste water point sources into the environment. Modelling results show that, between the adoption of the Directive and 2014, BOD, N and P loads in treated waste water fell by 61%, 32% and 44%, respectively. **Further reductions can be expected once the Directive is fully implemented.** The reductions achieved so far, especially of BOD and P content in water bodies, have had the expected **positive effects on the aquatic environment.** Rivers, seas, lakes, coastal zones and designated **bathing sites** have seen substantial improvement and a big part of this can be linked to the UWWTD. Furthermore, although the treatment required by the UWWTD does not directly target chemicals (other than N and P), including [contaminants of emerging concern](#), it has substantial impact on their reduction as well.

Nevertheless, **point source pollution from untreated or inadequately treated urban waste water is still one of the main reasons for why EU waters fail to achieve good ecological status.** According to

data reported under the 2<sup>nd</sup> round of river basin management plans (RBMPs), urban waste water is a significant pressure on 12% of surface water bodies, leading them to fail to achieve good ecological status under the WFD. The main factors that impact the effectiveness of the UWWTD are related to both the text of the UWWTD itself and to a lack of implementation in several Member States. These factors will be discussed in more detail below.

1. **Non-compliant agglomerations** produce a high proportion of avoidable loads and put pressure on EU water bodies. In the last decade, UWWTD implementation levels have increased across the EU on average, but some Member States took a long time to become compliant and some are still not fully compliant. The initial **deadlines** set in the Directive and those negotiated in Accession Treaties seem to have been **overambitious**. Clearly, implementing the Directive is challenging for some Member States in terms of required funding, as well as institutional and administrative capacity. However, evidence shows that some Member States have managed to implement the Directive in a rather short time (i.e. EE and LT). To advance implementation, the Commission provides support through compliance promotion activities and drives it through infringement procedures, whenever appropriate. It also supports it through funding, as implementation of the UWWTD requires substantial and continuous investments in infrastructure. Member States use a mix of public budget, taxes and water tariffs to finance implementation. Many relied, and some still heavily rely, on EU funding to build up the initial infrastructure. Only a few Member States have moved towards full cost recovery through water tariffs. Most Member States use water tariffs to have households and some industries partly pay for (waste) water services, and so the polluter pays principle is being respected to some extent. According to the analysis, the general affordability of water services is not at risk in any country, though in some countries, such as Romania and Bulgaria, the burden borne by lower income households is slightly higher than in other Member States. A number of financing and management problems were noted in some Member States, e.g. lack of effective use of funding and issues with national procurement rules.

The analysis also considered **whether unclear terminology reduced the effectiveness of the UWWTD**. Overall, the UWWTD is effective largely due to **its clarity** – including as regards implementation deadlines - and its **enforceability**. Discussions with stakeholders and other research revealed only a few terms and obligations that need further clarification.

2. The UWWTD provisions give Member States the **flexibility to use IAS** if the cost of a collection system would be disproportionate and as long as the individual system used achieves the same level of environmental protection as a collection system would. IAS can be a way of adapting to geographical circumstances. The UWWTD is not clear on how costs and benefits need to be assessed in order to ascertain whether IAS could be used, what ‘sufficiently concentrated’ means in the context of agglomerations or how Member States need to monitor the effectiveness of IAS use. Some Member States report high IAS use, also in larger agglomerations where a collecting system is in place. Badly designed, monitored and maintained IAS can lead to ineffectively collected waste water and can cause releases of untreated waste water affecting the environment. This is an issue of implementation, as well as of clear provisions under the UWWTD itself.
3. The UWWTD covers agglomerations below 2 000 p.e. only to a limited extent. Information from the 2<sup>nd</sup> round of RBMPs shows that **small agglomerations and non-connected dwellings** can be a factor in not reaching good status under the WFD. The impact of small agglomerations and non-connected dwellings and their discharges depends on local conditions such as the discharge point and the type and size of the receiving water body. It is expected that in many small agglomerations substantial use of IAS is made.
4. **The UWWTD addresses SWOs only to a limited extent**. Case-law has helped clarify the UWWTD’s only reference to this (in a footnote), but the Court pointed out a need to develop related guidance. SWOs are mostly a problem at local level, but EEA and JRC findings show that they can have a significant environmental impact. This pollution source is becoming more relevant with increasingly heavy rainfall and higher levels of UWWTD implementation. Related to SWOs is **urban runoff**, a component of combined sewage. The pressure created by runoff is partly covered by the UWWTD (when the runoff enters the combined sewer system) and partly by the WFD (when the runoff discharges directly to receiving waters through separate storm sewers, where Member States identify it as a pressure to meeting environmental objectives). With increasingly heavy rainfall induced by climate change and increasing imperviousness of urban

surfaces, **urban runoff** may have an increasingly negative impact on water quality.

5. Although the UWWTD requires the designation of **sensitive areas under criterion A**, for those areas that are eutrophic or at risk of eutrophication, it is not very specific on how to assess eutrophication. The Court set out four criteria to assess eutrophication. Evidence shows that neighbouring Member States do not always apply the concept in the same way, however. This may lead to less improvement than what can potentially be achieved. Also designation under criteria B and C is not clear.

Note that **waste water pollution needs to be seen in the context of pollution from other sources**: in a number of cases other diffuse and point sources, such as agriculture and industry, are the dominant pollution sources. The relative significance of these sources is expected to increase under full UWWTD implementation.

The effectiveness of the UWWTD's provisions on monitoring, reporting and disseminating information has also been assessed, and is discussed below:

1. Overall, the **monitoring requirements are effective** in supporting the Commission's compliance assessments and the data provided under these requirements have been used for infringement cases. To address local conditions, a number of Member States have set stricter threshold levels for BOD, N and P, demonstrating that it is possible to achieve more than what is expected under the UWWTD. Monitoring provides only a **partial picture** of what is entering the environment via WWTPs, as few samples are required and monitoring is only required for a limited number of parameters. Further evidence is needed to understand the impact of this. Monitoring provisions are not directly required to adapt to changing external factors or new technologies. The Directive does not contain (clear) monitoring requirements for SWOs and IAS.
2. The **reported data**, which are based on the monitoring results, were essential to ensuring effective enforcement. However, the process of assessing reported data is still time-consuming and the information is not made available quickly enough. Moreover, the legal text as well as some of the parameters are not yet fully aligned with other related (more recent) legislation. Furthermore, Member States do not always provide all information in a comparable way, such as information on investments, nor do they always comply with agreed formats and data management processes, e.g. those set by the [INSPIRE Directive](#).
3. The Directive requires that Member States provide situation reports as **information to the public**. This has led to diverse practices across the EU and it is not clear whether the information that the public is interested in is made available to them. Practices in Member States are very diverse and there is significant potential for improvement. At EU level, the [Structured Information and Implementation Framework](#) (SIIF) is a step forward in modernising the ways in which information is provided. Generally, **the public is interested in information on waste water**, especially on aspects that affect their daily lives, such as where treated waste water is discharged and associated costs. People are also interested in information on what they pay for in terms of water services. The Directive does not ensure that this kind of information is made available.

The **effectiveness** analysis considers how successful the UWWTD has been in achieving or progressing towards its objectives. Where the objectives have not been achieved, the assessment considers the extent to which progress has fallen short. The underlying reasons are discussed in the section on [factors influencing the UWWTD's effectiveness](#).

### *Achievement of the Directive's objectives*

As regards **pollutant loads in treated waste water**, modelling shows that the UWWTD has had a significant impact. At EU level, **organic matter** in treated waste water, **assessed based on BOD levels**, has decreased from 3.7 million tonnes per year before adoption of the UWWTD to 1.4 million tonnes per year, from 1 to 0.7 million tonnes for **N** and from 0.2 to 0.1 million tonnes for **P** (*Table 4*). Further reductions are expected once the UWWTD is fully implemented.

This decline in BOD and phosphorus concentrations due to the enforcement of the UWWTD and investment in urban waste water treatment has also been noted in the recent state of the environment publication by the European Environment Agency (EEA, 2019c).

Modelled loads from urban waste water sources (tonnes/year)				
Parameters	1990 <sup>15</sup>	2014	Reduction 1990 to 2014	Residual load under full implementation
<b>BOD</b>	3,703,875	1,451,561	61%	887,022
<b>N</b>	1,007,511	689,626	32%	572,386
<b>P</b>	210,118	118,069	44%	102,123

Table 4 Reduction of loads in treated waste water (EU aggregated figures)

Stakeholders that replied to the public consultation generally agreed that the UWWTD has been either very effective or somewhat effective (46% and 42%, n<sup>16</sup>=345) in protecting the environment, with only 1% judging that the Directive was very ineffective and 4% judging that it was neither effective nor ineffective.

### Biochemical oxygen demand

The achieved reduction in BOD loads is substantial. In most Member States, loads have halved compared to levels seen in the 1990s (Figure 11).

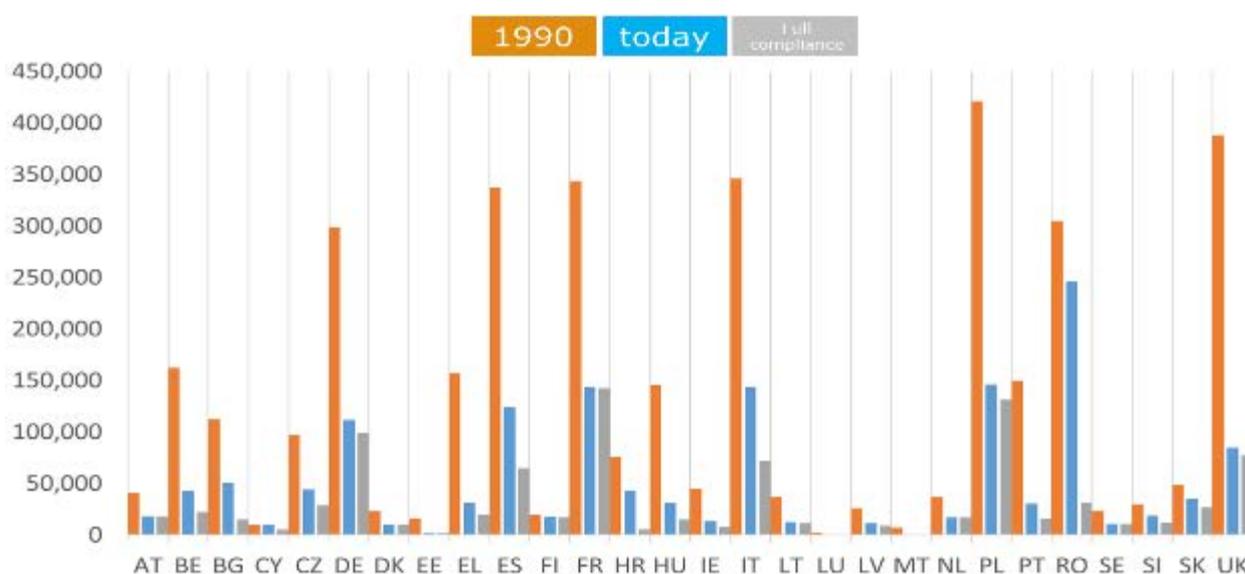


Figure 11 Reduction of BOD loads (tonnes/year) in treated waste water

<sup>15</sup> 1990 accounts for all 28 EU Member States (also those who were not yet part of the EU at the time.)

<sup>16</sup> 'n' = total number of respondents to this question. Given that most questions in the public consultation were not mandatory, the total 'n' changes per question.

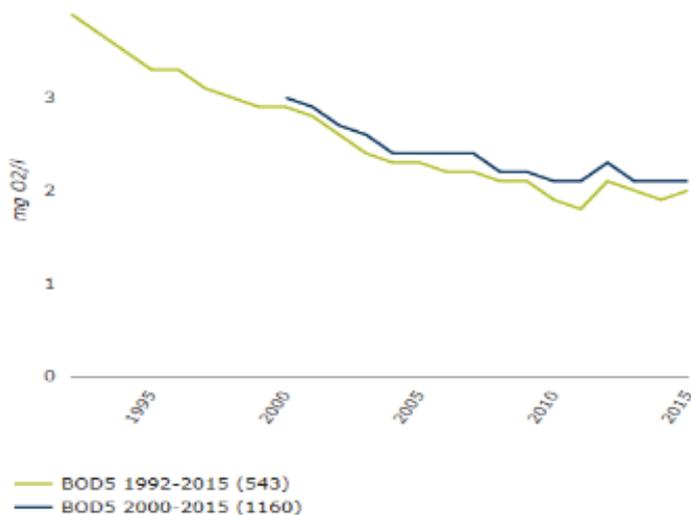


Figure 12 BOD in selected European monitoring stations. EEA (2019a).

Evidence from selected European monitoring stations shows that BOD levels have indeed reduced: since 1992, the presence of oxygen-demanding substances (measured based on BOD) have substantially decreased. The decrease is about 2.7% per year (0.08 mg O<sub>2</sub>/l), with a significant decrease of 64% at monitored river sites (Figure 12) (EEA, 2019a).

Models show a clear reduction of BOD loads in water bodies, with about 4% of the river network moving up to ‘good’ status<sup>17</sup> and additional further

improvement expected under full compliance (Figure 13). However, the EU average hides the fact that a number of Member States still have to make significant progress (notably RO, IT, ES, BG). Based on WIND results, it can be assumed that some Member States would have 10% less of their river network in good or high status if the Directive was not in place (see Annex 4, [WIND results](#)).



Figure 13 EU-28 river network conditions regarding BOD quality standards under different scenarios<sup>18</sup>

<sup>17</sup> There is no EU-wide agreed level for what constitutes ‘good status’ or ‘high status’ as regards BOD, N and P in EU water bodies. The levels that indicate ‘good status’ are based on an analysis of the provisions in EU legislation and scientific literature.

<sup>18</sup> All graphs showing the modelled improvement of EU water quality include results for four scenarios: 1) 1990, 2) two WIND scenarios with different weights, 3) current level of implementation, 4) full implementation.

These findings are confirmed by stakeholder replies to the public consultation: according to 52% and 29% of respondents, respectively, the Directive has been either very effective or somewhat effective in reducing BOD. Only 1% of respondents said that the Directive was very ineffective and 5% replied that it was neither effective nor ineffective (n=343).

### Nitrogen

A reduction in N released through treated waste water is also clearly visible (Figure 14), and was achieved due to the implementation of Article 5.

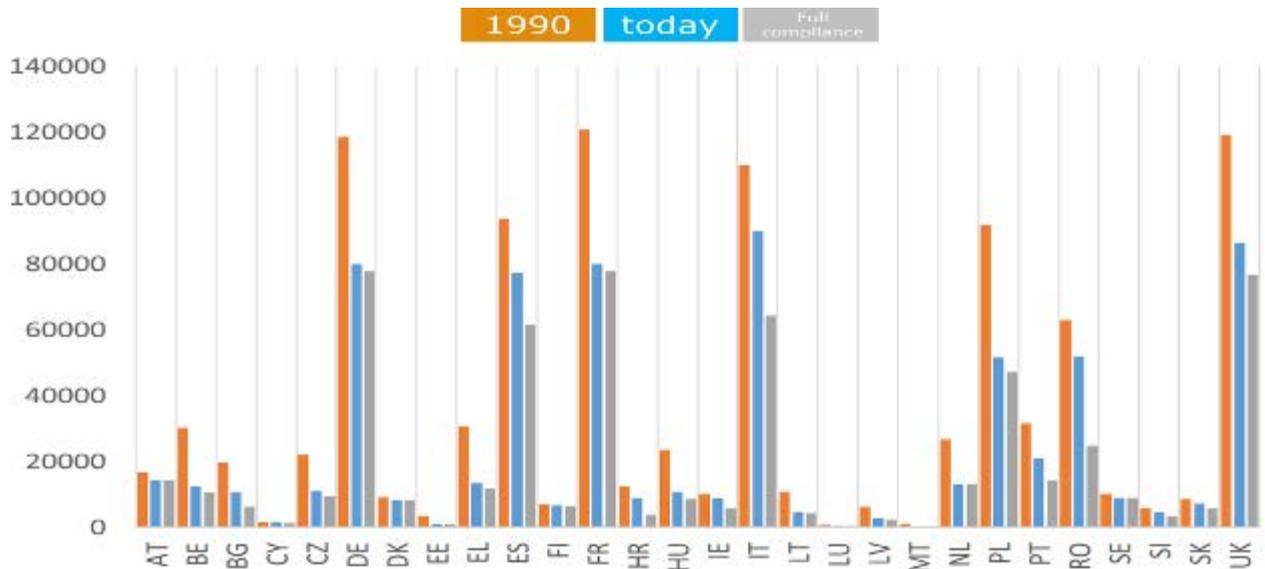


Figure 14 Reduction of N content (tonnes/year) in treated waste water

The EEA’s assessment of data from selected European river monitoring stations shows that there was steady decrease in nitrate concentrations since 1992, and links this to improved waste water treatment (and the UWWTD). On average, the nitrate concentration has decreased by 0.02 milligrams/l of nitrogen (0.8%) per year between 1992 and 2015 (Figure 15) (EEA, 2019a)

As shown in the [state of play](#) section and in Figure 14, some Member States still need to make substantial efforts to increase treatment for N. In spite of this, modelling suggests that, under current implementation levels, the UWWTD has improved the status of about 4% of the river network from below ‘good’ to ‘good’ or ‘high’. Under full compliance, another 0.7% of the river network could achieve ‘good’ or ‘high’ status (Figure 16). Estimates of what would have happened

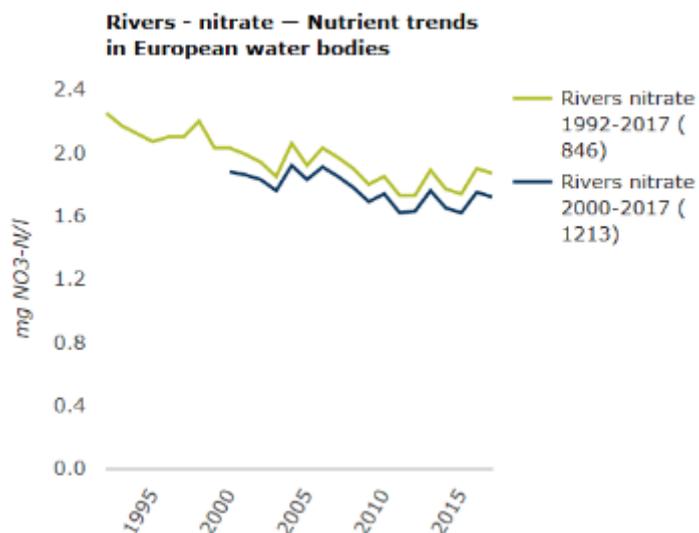


Figure 15 Nitrate in selected European monitoring stations. EEA (2019a).

without the UWWTD show that some Member States would not have seen any improvement in about 20% of their river network (Annex 4, [WIND results](#)).

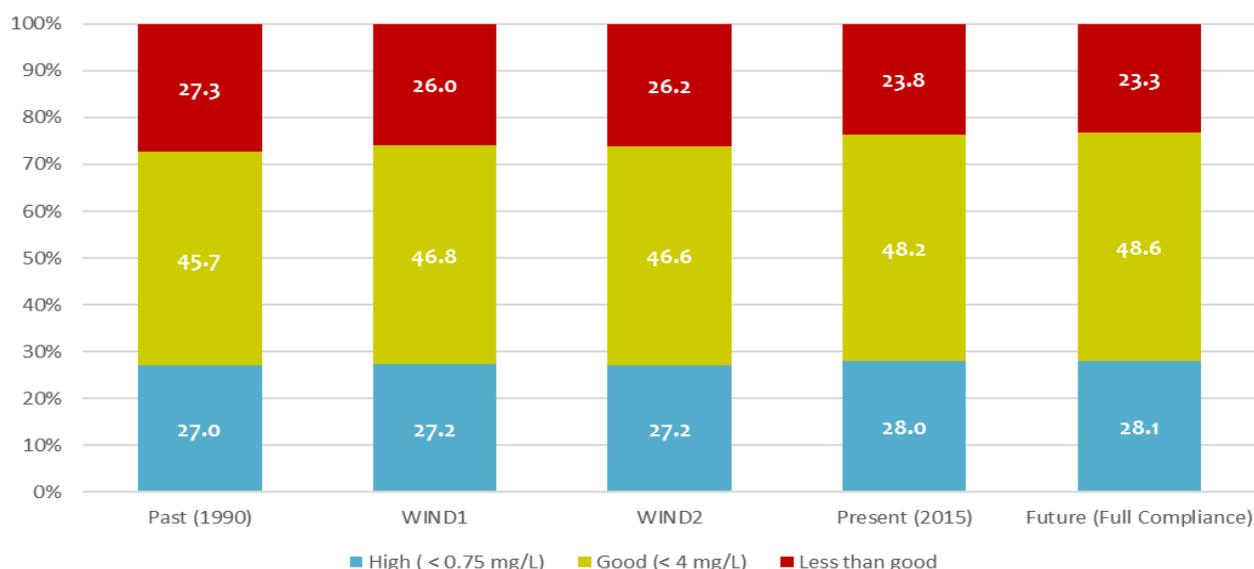
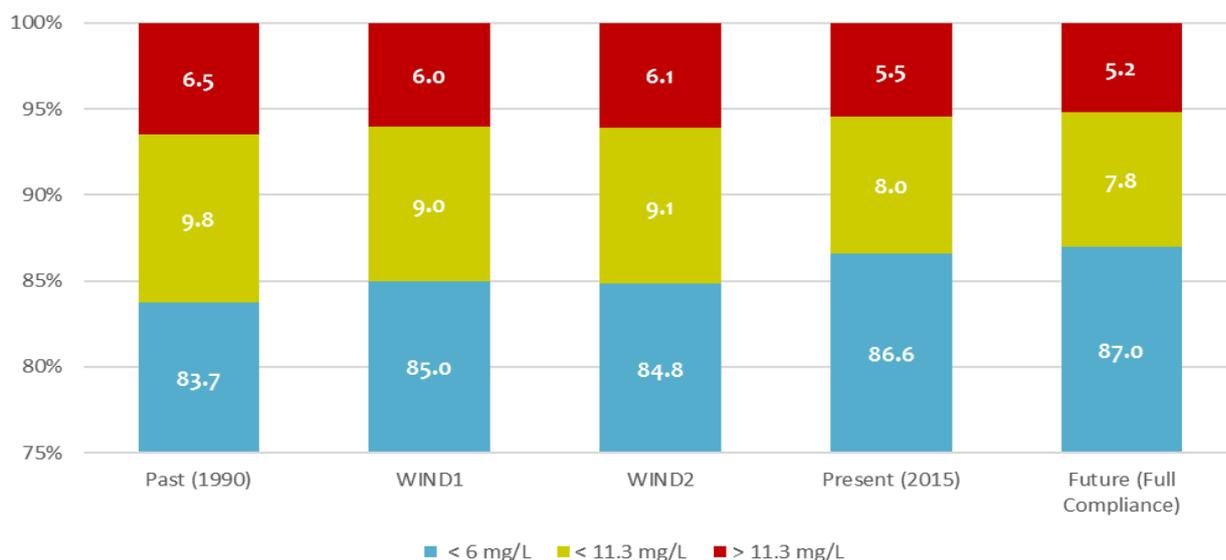


Figure 16 EU-28 river network conditions regarding N quality standards under different scenarios<sup>19</sup>

Annex II of the UWWTD refers to the requirement for Member States to ensure that surface waters intended for the abstraction of drinking water do not contain nitrate concentrations above those set out in the DWD<sup>20</sup>. Note that improvements appear smaller when considering higher concentration thresholds, such as those of the DWD (Figure 17).



<sup>19</sup> Grizzetti *et al.*, (2017) show that the median of predicted concentrations for rivers in good status is normally about 4 mg/L for total N.

<sup>20</sup> The UWWTD from 1991 makes reference to [Council Directive 75/440/EEC](#), which has since been revised twice with a proposal on a recast of the Directive pending at the time of the UWWTD evaluation. The modelling considers nitrate (NO<sub>3</sub>) 50mg/l (11,3 mg/l as N).

Figure 17 EU-28 river network with N limits below those set out in the DWD (11,3 mg/l) and precautionary limits applicable to children (6 mg/l).

The most significant source of N is diffuse pollution from agriculture (see the section on [contextualisation](#)). Additionally, N has a potentially long residence time in groundwater, which means that the effects of load reduction measures may only be visible after decades in the downstream surface receiving waters (Grizetti *et al*, 2017).

The public consultation results regarding the UWWTD’s effectiveness to reduce N show that stakeholders are slightly less positive on N compared to BOD, with only 38% judging that the UWWTD was very effective and 36% that it was somewhat effective. Only 1% of respondents considered the UWWTD to be very ineffective, and 9% judged that it was neither effective nor ineffective (n=344).

### Phosphorus

Modelling shows that there has been a significant reduction in P released through treated waste water, and that this was achieved through compliance with Article 5 (Figure 18).

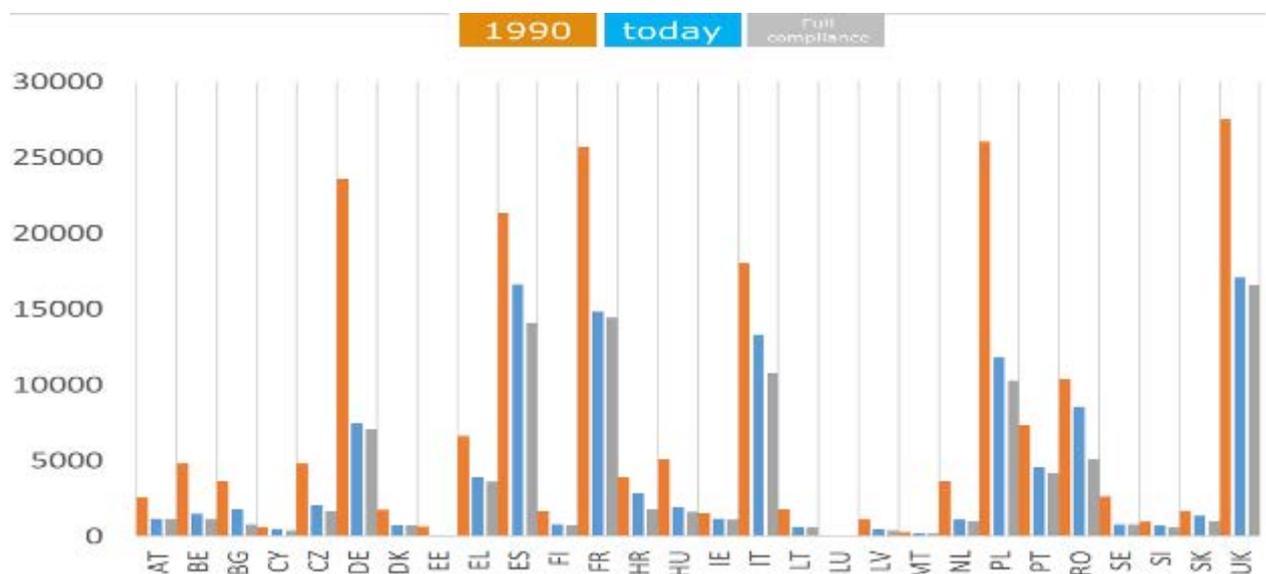


Figure 18 Reduction of P content (tonnes/year) in treated waste water

Monitoring data from rivers and lakes across the EU support this finding and show that concentrations of orthophosphate in rivers have more than halved between 1992 and 2015 (Figure 19). The EEA links this to the implementation of the UWWTD and improvements in the EU’s regulation of P in detergents.

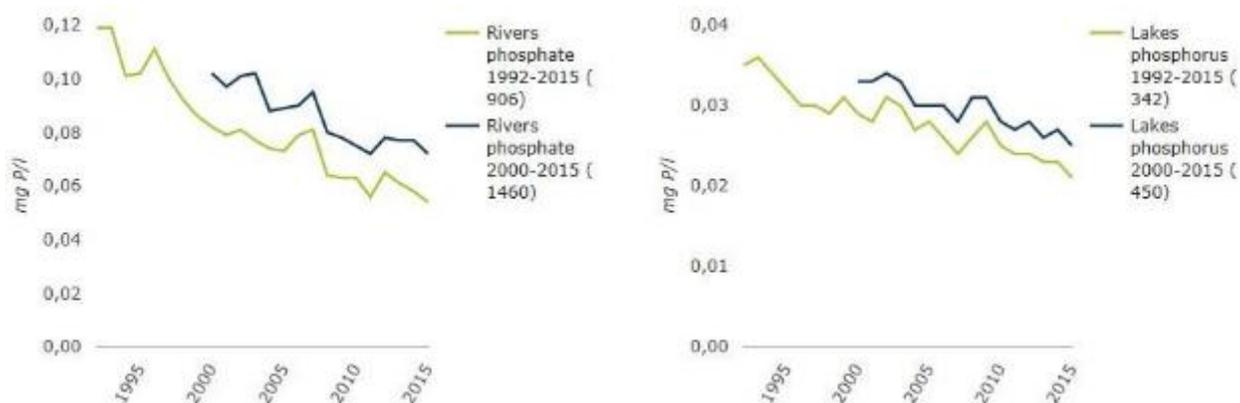


Figure 19 Phosphate in rivers and phosphorus in lakes. EEA (2019a).

According to modelling results, the status of about 10% of the EU river network improved from below ‘good’, to ‘good’ or ‘high’ thanks to UWWTD implementation. An additional improvement of about 1% can be expected with full implementation (Figure 20). Without the Directive, up to 50% of the river network in some Member States would be below ‘good’ status (see Annex 4, [WIND results](#)). However, when considering other sources of P in EU water bodies, urban waste water remains one of the main pressures.

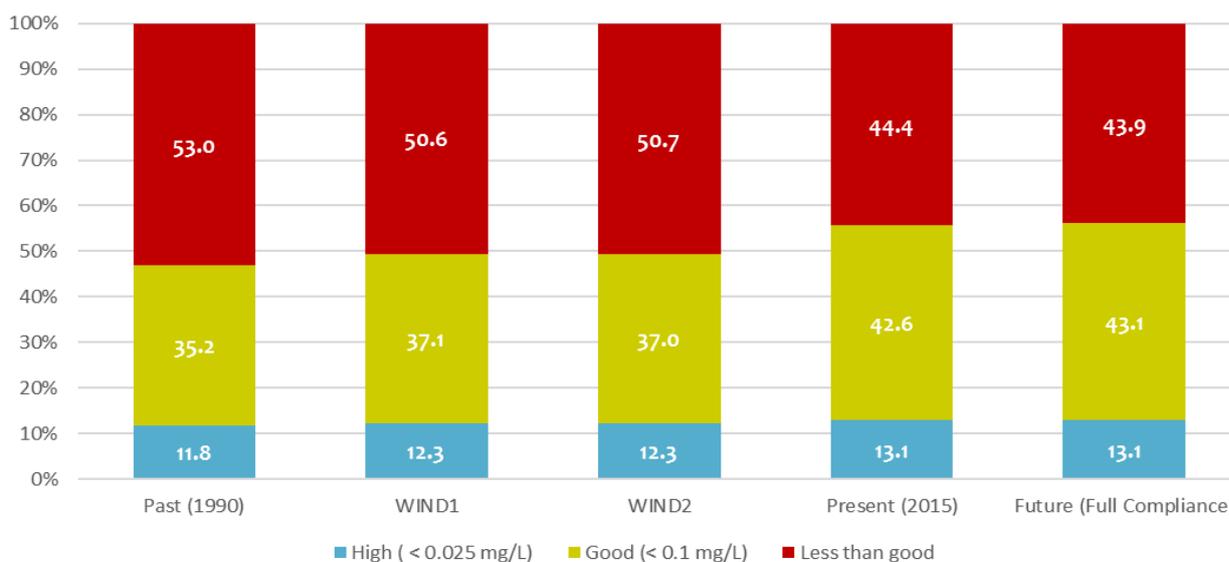


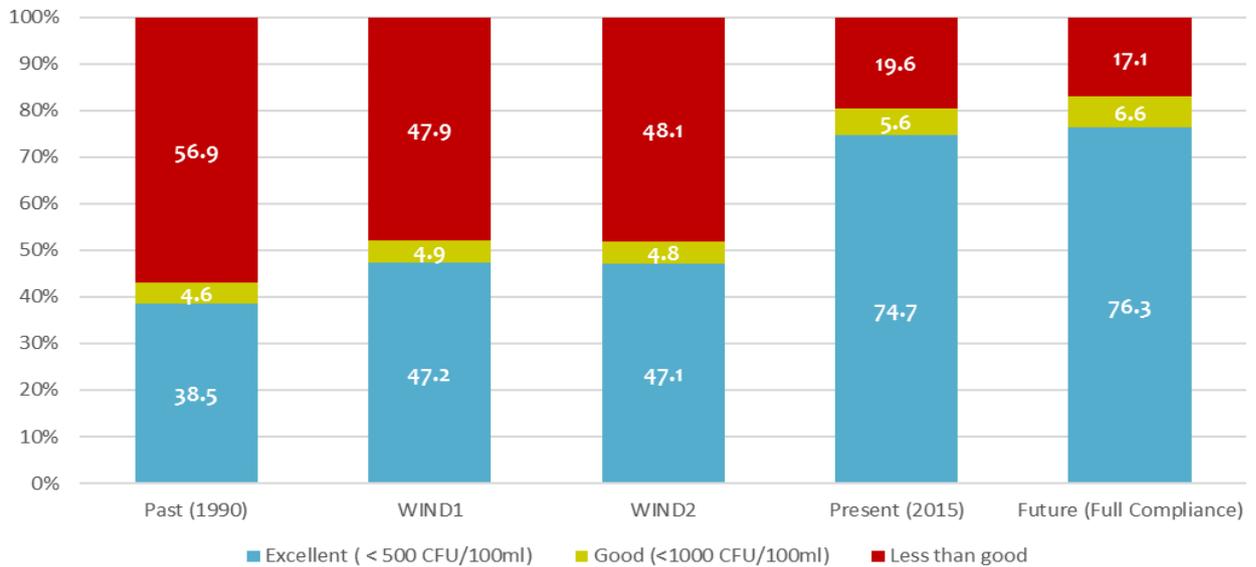
Figure 20 EU-28 river network conditions regarding P quality standards under different scenarios

In the public consultation, 37% of stakeholders held that the UWWTD was very effective in reducing P and 36% held that it was somewhat effective (n=343). Only 1% held that it was very ineffective and 10% considered it neither effective nor ineffective.

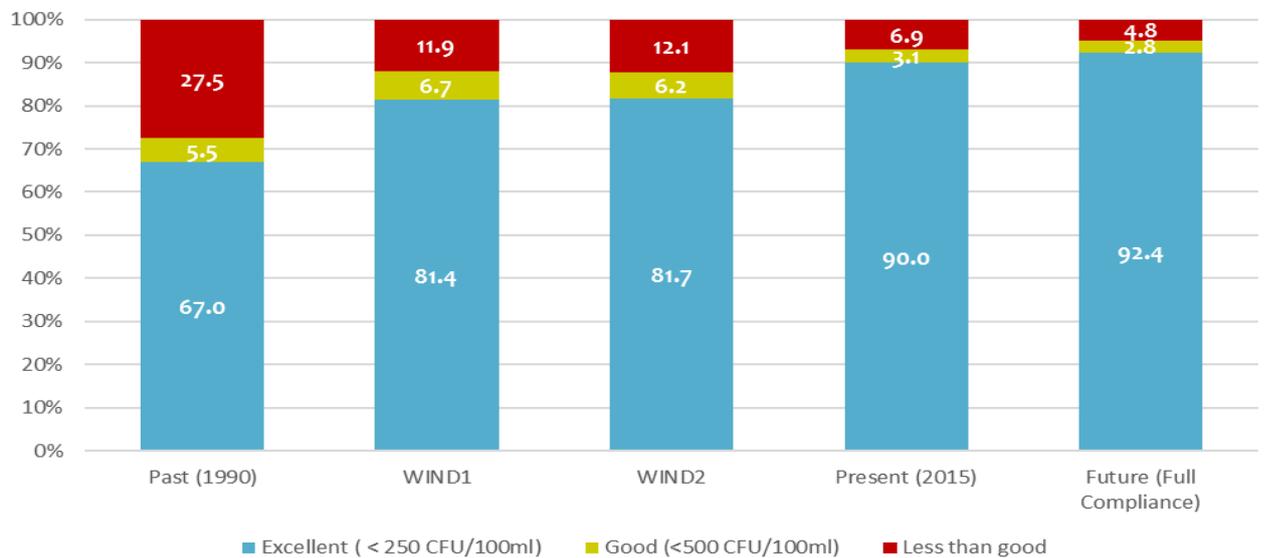
### **Impact of the UWWTD on bathing waters and on chemical concentrations in treated waste water**

The UWWTD’s effectiveness can also be assessed using bathing water quality standards for microbiological pollution. This is related to point (c) of Annex III of the UWWTD, which requires more stringent treatment when this is necessary for the attainment of objectives under other directives – in the case of bathing waters, the BWD. Some Member States have categorised areas as sensitive due to the presence of bathing water

sites, and apply disinfection as the more stringent treatment required (see [coherence](#)). Removal efficiencies for coliforms of primary and secondary treatment are on average 95%. Results show that the UWWTD has had a substantial effect on improving **bathing water sites** in the EU (*Figure 21* and *Figure 22*), in accordance with the BWD's thresholds for inland and coastal bathing sites. Without the impact of the UWWTD, it is estimated that, on average in the EU, more than 25% of improvements would not have been achieved.



*Figure 21 Conditions of EU inland freshwaters as regards bathing water standards under different scenarios.*



*Figure 22 Conditions of European coastlines as regards bathing water standards under different scenarios.*

In 2017, 96% of the EU's designated bathing sites reached the minimum quality requirements of the BWD, with 85% rated 'excellent'. This compares to 80% compliance

for coastal waters and 52% for inland waters in the 1990s<sup>21</sup>. According to the EEA, in the past the release of untreated waste water into the environment was a primary source of pollution. Bathing water quality improved partly due to heavy investment in waste water collection and treatment (EEA, 2018c, EEA, 2019c).

Furthermore, through secondary and more stringent treatment, some **chemicals** (other than N and P), including pharmaceuticals, are partially or entirely removed depending on their behaviour in the process (*Figure 23*)<sup>22</sup>, whereas other chemicals are effectively *not* removed from the influent to the WWTP. A preliminary modelling of chemical removal during the different waste water treatment stages shows that, before adoption of the Directive:

- around 30% of the length of the EU river network was below concentration thresholds that may be assumed to correspond to good conditions in terms of chemical pollution, and
- more than 50% was below a threshold assumed to represent good conditions.

In a scenario where the Directive is fully implemented, these increase to more than 50% and 80%, respectively. Although chemicals have different behaviours and outcomes in WWTPs, this pattern can be observed for most. Thus, the UWWTD has also been effective in removing non-target chemicals. For some chemicals, however, being removed through treatment means that they are transferred to and concentrated in the sludge (for details, see Pistocchi *et al*, 2019).



*Figure 23 Reduction of pollution in the European stream network with the implementation of the UWWTD: metachemical c#3, e.g. estrone (E1), estradiol (E2), bisphenol A (see Pistocchi *et al*, 2019 for details).*

<sup>21</sup> In the 1990s, the predecessor of the current BWD was in place and reporting differed slightly. Member States' compliance with the obligatory values for **coastal bathing waters** was at slightly below 80% in 1990. For EU **inland bathing waters**, compliance with mandatory values was 52% in 1990 (EEA, 2015).

<sup>22</sup> For all metachemicals or Pistocchi *et al*. (*forthcoming*).

## Factors influencing the effectiveness of the UWWTD

The Evaluation results have shown that, in general, the UWWTD is achieving its objectives to help protect the quality of EU water bodies. By doing so it also supports the attainment of the objectives of other EU legislation related to water. Member State reporting under the WFD, however, shows that urban waste water still results in 12% of surface water bodies failing to achieve good ecological status.

In addition, modelling shows that full compliance with the UWWTD could help avoid around 490 000 t/year of **BOD loads** being discharged from non-compliant agglomerations. Additionally, 110 000 t/year of BOD loads from IAS and 210 000 t/year from SWOs could also be avoided. Though not directly covered by the Directive, the requirement to ensure the same treatment levels for loads from small agglomerations and non-connected dwellings would lead to about 230 000 t/year less BOD being discharged. Lastly, 690,000 t/year BOD could be avoided by fully dealing with urban runoff (*Figure 24*).

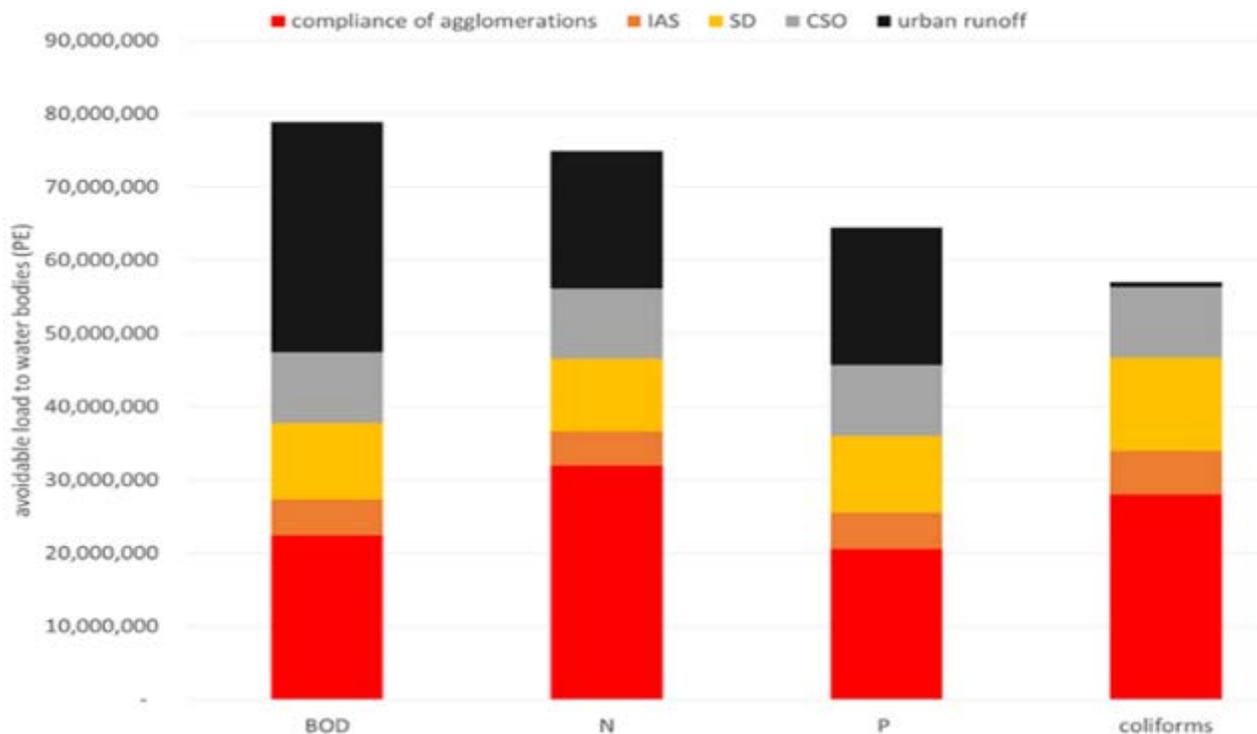


Figure 24 Remaining loads that can be avoided<sup>23</sup> (SD=agglomerations below 2 000 p.e.)

Thus, although the Directive is generally effective in reducing loads and improving water quality, a number of factors reduce its effectiveness. These factors either (i) relate to late or incomplete implementation, (ii) stem directly from the Directive's text, or (iii) arise from issues that are not (directly) in the scope of the Directive.

<sup>23</sup> Meaning: loads that can be avoided by enforcing full compliance with the UWWTD (for agglomerations); an equivalent treatment level (for small agglomerations <2 000 p.e. = SD); full control of CSO (neglecting management measures currently in place); and effective enforcement of IAS treatment equivalent to the WWTP of the corresponding agglomeration. Urban runoff excludes the CSO component.

### *Late implementation: reasons behind late or incomplete compliance*

One of the factors that negatively influence the UWWTD's effectiveness in terms of reducing loads and protecting water quality is that several Member States have not yet fully implemented the Directive. According to *Figure 24*, a high proportion of remaining loads comes from non-compliant agglomerations. This is in line with the findings discussed in the [state of play section](#).

In the early 1990s, the levels of infrastructure in place for waste water collection and treatment varied across the EU-15. When the UWWTD entered into force, it set out standard deadlines by which all Member States had to meet its requirements. Even though over time many Member States reached good implementation levels, some EU-15 and EU-13 Member States still have not fully complied with requirements.

The high number of infringement cases that were opened against Member States, especially based on Articles 3-5, demonstrates the scale of the issue. In total, there were **29** infringement cases related to Articles 3-5 with a final ruling at the time of the Evaluation. Overall, it seems that the **deadlines** initially accepted by the 12 countries that were EU Member States when the UWWTD was adopted and were later included in the successive Accession Treaties were overambitious for several Member States. However, some Member States that joined the EU after 2004 managed to increase compliance very quickly, e.g. EE increased compliance with Article 3 from 30% in 2010 to 94% in 2014, thanks to good use of funding and strong political will. A major underlying factor for delays is financing and this is discussed separately in the section on [financing UWWTD implementation](#).

In some Member States, there also seems to be a **lack of institutional ability and administrative and technical capacity** to implement correctly the Directive, as well as an inability to use funds effectively at local or regional level and to undertake large-scale projects. Furthermore, there are difficulties with planning the implementation of the UWWTD at national, regional and local level across the EU (see box on IT). Problems with public procurement also persist. In addition, some cases indicate that the population forecasting needed to implement the UWWTD correctly (e.g. urbanisation, changing demographics, fluctuations due to tourism) can be difficult and may delay implementation. For instance, in

#### **Challenges for UWWTD implementation in Italy**

Italy has a complex institutional set-up for implementing the UWWTD. Although administrative arrangements and relationships are set in the national legislation, communication and coordination between national and regional or local authorities can be slow. This is crucial, because the Italian regions are responsible for monitoring, managing and protecting water bodies, as well as planning infrastructure and enforcing law. The authorities responsible for water supply and sanitation services in Italy are the AATOs ('Autorità di Ambito Territoriale Ottimale'), which were specifically created to manage integrated water services. AATOs plan the investments necessary and then delegate the management of the integrated water services to a joint-stock company. In principle, the public authorities maintain ownership of the infrastructure, while the integrated water services may be handed over to either publicly-owned operators or privately-owned operators under contract.

RO and SK there are cases of incorrect sizing of WWTPs, where the infrastructure was undersized relative to the generated load of the agglomeration (ECA, 2015).

There are also cases where the efforts and time needed for implementation were underestimated, or where there was a lack of political will to prioritise UWWTD implementation and channel the needed resources into implementation activities. These

sorts of situations can lead to a lack of resources at local level, which is where implementation projects are typically run and where infrastructure is managed. A lack of clarity as to responsibilities between governance levels can lead to sub-optimal or delayed implementation as well. There is also evidence that overall governance difficulties impact the implementation, for instance, BE pleaded in Case [C-236/99](#)<sup>24</sup> where BE pleaded that political and administrative difficulties were emerging from the process of institutional reform which it had to carry out to preserve the unity of the State. Due to these difficulties, the implementation of the Directive was delayed. Another difficulty for implementation at all levels can arise if there is opposition from the public. In EL, for instance, the public was opposed to having the necessary infrastructure installed in Eastern Attica, which led to delays in implementing the Directive in this area. In RO, as well as in a few other Member States such as SK and EL, there are cases where people do not want to connect to existing collection systems as they already have individual systems in place and a connection to the collection system is perceived as a very expensive both one-off and recurrent cost.

In the public consultation, stakeholders confirmed these findings across all categories, identifying similar barriers — lack of funding<sup>25</sup> and lack of political will<sup>26</sup> — as major issues. Almost half of the respondents held that the Directive has not been implemented effectively (one third of these being citizens), with 37% arguing that it was and 21% stating that they do not know (n=341). When considering only WWTP operators and Member State competent authorities, 42% stated that the UWWTD has been implemented correctly. Stakeholders raised concerns about different levels of ambition across regions, varying levels of industry compliance with minimum standards for effluents, unequal application of IAS requirements and the need to address SWOs more consistently.

Overall, these findings are aligned with the overall findings of the 7<sup>th</sup> Environment Action Programme Evaluation, which identified a lack of implementation, investment, information and integration as the main challenges for EU environment policy (EC, 2019b).

In parallel to these underlying factors that hinder or delay implementation, a number of **EU-level drivers** support Member States in implementing the Directive, especially EU funding which helps Member States cover the costs of implementing the UWWTD. EU funding has also led to more integrated regional development, as it required the adoption of WFD RBMPs as a precondition (*ex ante* conditionality) of receiving funding ([Regulation No 1303/2013](#)). Over the three financing periods since 2000, a total of EUR 38.8 billion of cohesion policy funding was allocated to the EU waste water sector (see [financing the UWWTD implementation](#)) (Cowi *et al.*, 2019, p. 62<sup>27</sup>).

Acknowledging the scale of expenditure required to implement the UWWTD successfully, in parallel to the Evaluation the Commission launched a joint study with the

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<sup>24</sup> Judgment of the Court (Sixth Chamber) 6 July 2000 (1) (Failure by a Member State to fulfil its obligations - Failure to transpose Directive 91/271/EEC) in Case C-236/99, Commission of the European Communities v Kingdom of Belgium. Case C-236/99

<sup>25</sup> 85% judged this as a high or moderate barrier, n=77.

<sup>26</sup> 85% judged this as a high or moderate barrier, n=77.

<sup>27</sup> [Cohesion Policy Open Data Portal](#), accessed on 27/11/2019, completed with Cowi *et al.*, (2019) data.

OECD on investment needs and financing options in the EU water sector. This includes comparative assessments of Member States' investment needs and targeted Member State workshops to discuss future financing options. Aside from this study, the Commission also carries out a number of other **compliance promotion activities**. It has set up a UWWTD expert group, which typically meets at least once every two years to discuss the results of the latest reporting exercise, as well as findings from other relevant studies. It also participates in meetings with candidate/accession countries to prepare for UWWTD implementation. Additionally, the Commission carries out UWWTD-related studies to investigate specific issues (e.g. the COD requirement and the use of IAS), publishes guidance (EC, 2001) and supports research in the waste water area through its cohesion policy funds, the LIFE programme and the Horizon 2020 financing mechanism.

Other compliance promotion programmes include technical assistance through [JASPERS](#) and the TAEIX REGIO Peer 2 Peer and [TAIEX EIR Peer 2 Peer](#) programmes. These programmes are demand-based and give Member States an opportunity to exchange experiences and learn from each other. In addition, the Commission can provide structural assistance through the [Structural Reform Support Service](#). For instance, in 2018 the Scottish Water Industry Commission worked with the Romanian regulator through this service to analyse inefficiencies in the water sector and develop ideas for improvement.

Aside from funding, infringement procedures were also identified as an effective way to increase implementation levels. Active legal enforcement is a tool that the Commission uses to foster compliance with the UWWTD. Overall, more than 40 CJEU rulings were issued by June 2018 (*Table 5*) and this does not include infringement cases that were closed before reaching the Court. Infringements can lead to penalties, which in the past have ranged between EUR 2 million and EUR 25 million for lump sum fines and between EUR 2 800 and EUR 8 000 for each day of delay. Infringement procedures are generally rather slow, but they do drive Member States to gradually become fully compliant.

Member States	Infringement cases per time period with final					
	1991 - 2000	2000 - 2005	2005 - 2010	2010 - 2015	2015 - 2018	Total: 1991 - 2018
EL	1	2	1	1	0	5
ES	1	4	0	0	0	5
IT	2	1	2	0	0	5
PT	0	2	2	0	0	4
FR	1	2	1	0	0	4
UK	1	2	0	1	0	4
BE	2	0	1	0	0	3
LU	0	1	0	0	0	1
IE	0	1	0	0	0	1

FI	0	1	0	0	0	1
SE	0	1	0	0	0	1
DE	1	0	0	0	0	1
Total number of infringements cases with final ruling	9	17	7	2	0	35
Total number of referred agglomerations in the final judgments of the CJEU	168	129	255	17	0	569

*Table 5 Number of Art. 258 infringement cases per Member State with a final ruling by the CJEU between 1991 and 2018. NL, DK and AT had no infringement case.*

### *Financing UWWTD implementation*

The assessment of late implementation indicated that Member States' difficulties with financing UWWTD implementation were a major cause of implementation delays. The UWWTD does not prescribe how Member States should organise their water supply and waste water sector, and Member States use different models of governance. The management models used most often are public- and delegated private management. In the first case management remains in the hands of the public and, in the latter, the public entity contracts a private company to manage operations. The infrastructure is almost always owned by public authorities (EurEau, 2018). The UWWTD also does not prescribe how Member States should finance infrastructure and the operation and maintenance of collection systems and WWTPs. However, both the TFEU and the WFD do provide indications on how water services should be financed. Article 191(2) TFEU states that 'environmental damage should as a priority be rectified at source and that the polluter should pay'. Article 9 of the WFD, under which the UWWTD is a 'basic measure', requires that Member States ensure that *adequate* contributions are received from the different water uses. This is meant to recover costs of water services based on economic analyses and by taking into account the 'polluter pays' principle. When choosing their approach, Member States should consider possible social, economic and environmental effects.

In terms of **financing**, the OECD's analysis shows that Member States use a mix of public budget and water tariffs to finance their water supply and waste water sectors (*Figure 25*). Some Member States manage to almost entirely finance their water supply and waste water sector through revenues from water tariffs (e.g. DK, UK). Others like IE, CY and LU are heavily relying on budget transfers.

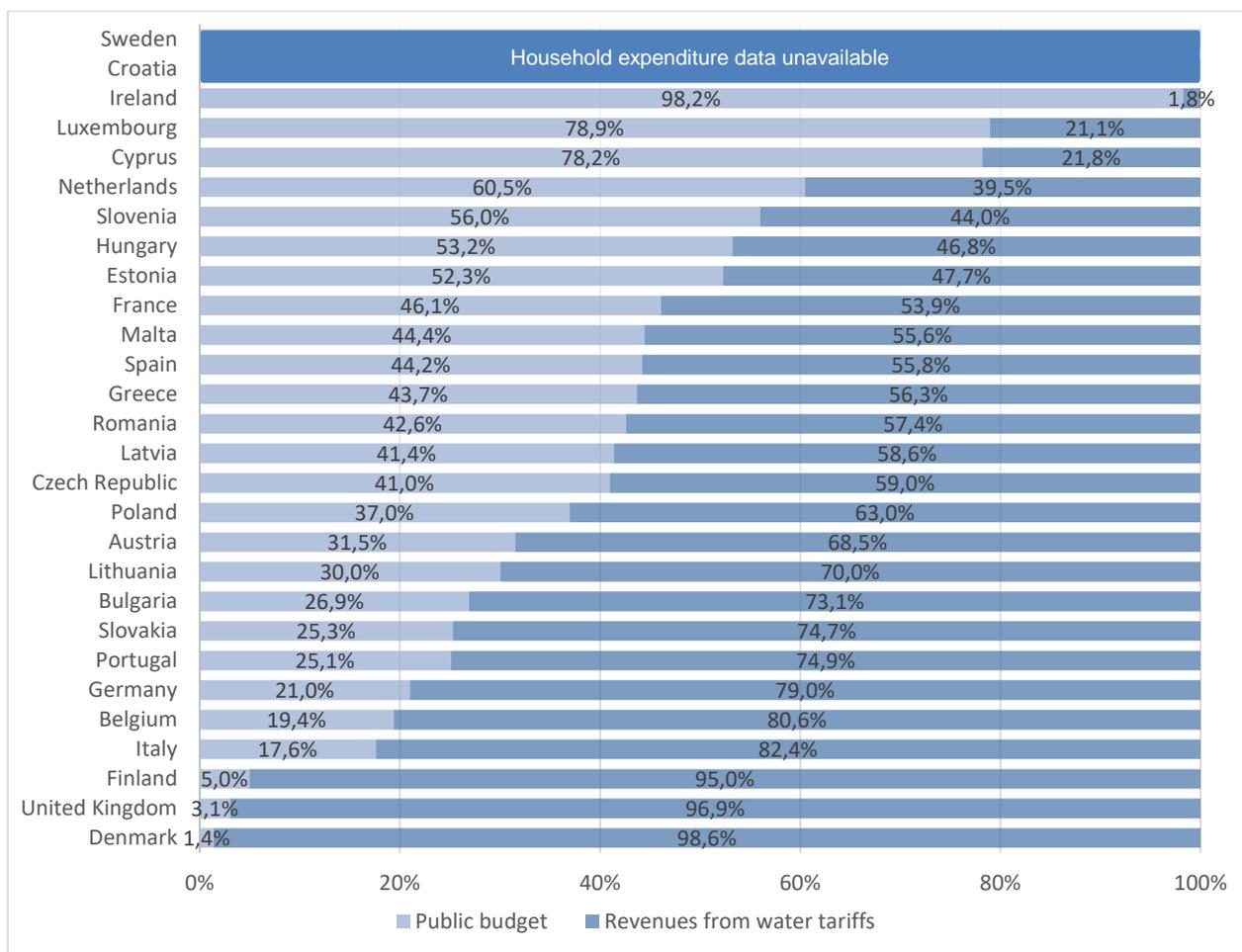


Figure 25 Sources of funding for water supply and sanitation services per Member State as annual average over the 2011-2015 period<sup>28</sup>. Source: OECD (forthcoming – draft findings)

A number of Member States have struggled to meet the investment requirements related to UWWTD implementation. For instance, Case [C-293/05](#)<sup>29</sup> IT pleaded that substantial funds are needed to construct the infrastructure needed and that this was the reason for delayed implementation. The Court rejected this argument. Budgetary constraints were also raised by BE as an argument for delayed implementation.

In terms of future investment needs, the OECD assessed the total additional expenditure that each Member States needs to spend to reach compliance. As shown in *Figure 26*, IT, ES and RO, but also PL, BG, PT, SK and HR need to increase their expenditure to reach compliance.

<sup>28</sup> The OECD notes that it is likely that there is an overestimate of supply-related expenditure (and a corresponding underestimate of sanitation) in countries where waste-water-related charges are included in the water bill.

<sup>29</sup> Judgment of the Court (Sixth Chamber) of 30 November 2006. Commission of the European Communities v Italian Republic. Failure of a Member State to fulfil obligations - Directive 91/271/EEC - Pollution and nuisance - Urban waste-water treatment - Province of Varese. Case C-293/05.

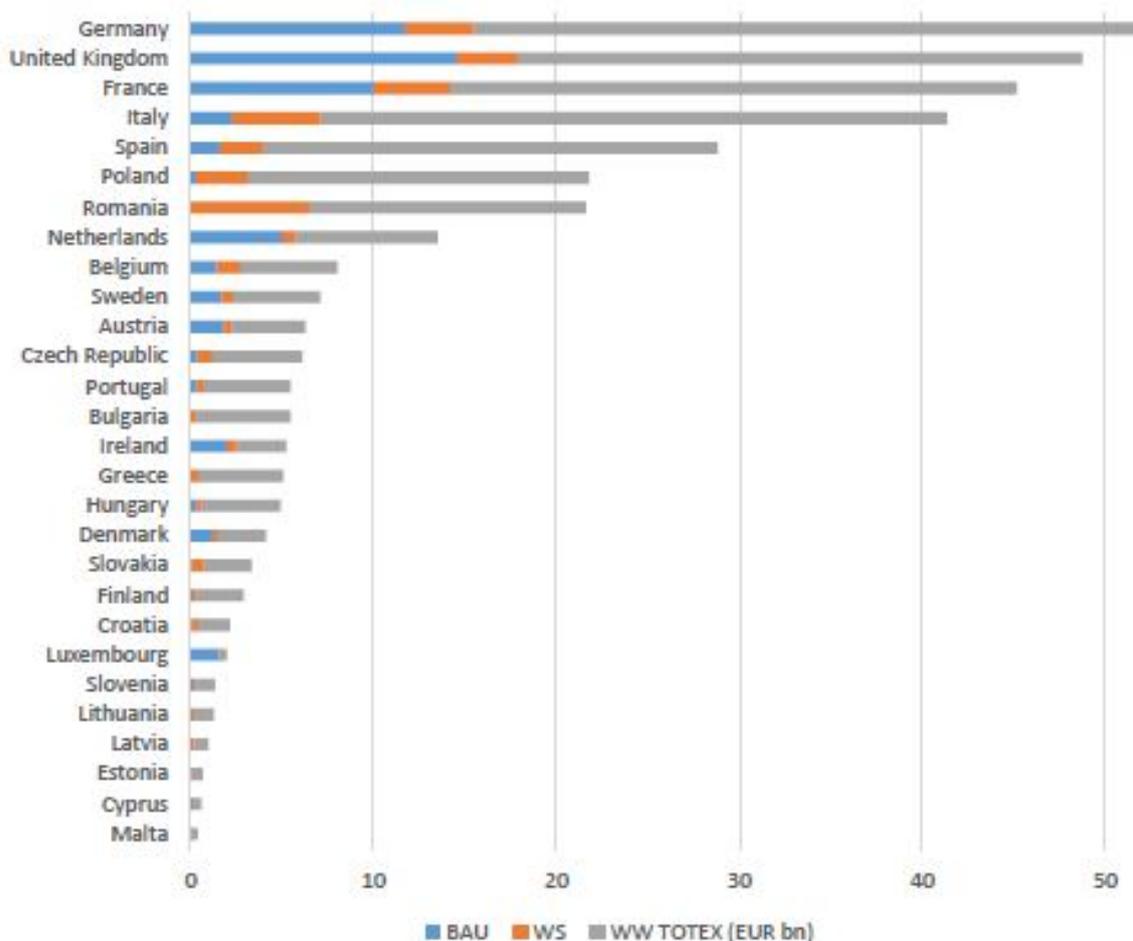


Figure 26 Total additional expenditures to 2030: Business-as-usual (BAU) + Compliance + Efficiency. Source: OECD (forthcoming – draft findings)<sup>30</sup>.

At EU aggregate level, to reach full compliance with the UWWTD, a further EUR 253 billion would need to be spent between now and 2030.<sup>31</sup> The additional expenditure needed to comply with the revised DWD (and to provide more access to water and improve system efficiency) and the UWWTD can be broken down by Member State. Figure 27 shows that, apart from DE, all EU Member States need to increase their spending by more than 25% compared to what is currently being spent (baseline level). Some Member States need to spend more than double what they currently spend (e.g. RO).

<sup>30</sup> Although the methodology for these estimates is considered to be stable and findings have been shared with Member States and experts, further efforts will be made to further fine-tune the assessment. This might lead to changes to the projected investment needs in a few countries, but the order of magnitude will remain the same. Overall, it is assumed that the investment needs for the waste water sector are underestimated due to shortcomings in the baseline.

<sup>31</sup> This is an estimate, see OECD (forthcoming) for details.

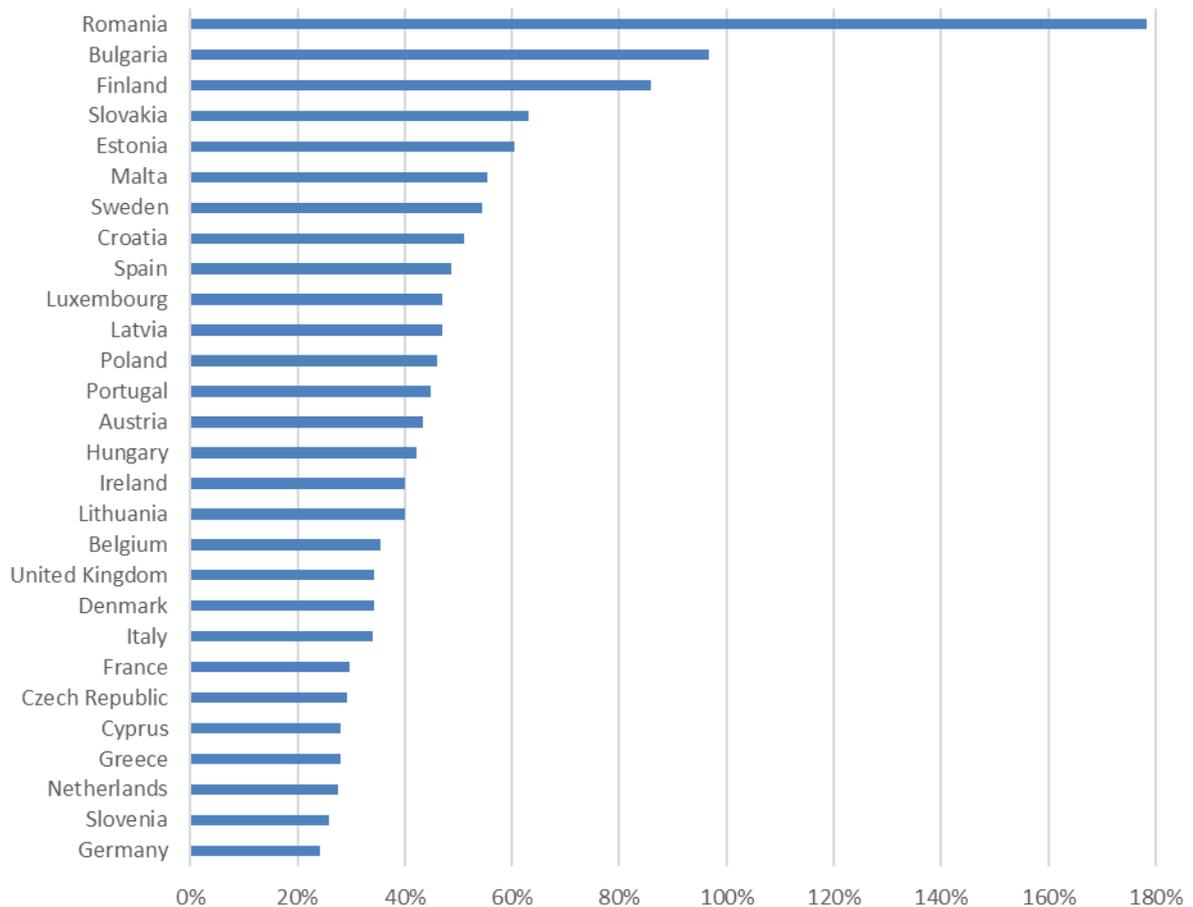


Figure 27 Annual additional expenditure needed by 2030 per Member State, as a percentage compared to the baseline expenditure level.

Member States have to not only *achieve* compliance with the UWWTD, they also have to maintain it. The patchy information on **investment in infrastructure renewal** shows that Member States are potentially not spending enough to ensure continuous compliance. According to the EU water industry association EurEau, given that collection systems can last for several decades, an annual renewal rate of 1% could be acceptable. However, this level is not met in many countries. In many Member States, water tariffs cover only operational costs and not the amortisation of infrastructure or renewal (EurEau, 2017)<sup>32</sup>.

Under WFD reporting, there is no overview of how cost recovery is applied across the water sectors of the 28 EU Member States. In its 2<sup>nd</sup> RBMP assessment, the Commission noted that Member States have improved their general water pricing policies by fulfilling the precondition for receiving funding for water under the European Structural and Investment Funds for 2014-2020 (EC, 2019c). There is no evidence of different cost recovery strategies having a major effect on the internal market. Generally, in the cost structure of European industries, the cost of water is relatively modest compared to that of raw materials, energy and wages.

<sup>32</sup> The OECD noted that many of the OECD countries need to replace their ageing water infrastructure (OECD, 2009)

A mix of tariffs, taxes, and EU funding can be used to meet the investment needs required to achieve UWWTD compliance. This is supported by Article 9 of the WFD, which requires ‘adequate contribution of the different water uses...to the recovery of water services’. The ‘**polluter pays**’ principle should be respected as regards waste water, and so households and industry, as the primary polluters, are usually charged to a certain extent. The structure of water tariffs applied to **households** varies between Member States, though often contains one fixed and one volumetric component. The actual price is often set at local level, whereas the tariff structure is often decided at national level (EurEau 2018).

**Industrial dischargers** are usually required to acquire installation permits if they release their waste waters in the urban waste water collection system. These are issued either under the IED for bigger industries or at local level for smaller activities. Permits usually require industrial dischargers to contribute financially to the treatment of their releases in WWTPs. Sometimes they pay based on their own assessment of what is contained in their waste water, which might not reflect the true level of pollution they cause. In other instances, regular sampling reflecting the actual pollution emitted is taken, and is verified by the local competent authorities.

The **affordability of water supply and waste water services** to households in Member States can be assessed by dividing the total costs by the number of households in the individual Member States and comparing this to their disposable income. There is no one generally agreed level of how much a household should be able to spend on water services. The results of the OECD study show that, at current levels of water service charges, only RO’s and BG’s lowest income households deviate from the average (*Figure 28*)<sup>33</sup>. Affordability issues are usually solved at national/local level, notably by introducing social tariffs, social quotas or other specific support (not covered by the OECD’s work).

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<sup>33</sup> The Commission considers a 4% affordability level as indicative, and the adequate ratio is to be set by Member States. Source: Commission reply 5(a) (European Court of Auditors (2015, Special report no 23/2015.) See also CIS Guidance Document 20 on exemptions to the environmental objectives.

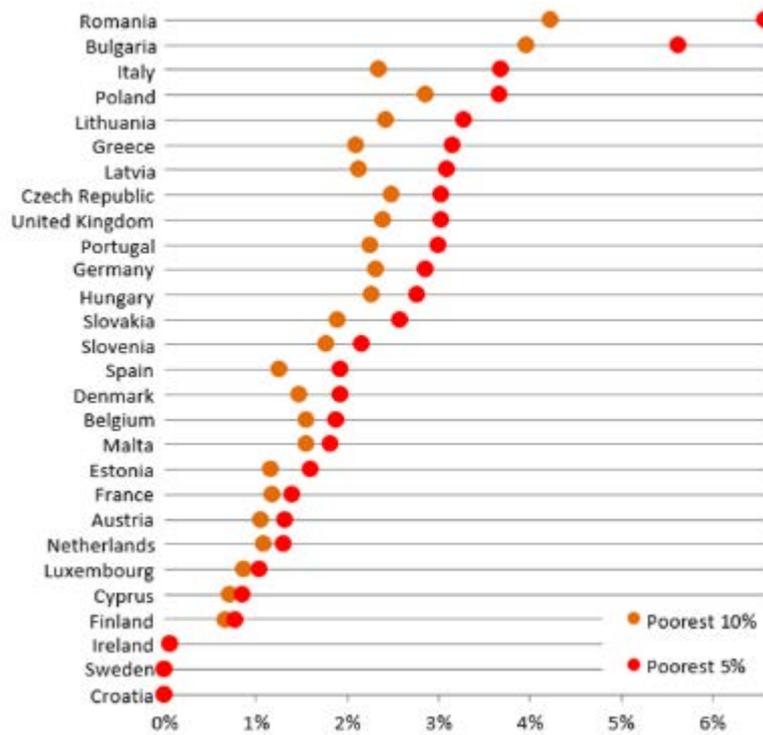


Figure 28 Proportion of water supply and waste water service expenditure in household disposable income (2011-2015 average). Source: OECD (forthcoming – draft findings).

Increasing water tariffs is often unpopular with the public, which can cause politicians, especially at local level, to keep water prices artificially low, though this is also often done to protect lower income households. In IT, the issue of potentially raising water prices not only led to constant political debates but also to the organisation of a referendum in 2011. The referendum rejected the proposed reforms related to the water sector. The required investment was estimated at EUR 61/capita/year, but the actual investment made was EUR 33/capita/year.

In terms of financing the water sector, affordability constraints can keep some Member States from making further progress, especially when expenditure related to waste water and the water supply sector is already a significant part of their GDP (Figure 29).

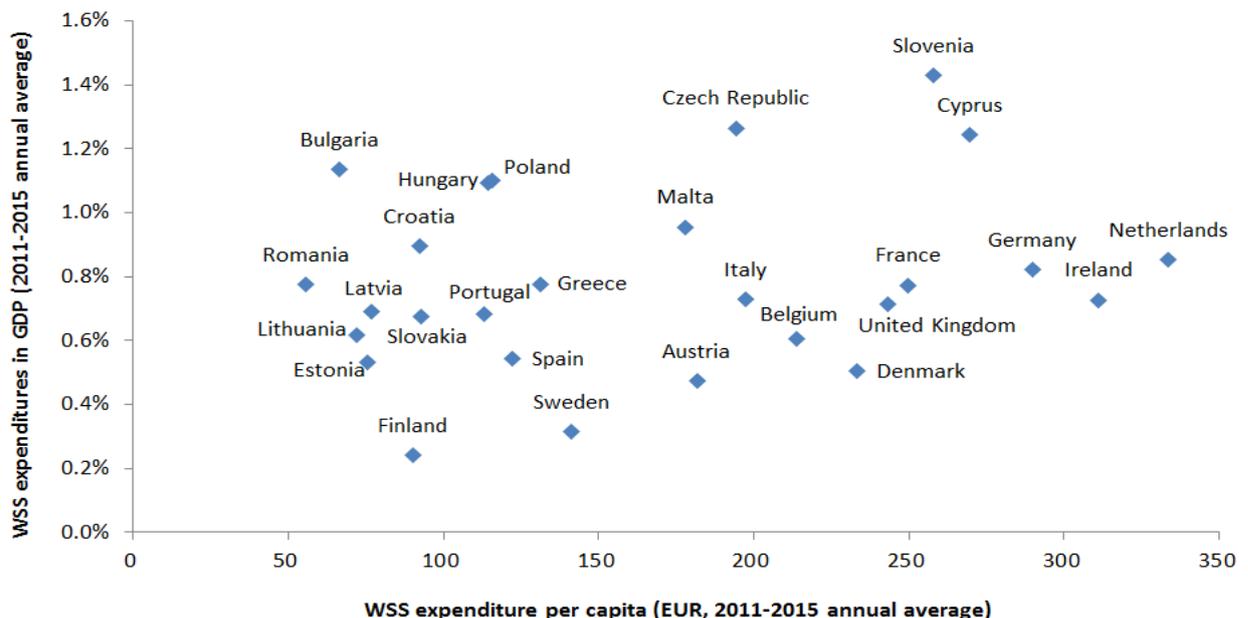


Figure 29 Macroeconomic affordability of water supply and waste water collection and treatment (WSS) in EU Member States. Source: OECD (forthcoming – draft findings).

Overall, Member States have flexibility in how to ensure sustainable financing of their water supply and waste water sector. Some rely too heavily on EU funding and need to ensure that their water sector will be financially stable when EU funding decreases. Others use high amounts of public budget transfers (which can include EU funding) and should consider increasing water tariffs, where possible, to ensure that compliance can be maintained over time.

Of the 300 replies to the public consultation question on the UWWTD's impact on the affordability of water services, only 37% indicated that it had a negative impact (with about 16% having no opinion or no answer). These 37% of respondents were mostly members of the public and public- and private WWTP operators. Over 244 replies to this question from members of the public, NGOs and water companies stressed that industry or other main polluters should pay for the needed treatment, referring to the 'polluter pays' principle.

The costs of implementing the Directive have been met with substantial **funding from the EU**. Over the past three financing periods, most environmental EU funding has been allocated to the water sector. Cohesion Policy allocations for the water sector added up to EUR 57.7 billion: on EU aggregated level, EUR 20.7 billion in 2000-2006, EUR 21.5 billion in 2007-2013 and EUR 15.5 billion in 2014-2020<sup>34</sup> were allocated to the water sector (Cowi *et al.*, 2019). In the 2007-2013 period, this contributed to about 7 million people in the EU being newly connected to or having improved waste water services. The decline in allocations is explained by the fact that some Member States (e.g. EE) have now met their basic needs by completing the infrastructure, and by the fact that the Commission considered that in the 2014-2020 period EU funding for basic environmental infrastructure should be focused on less developed regions (*ibid.*). Over the past three periods, Member States invested the lion's share into the waste water sector compared to the drinking water sector, with the waste water sector receiving EUR 38.8 billion of the EUR 57.7 billion. Over all periods, Cohesion Policy funded more than 50% of all water sector-related<sup>35</sup> expenditures in EE, LV and HU. EU investments funded more than 35% of all expenditures in LT, BG, MT, RO, PT and SK (*ibid.*). At the aggregated EU level, Member States covered about 25% of the total expenditure with EU funds.

Besides cohesion policy funding for direct investment in the water sector, EU funds (including cohesion policy funds, Horizon 2020 and LIFE funds) also supported research in the EU water sector. Between 2000 and 2017, the EU financed a total of 138 LIFE projects related to waste water treatment (EC, 2019d).

To summarise the discussion above, there are a number of financial and management issues when it comes to the economic aspects of implementing the UWWTD. **Financial issues** related to UWWTD implementation include the following: 1) full cost recovery

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<sup>34</sup> Retrieved from [Cohesion Policy Open Data Portal](#) on 27/11/2019.

<sup>35</sup> COWI *et al.* (2017) explain that the water management related Directives (UWWTD and DWD) are the most cost intensive ones, but in the assessment it cannot always be factored out that a project was only linked to one of these Directives, it could also be linked simultaneously to the WFD (p. 56). Thus, comparisons between the OECD's work and the COWI *et al.* study are only possible to a limited extent.

can in some Member States be constrained by affordability, 2) Member States' economic situation and their ability to use loans, 3) national co-funding when EU funding is being used, and 4) financing sources are not sufficient for the maintenance of infrastructure. **Management** and associated issues mainly relate to 1) Member States' ability to use funds effectively, 2) the lack of financial sustainability of investments in infrastructure, 3) issues with national procurement law, and 4) the possible lack of (technically and financially) competent contractors.

### ***Terms and obligations in the UWWTD***

The Evaluation also assessed the clarity of the Directive's terms and obligations. If terms and obligations are unclear, this can lead to delayed implementation or reduce the effectiveness of the Directive. Overall, the Directive was found to be clear and straightforward in its intervention logic and enforceability. It sets out clear actions to be taken by Member States and clear deadlines for when these have to be accomplished. This clarity has supported the Directive's correct and timely implementation and its effectiveness.

Stakeholder respondents to the public consultation confirmed that the Directive is clearly drafted to a large (22%) or to some extent (66%) (n=301). Only 4% of respondents replied that the Directive is not clearly drafted and 8% indicated that they do not know.

Nevertheless, a few terms and obligations have been identified as not entirely clear. This has been noted by stakeholders, as well as through cases where the CJEU had to intervene or where further clarification through exchanges between Member States and Commission had to be sought. Such unclear terms include for instance 'storm water overflows', 'unusual situations' and 'sufficiently concentrated' in connection with 'agglomerations' (see [storm water overflows](#) and [IAS](#), and Annex 4, [terminology](#)) and the obligations related to these. Although not mentioned in the UWWTD, the term 'tertiary treatment' was also often mentioned by stakeholders as unclear.

Aside from these specific terms, the requirements on water reuse and sludge reuse were also found to be unclear, with plenty of room for interpretation of the meaning of 'whenever appropriate' as well as lack of clarity on which requirements apply if water and sludge were to be reused and for which purposes they may be reused. The questions related to water reuse have been clarified through the Commission's proposal for a regulation on water reuse (EC, 2019d).

The main terms discussed in the Evaluation to assess impact on the UWWTD's effectiveness are 'storm water overflows', 'urban runoff', IAS, 'scattered dwellings' and eutrophication. As shown in *Figure 24*, IAS and SWOs are estimated to be a sizeable contributor to remaining loads that could be avoided.

### ***Storm water overflows (SWOs) and urban runoff***

Next to non-compliant agglomerations, storm water overflows (SWOs) and urban runoff account for a significant proportion of the BOD load. This could be avoided through full control of SWOs<sup>36</sup> (*Figure 23*). The UWWTD only includes a footnote on SWOs, stating that "...during situations such as unusually heavy rainfall, Member States shall decide on measures to limit pollution from storm water overflows. Such measures could be

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<sup>36</sup> In the SWO workshop on 25 October 2018, it was clarified that this means combined sewer overflows.

based on dilution rates or capacity in relation to dry weather flow or could specify a certain acceptable number of overflows per year.” The Directive does not define what constitutes ‘unusually heavy rainfall’ or an ‘acceptable number of overflows per year’. It also does not require the monitoring of overflows. **Other Directives**, such as the WFD, BWD and MSFD, do not address SWOs directly either, even though their objectives can be affected by SWOs. However, as these Directives set quality standards for water bodies and require water quality monitoring, measures addressing SWOs can be taken under them. In recent cases, the Court held twice that as ‘unusually heavy rainfall’ is not defined in the Directive, “it is legitimate for the Commission... to adopt guidelines” (para. 61) ([Case C-310/10](#)<sup>37</sup>, see also: [Case C-427/17](#)<sup>38</sup>).

There are discharges from SWOs in cases of heavy rainfall events, when urban runoff enters the combined system and when the downstream collecting system does not have the capacity to convey all flows, domestic waste water and the urban runoff, to treatment. Urban runoff entering the sewer can carry several pollutants, such as heavy metals, hydrocarbons, urban pesticides and litter (including microplastics), from a variety of urban diffuse sources (e.g. pollution in streets and public places). The **first flush** is often (not always) more contaminated than later parts (Gupta, K & Saul, A., 1996; Barco et al., 2008). These overflows ensure that sensitive environments, public places and property are protected from flooding and that WWTPs are not overloaded during events during which the system’s normal operating system capacity is exceeded. Overloading can lead to their poor functioning and severe environmental risks.

According to information reported under the 2<sup>nd</sup> round of RBMPs, SWOs were the cause of 4% of the EU’s surface water bodies failing to achieve good ecological status (*Figure 3*) (EEA, 2018b). Modelling demonstrates that a significant proportion of the remaining load, which could be avoided, comes from SWOs, though it assumes that these are not addressed adequately at the moment (*Figure 30 above*). Modelling results show that, under assumed full compliance with the UWWTD, SWOs can contribute to 50% or more of the remaining load in some Member States where there are no management measures in place. Where SWO management measures *are* in place, loads can be substantially reduced (*Figure 30 below*). Still, the aggregated loads from SWOs in one region can be equivalent to those of an entire agglomeration of tens or hundreds of thousand p.e. The pollutants for which SWOs represent a potentially significant share of the total load to the environment are those that are usually well removed in WWTPs (coliforms, BOD, to some extent P and certain chemicals) (see Annex 4, [storm water overflows](#)). More frequent heavy rainfall events under a changing climate will further aggravate this issue.

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<sup>37</sup> Judgment of the Court (First Chamber), 18 October 2012, European Commission v United Kingdom of Great Britain and Northern Ireland, Failure of a Member State to fulfil obligations – Pollution and nuisance – Urban waste water treatment – Directive 91/271/EEC – Articles 3, 4 and 10 – Annex I(A) and (B), Case C-301/10.

<sup>38</sup> Judgment of the Court (Tenth Chamber) of 28 March 2019 European Commission v Ireland; Failure of a Member State to fulfil obligations — Directive 91/271/EEC — Collection and treatment of urban waste water — Exceptional circumstances — Best technical knowledge not entailing excessive costs — Principle that the costs should be proportionate — Burden of proof — Means of proof; Case C-427/17.

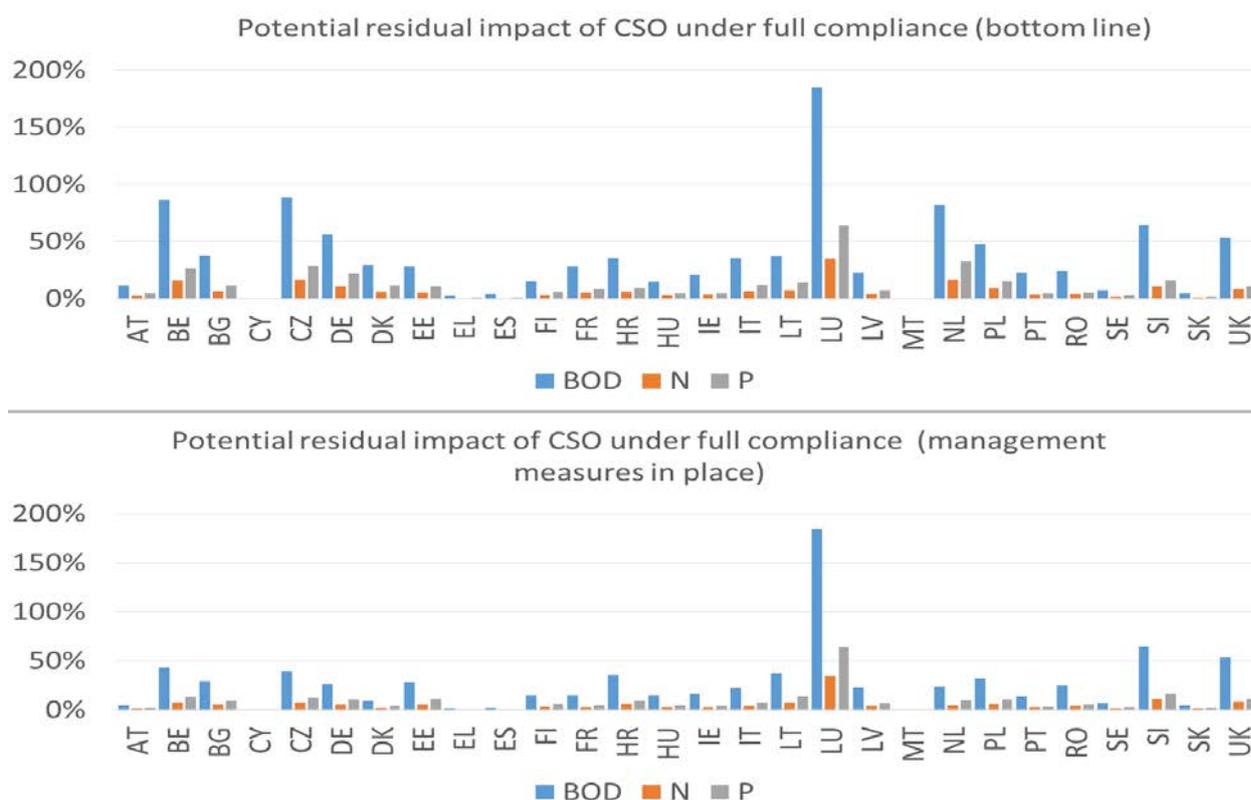


Figure 30 Modelled loads related to SWO as a percentage of the load generated from WWTPs in the EU-28.

These modelled estimates are developed at such a scale that they do not reflect the impact of SWOs at a local level. In its recent report on chemicals in European waters, the EEA identified overflows as the main pressure for a number of chemicals such as nonylphenol, metals, hexachlorocyclohexane and to a lesser extent for some herbicides. However, the EEA acknowledges that an assessment of the different sources and pathways for chemicals is difficult due to a lack of reported data (EEA, 2018f).

Member States have taken a number of measures to address SWOs. For instance, in England and Wales ‘event duration monitoring’ is used to determine event frequency and duration. In AT, international design practices such as mass balances are used to simulate the consequences of heavy rainfall events; where results show that WWTPs do not have the capacity to adequately deal with flows, the upstream collecting system is upgraded. ES has determined that SWO discharges need to be limited to 15-20 occurrences or to 10-15% of the yearly runoff volume. In DE, use is made of constructed wetlands that can retain peak flows, reduce suspended solids by filtration and reduce soluble particles through adsorption and biological degradation.

At ‘big city’ level, **Copenhagen** adopted a cost-effective approach to deal with flows that did not focus on upgrading the upstream collecting system. This integrated approach includes rainwater-harvesting systems, urban green spaces that can be infiltrated by storm water, special rooftops and diversion of rainwater into streets that can serve as channels. In **Rotterdam**, a full-scale water square that can retain up to 2 000 m<sup>3</sup> of rainwater was built and can be used for leisure activities in dry weather conditions (Urban Water Atlas, 2018).

From a **monitoring perspective**, new technologies to deal with SWOs include real time control (RTC) of collecting systems to maximise combined sewage retention during rainfall events and minimise discharges going directly to receiving waters, by regulating

flows. RTC systems often integrate a high number of data sources such as weather and water gauge measurements, data from surveillance cameras, and detailed hydraulic and water quality models, based on asset information.

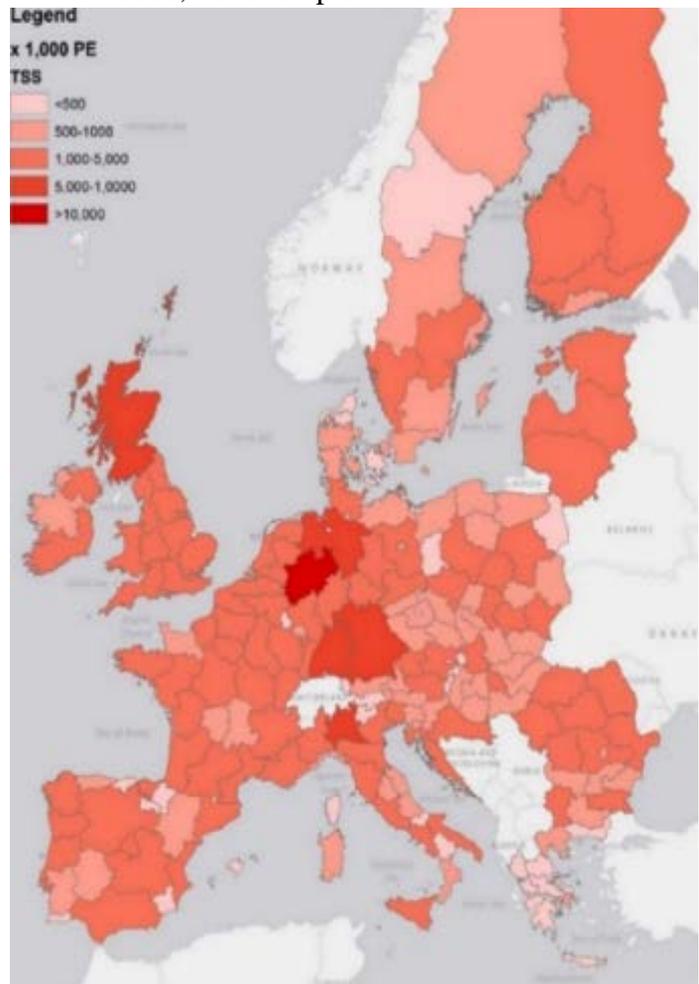
Stakeholders representing Member States and industry raised the issue of the Directive's lack of clarity regarding SWOs during the public consultation, the dedicated SWO workshop and the major stakeholder conference. As an example, the lack of an EU-wide definition for 'spill' – meaning duration, volume etc. – was frequently mentioned during the workshop.

'Urban stormwater is **one of the biggest problems** facing city infrastructure waterways today. Urban cloudbursts and the resulting rapid stormwaters that overflow along surfaces and in networks are more and more common in cities due to climate change, increasingly impervious surface areas, aging infrastructure and often undersized, centralised stormwater networks.'

[Urban Water Atlas](#) (2018), p.26

When urban runoff does not enter the sewer, it may directly enter water bodies. According to *Figure 24*, under full implementation of the UWWTD, **urban runoff** is the main avoidable source of BOD loads. The WFD does not contain a specific requirement for dealing with urban runoff, but Member States should put in place appropriate measures if they identify it as a pressure. This includes, for example: if runoff contains priority substances at levels that could result in failure to meet the environmental quality standards set for surface waters under the EQSD; if it contains priority hazardous substances whose emission to the aquatic environment should be phased out, or; if it results in the discharge of significant quantities of other pollutants that individual Member States should identify as river basin specific pollutants (EC, 2019f).

Urban runoff causes failure of 3% of the surface water bodies in the EU to meet good ecological status according to information reported under the 2<sup>nd</sup> RBMPs (EEA, 2018). When untreated, the associated loads can be equivalent to or even higher than those of waste water from WWTPs. For instance, total suspended solids (TSS) in urban runoff can correspond to several million p.e. across the EU (*Figure 31*) (Grizzetti *et al*, 2017). In the absence of a holistic approach to cover urban water management, these kinds of loads might in the future represent a more substantial problem than waste water, especially in light of increasing numbers of heavy rainfall events in times of climate change and increasingly more impervious surfaces that do not allow the soil to absorb rain water (EEA, 2017).



*Figure 31 Urban runoff loads in terms of total suspended solids*

Urban sources as well as agricultural runoff entering sewers were named as important sources of pollution to water bodies by 45% and 74% of the public consultation respondents respectively (n=608). Only 2% and 0.2% respectively believe that these sources are not relevant, and 16% did not provide an answer. Authorities, water industry and NGOs were more likely to state that this is an important source than citizens.

### *Individual and other appropriate systems (IAS)*

IAS are considered to be another source of pollution, as shown in *Figure 24*. To understand whether the Directive leads to effective collection and treatment of waste water, the Evaluation assessed its provisions on IAS used in agglomerations above 2 000 p.e.<sup>39</sup> Article 3(1) allows Member States to use these systems as long as they ensure the same level of environmental protection as a collection system and treatment would, and if collection systems would lead to excessive costs or would not provide environmental benefits. In general, IAS are a useful alternative when, for example, collection systems cannot be built for geographic reasons. The UWWTD does not set out the extent to which IAS can be used; it is up to Member States to decide whether the conditions specified in Article 3(1) are met. Member States must report on how much of the waste water load is collected by IAS, but there is no specific UWWTD provision that obliges them to ensure monitoring of the resulting effluent or environmental impacts.

The Directive does not define what kind of IAS technologies are adequate. ‘IAS’ is a catch-all term in the Directive and can cover all kinds of technological solutions. The [2007 terms and definitions of the UWWTD](#) only require that these are contained systems that are impervious, not subject to overflow and that are regularly emptied meet UWWTD requirements. Although the 2007 guidance document discusses the use of IAS (UWWTD-rep group, 2007), implementation reports and stakeholder feedback show that there is a lack of clarity and common understanding of how to correctly implement the IAS provisions.

One recurring issue in this context is that, although the UWWTD provides a definition of the term ‘agglomeration’ (an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to a WWTP), there is a lack of clarity on how to actually delineate an agglomeration. Neither the UWWTD nor the 2007 guidance explicitly define what constitutes the ‘sufficiently concentrated areas’ mentioned in Article 2(4). Member States have used their own national ways to delineate agglomerations and decide which areas could be served by collecting systems and which areas would need to apply IAS. Furthermore, it is not further explained in the UWWTD or the guidance what ‘excessive’ costs are. The ECA remarked that the requirements regarding the use of IAS and ensuring that IAS achieve the same level of protection are vague (ECA, 2015, 2016). In consequence, the Commission has developed a new, more systematic legal approach to verifying IAS compliance, by checking the legal frameworks in Member States to make sure that they

#### **ISO standards for IAS**

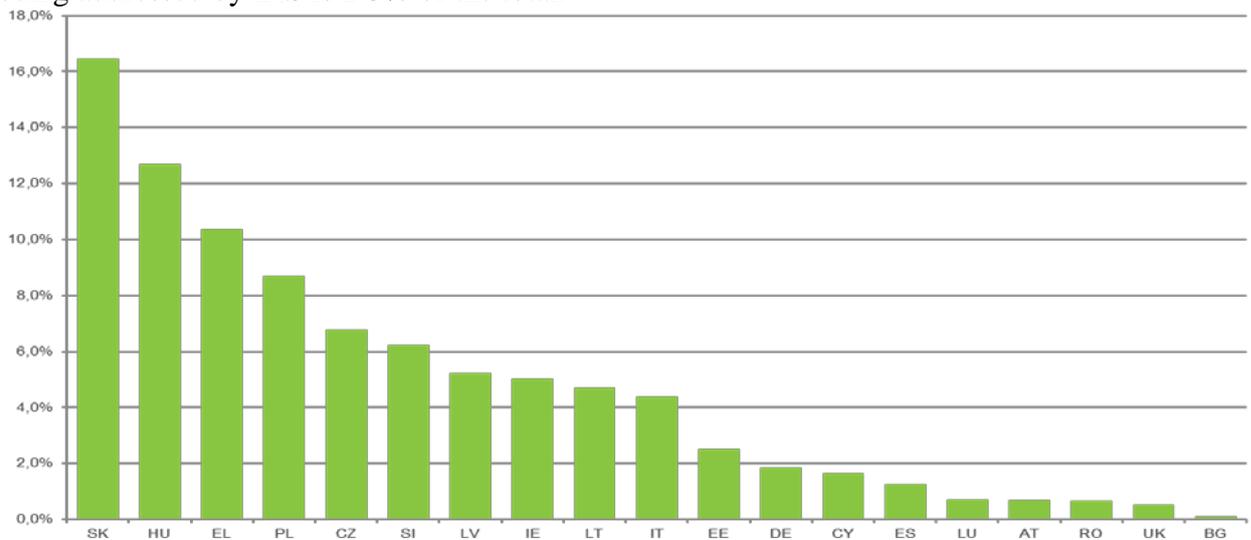
At technical level, the ISO EN 12566 standard prescribes rules for IAS used for up to 50 inhabitants. A few Member States adopted stricter standards to address their concerns about IAS having a negative environmental impact. In one specific instance, the CJEU ruled that these additional requirements on manufactured products introduce barriers to the correct functioning of the internal market.

Case [C-100/13](#) European Commission v Germany.

<sup>39</sup> For a more in-depth assessment of IAS used in agglomerations below 2 000 p.e., see also: Ricardo (2019) Urban Waste Water – non-connected dwellings; funded by the EEA.

have certain specific obligations in place to regulate IAS. This approach was launched in 2016-2017, starting with a few Member States. The exercise is still ongoing, and as of yet it is premature to draw definite conclusions from this work. However, example cases point towards positive results (e.g. establishment of an IAS register in LV, new legislation being drafted in LT).

Regarding the **extent of IAS use** in agglomerations over 2,000 p.e., reporting under the UWWTD shows that Member States collect (and sometimes also treat) between 0% and 16% of their total load with IAS (*Figure 32*). Overall, about 15 million p.e. are served by IAS. In some Member States (i.e. SI, LT, CZ, SK and LV) the average load in big cities<sup>40</sup> being addressed by IAS is 2-5% of the total.



*Figure 32 Share of total load in agglomerations >2 000 p.e addressed with IAS in 2014.*

In terms of practices in the Member States, a variety of IAS technologies are in use, from simple units with basic filtration and/or primary treatment to more advanced solutions equivalent to individual treatment plants. Many IAS are simple storage tanks that need regular emptying; if a well-functioning system is in place, the contents of these storage tanks will reach the WWTP via trucks, thus ensuring an equivalent level of environmental protection. Overall, a well-designed and well-maintained IAS could result in similar levels of pollution reduction as UWWTPs.

However, a badly designed, maintained and unmonitored IAS **can have a negative environmental impact** when it is subject to overflows (as this can affect surface water bodies) or leaks (as this can consequently infiltrate groundwater). *Figure 33* shows the pathways that the diffuse pollution from IAS can take to reach surface and ground water bodies.

<sup>40</sup> Big cities are those above 150 000 inhabitants.

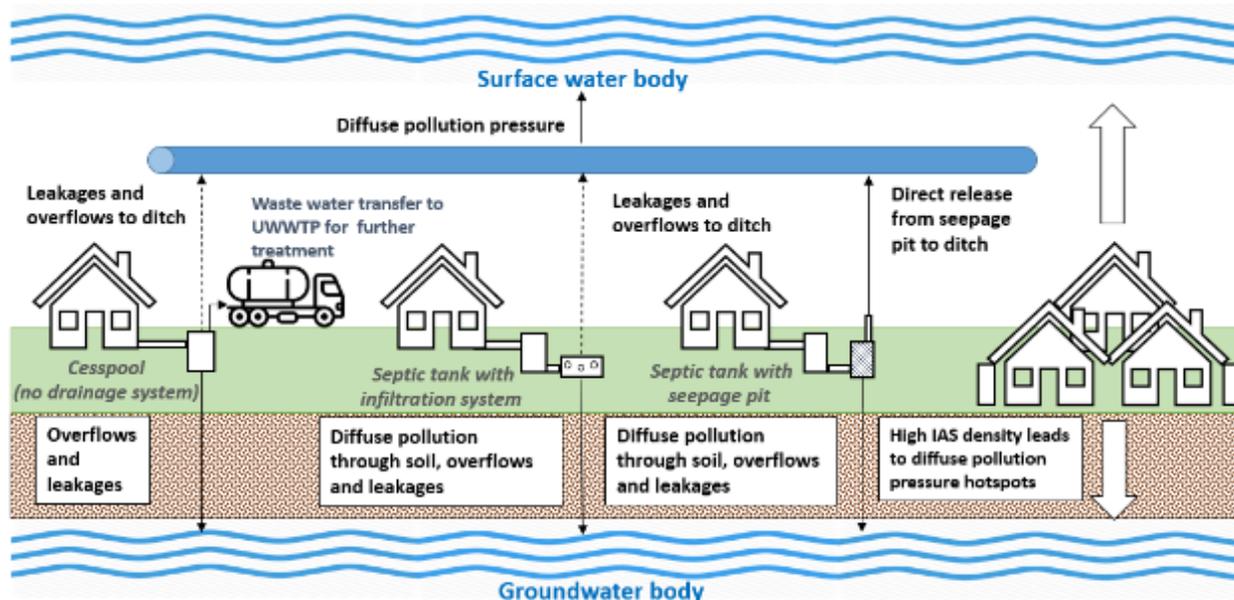


Figure 33 Pathways of diffuse pollution from individual or other appropriate systems. Source: Ricardo, (2019b) for EEA.

The JRC's modelling results show that, if all agglomerations reached full compliance with the UWWTD, the use of poorly managed IAS could account for a significant proportion of the remaining load that is potentially discharged into water bodies (Figure 34). In some Member States, the use of IAS would account for more than 20% of the BOD load being discharged under full compliance. For N and P, the load attributable to IAS use would be about 10% of the total. A comparison of the impact of IAS with and without management measures in place can be seen in Annex 4 on the impact of IAS.

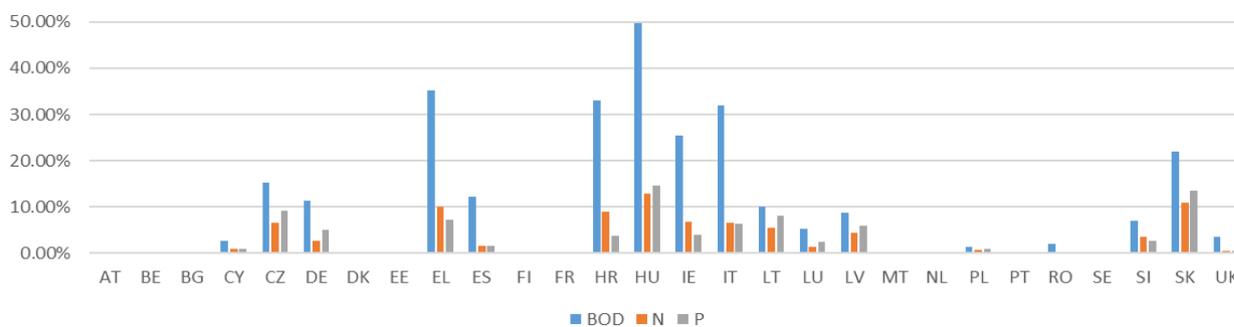


Figure 34 Potential loads assuming IAS correspond to primary treatment, as a percentage of total load, under full compliance, for BOD, N and P from waste water.

The main issue with IAS at the national level is that monitoring is difficult. For instance, in some Member States, competent authorities lack the capacity to monitor and check individual systems regularly. Furthermore, competent authorities do not always have the right to enter properties due to property rights. In addition, users of IAS do not always maintain and operate their systems correctly due to the high costs involved (Ricardo, 2019b; OECD forthcoming a).

Member States have a number of practices in place to deal with the problem that high IAS use might entail. The written consultation of the Member States and the IAS workshop under this Evaluation showed that some countries have strong enforcement mechanisms in place. Some Member States have established permitting systems (e.g. in CZ, SK, DE), provide trainings and certification schemes for operators of IAS (e.g. in AT), awareness raising and information campaigns (e.g. in IE and UK) as well as guidelines for the design, use and maintenance of IAS (e.g. in DK, FL, FR, RO, ES).

Some Member States have also taken action to ensure that citizens connect whenever a collection system is already in place. This can be the legal obligation to connect to the existing collection system (e.g. in AT, BE, HR, CY, CZ, DK, DE, EL and LT), special loans, and compensations as well as tax deduction to incentivise connection where this could be perceived as a financial hurdle (e.g. in CY, EL, LV, PL, SK, DK, DE, IE).

IAS use does not always entail a problem. When strong enforcement or management mechanisms are in place, it can be assumed that any IAS problems would only be significant at local level. However, not all Member States have national legislation and enforcement mechanisms in place for IAS use, and even those that do have strong systems in place can struggle with monitoring due to the extensive use of IAS in some places. Overall, it can be assumed that although some Member States have found ways to deal with IAS in general, others cannot yet ensure that all the declared systems function as needed and that they do not harm the environment.

A number of factors should be considered when comparing collection systems to IAS. Firstly, IAS can be an adequate substitute for the safe collection of waste water or even for the appropriate treatment of waste water, but if not well managed or functioning they also increase the risk of exposure and can thus have a negative health impact. Furthermore, IAS require that the owner, in some cases a non-expert, is trained in maintaining the system and ensuring its correct operation. If high numbers of IAS are used in a country, it is difficult to ensure that the authorities in charge of implementing the Directive regularly check all systems for their adequate functioning.

Overall, these findings are supported by stakeholder views: only 7% of the stakeholders (n=332) who replied to the public consultation found that the UWWTD is very effective in ensuring proper IAS application. The expert workshop on IAS, attended by representatives of Member States, academia and industry associations, concluded that IAS are an important solution that can be adapted to local circumstances but that they are difficult to monitor even with good systems in place, due to the sheer amount of them.

#### *Small agglomerations and non-connected dwellings*

Small agglomerations and non-connected dwellings are another major source of urban waste water pollution, as shown in *Figure 24*. However, the UWWTD does not require small agglomerations and non-connected dwellings under 2,000 p.e to build collection systems, nor does it require that information on such small agglomerations be reported to the Commission. Article 7 only requires small agglomerations that have a collecting system and discharge into freshwater or estuaries to apply ‘appropriate treatment’. Under the WFD, Member States should adopt measures to mitigate and reduce pressures that affect good status and should therefore ensure good water quality of those water bodies that are affected by small agglomerations or non-connected dwellings

It is assumed that IAS are used in many small agglomerations that do not fall under the UWWTD. These can have a negative environmental impact if not correctly monitored, operated and maintained (see [IAS](#)). Since Member States are not obliged to report on the use of IAS in agglomerations below 2 000 p.e., there is little EU-wide information available on this. Information reported under the 2<sup>nd</sup> round of RBMPs shows that discharge from non-connected dwellings<sup>41</sup> is a significant source of pressure on surface

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<sup>41</sup> Pressure 2.6 ‘Diffuse – Discharges not connected to sewerage network’. Main driver: Urban development. Description: Pollution resulting from urban waste water not connected to sewers and identified as a diffuse source. Source: European Commission (2016) [WFD Reporting Guidance](#) (see Annex 4, [scattered dwellings](#)).

waters, affecting 11% of them negatively and causing them to fail to achieve good ecological status (EEA, 2018). By comparison, agriculture is the cause of 25% of surface waters failing to meet good ecological status. *Table 6* shows the impact of non-connected dwellings on surface- and groundwater in several EU Member States (and NO), where it was reported that more than 10% of the ground- or surface water bodies are affected.

EEA Member countries reporting under the WFD	Groundwater	Surface water
BE	<10 %	47 %
BG	99.9 %	39 %
CZ	-	52 %
CY	81 %	<10 %
DE	-	14 %
DK	-	87 %
EE	58 %	42 %
ES	<10 %	13 %
FI	35 %	52 %
FR	<10 %	13 %
HR	-	92 %
HU	100%	-
IE	< 10 %	14 %
LV	-	25 %
NO	-	58 %
PL	-	67 %
RO	100 %	79 %
SE	61 %	29 %
SK	93 %	-

*Table 6 Countries where more than 10% of surface water bodies or groundwater body area are affected by diffuse pollution and non-connected dwellings are identified as one of the pressures. Source: Ricardo (2019b) produced for EEA.*

Small agglomerations under 2 000 p.e. account for about 23 million p.e. (Vigiak *et al.*, 2018). Although the current level of treatment in these agglomerations is unknown as there is no reporting required under the UWWTD in this area, it is unlikely to be less than primary treatment. Based on modelling estimates, small agglomerations contribute roughly 10 million p.e. of BOD load potentially being discharged without treatment per year (*Figure 23*). This is roughly at the same order of magnitude as SWO discharges (see [storm water overflows](#)). Considering that the modelling assumes that all agglomerations under 2,000 p.e. are without a collection system, the length of pollution pathways from these sources to the receiving water bodies is expected to be an additional factor causing natural attenuation. In addition, the environmental impact of these discharges depends on the situation at local level (flow, capacity and sensitivity of the receiving water).

In some Member States, a lack of connection might be due to geographic conditions (e.g. high numbers of small islands), whereas elsewhere it might be due to a lack of investment in infrastructure for agglomerations below the UWWTD's threshold levels. Given that the Commission does not gather information on smaller agglomerations or non-connected dwellings, there is no EU-wide overview of what is happening with waste water in these agglomerations. Some Member States (e.g. DE, AT) have set much lower thresholds to capture this load, whereas others struggle to implement the Directive even in agglomerations over 2 000 p.e.

Respondents to the public consultation expressed mixed views regarding the impact of the UWWTD's lack of clarity on small agglomerations. Stakeholders highlighted that the treatment and reporting requirements for agglomerations under 2 000 p.e. are not sufficiently clear. 31% of respondents stated that this has had some adverse impact (n=320). Public authorities representing different governance levels (n=44) stated that it has had high or some impact.

#### *Eutrophication – sensitive areas*

Another UWWTD obligation that has been identified as not entirely clear and has had to be clarified by the European Court of Justice is 'eutrophication', which is linked to the UWWTD's provisions on sensitive areas. Under criterion (a) of Annex II of the UWWTD, Member States must designate areas that are at risk of eutrophication or eutrophic. The UWWTD provides only very limited indications regarding which elements need to be taken into account when designating such areas.

In practice, 15 Member States have either designated their entire territory as sensitive or generally apply more stringent treatment everywhere<sup>42</sup>. Sensitive areas therefore officially cover 76% of the EU's territory. *Figure 36* shows the areas that Member States have designated as sensitive in their territory, as well as whether the removal of N, P or another contaminant is envisaged there.

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<sup>42</sup> AT, BE, CZ, DK, EE, FL, DE, LT, LV, LU, NL, PL, RO, SL, and SK.

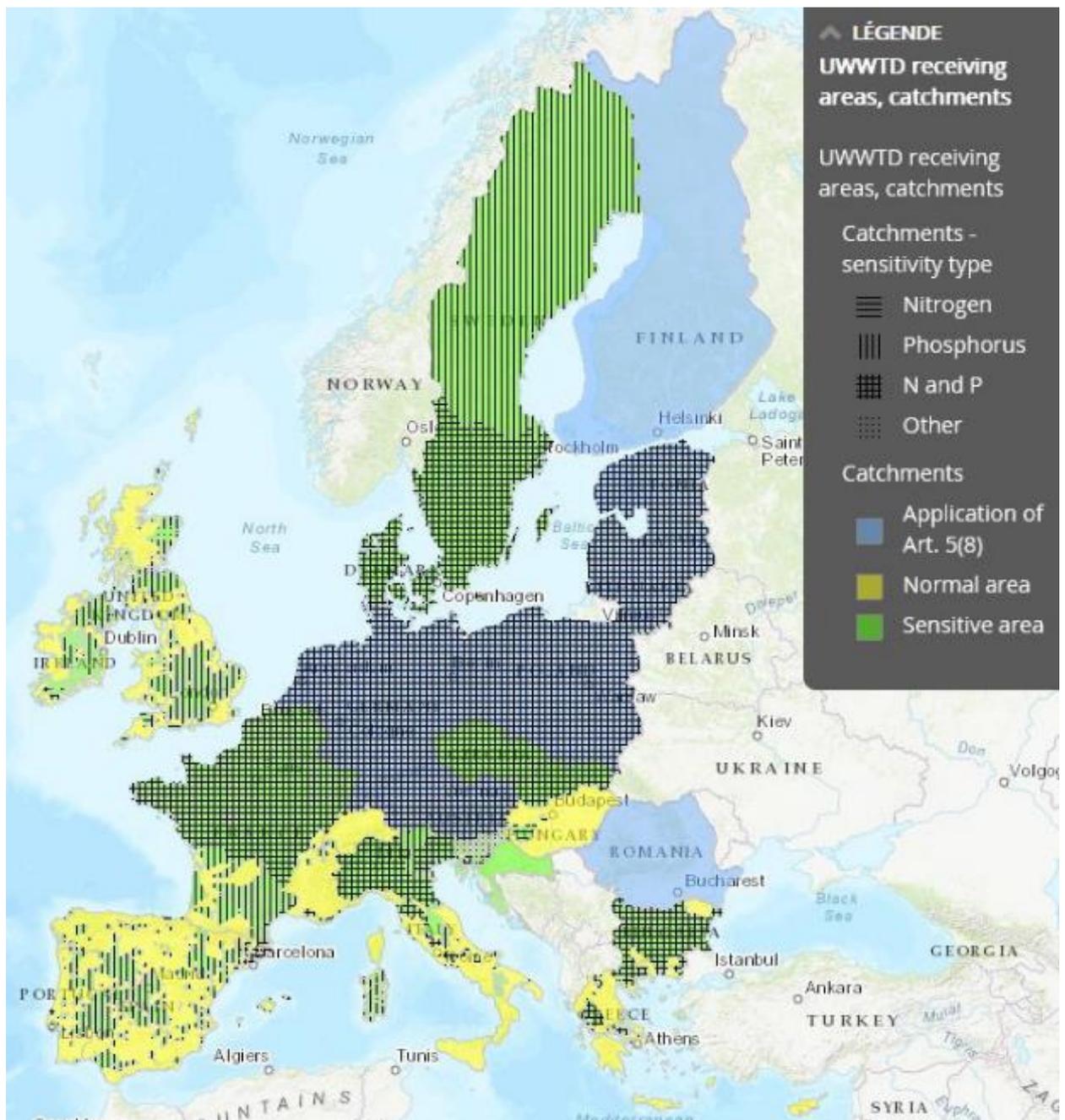


Figure 36: Designated sensitive areas across the EU and Switzerland. EEA (n.d.) [Urban waste water treatment map – sensitivity type](#)

**The lack of a clear definition of eutrophication was addressed through a Court ruling, which set out four criteria and required that a cause-effect relationship be established (Case C-280/02<sup>43</sup>). These four criteria are: 1) the enrichment of water by nutrients, especially compounds of N and/or P; 2) the accelerated growth of algae and higher forms of plant life; 3) an undesirable disturbance of the balance of organisms present in the water; and 4) deterioration of the quality of the water concerned. The Court**

<sup>43</sup> Judgment of the Court (Second Chamber) of 23 September 2004. Commission of the European Communities v French Republic. Failure of a Member State to fulfil obligations - Directive 91/271/EEC - Urban waste water treatment - Article 5(1) and (2) and Annex II - Failure to identify sensitive areas - Meaning of "eutrophication" - Failure to implement more stringent treatment of discharges into sensitive areas. Case C-280/02.

case dates back to 2004, pre-dating the map in *Figure 36*, which makes it unclear whether or not the Court's clarification has improved the interpretation of the UWWTD's requirements on sensitive areas under criterion (a).

It is worth noting that the areas designated as 'sensitive' under the UWWTD are considered 'protected' under the WFD. The WFD includes eutrophication indicators as one of the biological quality elements that need to be considered when classifying water bodies based on ecological status. According to the WFD, Member States should define quality elements that are sensitive to all pressures, including eutrophication. Different Member States have defined different quality elements. Next to urban waste water, agriculture is a major contributor of N releases and thus increases the risk of eutrophication. To address this source of pollution, the Commission adopted the Nitrates Directive (ND), under which Member States designate nitrate vulnerable zones (NVZs). However, there seem to be some inconsistencies between the designation of NVZs and the designation of sensitive areas under the UWWTD, as well as the assessment of ecological status. This is due to the fact that many Member States do not link the assessment of eutrophication required by the ND with the 'ecological status' concept of the WFD.

Due to the complexity of eutrophication, a guidance document on the harmonisation of eutrophication assessment was adopted in 2009 as part of the common implementation strategy under the WFD (EC, 2009). However, reporting under the ND in 2016 showed that the methodologies used for assessing eutrophication still varied widely among Member States and were often not well linked with the WFD quality elements. Efforts continue to improve coherence and synergies at Member State and EU levels. Regarding the relationship between the UWWTD and the ND, the Court clarified that the two Directives are complementary and that it is not important to define what percentage of pollution comes from waste water discharges and what percentage comes from agricultural pollution ([Case C-280/02](#)<sup>43</sup>). The significance of nutrient loading to a water body should be assessed based on the percentage of that nutrient's input, as well as on the absolute amount of nutrients. Consequently, the overall nutrient budget has to be considered on a case-by-case basis (*ibid.*, EC, 2009).

As regards EU-wide improvement in reducing eutrophication, a 2016 report of the European Topic Centre (ETC) concluded that the 'low hanging fruits' had been picked and that eutrophication abatement now faces the challenge of implementing measures to reduce nutrient inputs from diffuse sources against a strong agricultural lobby. According to the ETC, the decrease in P concentration is due to improvements in waste water treatment and a reduction of P in detergents (ETC/TCM, 2016). At the time of this Evaluation, there is no comprehensive evidence on how eutrophication has reduced or been avoided since the adoption of the UWWTD, the ND and the WFD. However, it is clear that reducing N and P releases as part of waste water discharges is important, and in that regard the UWWTD has noticeably contributed to progress in this area. Overall, P in rivers has decreased in the EU, but N still represents a significant issue mainly due to emissions from other sectors such as agriculture (see [contextualisation](#)). Modelling results show that fully implementing the UWWTD (with the current threshold levels for P) would reduce P emission to a limited extent further. An additional ban on P-containing detergents would further reduce P loads, which would in turn reduce concentrations in surface waters and the costs of water treatment (Bouraoui *et al.*, 2014).

## ***Monitoring, reporting and information provision requirements and their effectiveness***

As most environmental directives, the UWWTD contains a number of provisions on monitoring and reporting to ensure that it is implemented correctly. These provisions need to be fit for purpose to ensure that the Directive is effective in reaching its objectives.

### *Monitoring (parameters, limit values and frequencies)*

The UWWTD requires monitoring of the level of certain pollutants in the effluent so that compliance with thresholds set out in the Directive can be assessed. This is done through the following parameters: BOD, COD, and nutrients N and P where applicable (see Annex 4, [monitoring requirements](#)). The UWWTD sets out monitoring methodologies for each parameter.

A review of national thresholds shows that for **BOD**, based on local conditions, a number of Member States have set stricter threshold values compared to the UWWTD requirements (DE, CZ, SE, DK, IE, UK). To **measure BOD**, flow-proportional or time-based 24-hour samples are collected; the pass or fail results must be communicated to the Commission. This is practical for implementation and infringements. However, it does not require precise monitoring over time to detect more subtle changes. The methodology used to monitor **COD** under the UWWTD is based on potassium dichromate, which has been identified as a ‘substance of very high concern’ under REACH and therefore has to be phased out. A recent study reviewed this monitoring requirement and concluded that COD could be removed and replaced by total organic carbon (TOC) as an optional parameter (Umweltbundesamt et al., 2017).

As regards the nutrients: for **N**, a number of Member States have also set stricter thresholds based on local conditions (SE, AT, DK, BE, FI, UK, IE). The modelling results show that N loads could be further reduced under full compliance but the impact on water quality remains dependent on local conditions, as other sources may be more prevalent. Waste water is also a major pollution source for **P** content in water bodies, with modelling results indicating that urban waste water is one of the main sources for P impacting EU water body quality. Some Member States have set substantially stricter standards for P (FI, SE, IE, UK). It was found that lower concentrations seem to be achievable at acceptable costs. It was also found that, although the UWWTD has been effective, water quality is still suffering from high P concentrations, and that only marginal further improvements can be achieved through full implementation if current threshold levels are maintained (see [effectiveness](#)). As pointed out previously, other pollution sources, such as agriculture, also play an important role.

Evidence – and notably the levels of pollution reduction achieved (*Table 1*) – shows that the EU thresholds have helped Member States significantly reduce pollution. Member States consider them as minimum thresholds and some have applied stricter standards based on local conditions.

This is confirmed by the results of the public consultation: overall, the threshold levels for BOD, N and P are still considered to be accurate to a large extent or to some extent (*Table 7*). No clear alternative values were suggested, but many public authorities, public WWTP operators and members of the public suggested that COD be replaced by TOC.

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<b>To a large</b>	<b>To some extent</b>	<b>To no extent</b>	<b>I do not know</b>
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	extent			
<b>The limit value for BOD5 is still accurate (n=297).</b>	46%	30%	9%	15%
<b>The limit value for nitrogen is still accurate (n=295).</b>	55%	26%	5%	14%
<b>The limit value for phosphorus is still accurate (n=291)</b>	56%	23%	8%	13%

*Table 7 Public consultation results regarding the adequacy of the limit values set for BOD, N and P*

As regards **monitoring frequencies**, the CJEU supported Portugal in its claim that Article 4 on secondary treatment does not refer to Annex ID (frequencies). The Court concluded that, although Article 4 requires compliance in line with the requirements in Annex IB, there is no obligation for the “purpose of proving such compliance, that samples be collected over a full year” (Case [C-398/14](#)<sup>44</sup>). Thus, if a Member State can submit even just a single piece of evidence proving compliance with Article 4 and Annex IB, this is deemed satisfactory for the purposes of the Court case. This has had significant effects in terms of case-law and burden of proof for Member States and the Commission. However, it is unlikely that it will have consequences at local level, where monitoring over a full year is in any case imposed under Article 15.

Overall, the Directive is fixed when it comes to monitoring to a number of parameters, frequencies and methodologies that were deemed important and sufficient for effluent quality in the 1990s. Although the UWWTD requires that competent authorities consider the receiving waters to a certain extent (either because they are sensitive to eutrophication or to meet the objectives of other Council directives), there is no provision that requires the monitoring of new or emerging substances in the influent, or the amounts of them that still appear in the effluent. Monitoring technologies have been further developed over the past 30 years and more can be detected today in influent and effluent, often online. The Directive does not directly incentivise the uptake of new technologies (see [contaminants of emerging concern](#)). The advantages and disadvantages, as well as the costs and benefits, of taking EU action based on these technological advances would need to be assessed in a follow-up to this Evaluation. It would need to be ensured that any changes to the monitoring requirements do not come at the expense of valuable information that is required to check implementation progress in the Member States.

Furthermore, the Directive does not require the **monitoring of SWOs, including the constituents of urban runoff**. Similarly, it does not require any monitoring data on the functioning and effectiveness of **IAS** even though IAS is widely used in some Member States and remains a potential significant source of pollution (see [IAS](#)).

### *Reporting*

**Reporting** requirements ensure that the Commission can monitor progress on implementing the Directive. Article 15 requires Member States to make **monitoring** data available to the Commission. Article 17 requires that Member States set out a programme of implementation, submit it to the EEA and the Commission, and provide updates every

<sup>44</sup> Judgment of the Court (Second Chamber) of 28 January 2016 European Commission v Portuguese Republic; Failure of a Member State to fulfil obligations — Directive 91/271/EEC — Urban waste water treatment — Article 4 — Secondary treatment or equivalent — Annex I, Sections B and D; Case C-398/14.

two years. The EEA provides a platform through which the programme can be submitted and supports the Commission by checking the quality of the submitted data. Every two years, the Commission publishes an EU implementation report that goes beyond compliance checks. Working together with the Committee under Article 18, the Commission may adopt the reporting methods and formats it deems most appropriate (under Article 17(4), see Annex 4, [reporting obligations](#)). Note that the reported data have been used to take legal action in cases where Member States were not in compliance with the Directive's requirements (see the section on [late implementation](#)).

The ECA recommended that the Commission improve the reporting requirements. It found that it generally takes Member States around 18 months (and sometimes up to 30 months) to report data, and that the Commission needs another 18 months to analyse the data and publish them. It recommended that the Commission should:

1. also request reports from agglomerations over 2 000 p.e. that fall under Article 7,
2. verify any changes to agglomerations that are above or below 2 000 p.e. reported by Member States,
3. reduce the time it takes to assess and report on compliance.

In its reply, the Commission highlighted that it takes time for Member States to provide information and that the UWWTD does not include reporting requirements for small agglomerations (ECA, 2015). The Fitness Check on Environmental Reporting and Monitoring confirmed the ECA's overall findings and highlighted the following areas for simplification (EC, 2017b, Annex 6 and 8):

- aligning the legislative framework (mainly with the WFD and Sewage Sludge Directive (SSD)) to improve coherence and adapt timing and frequency of reporting as well as question the usefulness of Article 16 (see [information to the public](#));
- improving coherence with other related reporting flows and reducing delays by making the process more efficient and prioritising or restructuring the content (e.g. separating the publication of factual results from the regular Commission implementation report).

The Fitness Check also recognised the improvements already achieved in recent years and highlighted some of the features of urban waste water reporting as good practices (e.g. the distance-to-target assessment, and SIIF and the revised Article 17 reporting decision).

This Evaluation confirms these findings and provides some more detail on the opportunities and challenges of streamlining the monitoring and reporting requirements under the Directive, e.g. the Member States' report on investment needs. However, the Commission's assessment shows that these are not comparable. The overall picture provided by the Member States is often incomplete, based on different cost assumptions and on a partial assessment of investment needs. Hence, further improvements to the effectiveness of reporting can only be realised by the Member States themselves, e.g. through investment in data quality or by making data publicly available in [INSPIRE](#)-compliant services.

### *Information to the public*

Under Article 16, Member States have to publish a situation report on the disposal of urban waste water and sludge every two years. These reports must be sent to the Commission as soon as they have been published. The extent to which Member States

make an effort to disseminate these reports to the public is unclear, as is the extent to which the public appreciates them.

In addition to national information, the Commission and the EEA also give the public access to a substantial amount of UWWTD-related information (EEA, n.d.b). The EEA compiles the information and shows it in the form of maps and overview tables. The SIIF, a pilot project focusing on the organisation and management of data, accessibility of information and compliance calculations, provides information on agglomerations, treatment plants, discharge points and sensitive areas, as well as on compliance rates and distance-to-target. It does not provide information on costs included in the water bill or investment needs, however.

A recent study on environmental governance (IEEP et al., 2019) showed the diversity and heterogeneity of water-related information made available to the public. While some good practices exist, often the information is fragmented, difficult to find, understand and reuse. Moreover, Member States are also falling short when it comes to providing more information on inspections and enforcement activities. Investments in making better information available to the public will not only improve the transparency and accountability of administrations but also help reduce administrative burden resulting from reporting.

The recent European Citizens' Initiative on right2water (Right to water, 2019) and the high response rate from citizens (about 368 000) to the public consultation on the Water Fitness Check show that water is important to EU citizens.<sup>45</sup> Around 60% of the water price is related to waste water collection and treatment, and most EU citizens pay their water bill without being aware of how their financial contribution is used by the authorities. However, there are no EU-wide studies showing that increased awareness and knowledge increases users' willingness to pay for water treatment. Nevertheless, there are national-level indications that including the public in decision-making processes related to water management facilitates increases ways of advancing implementation and improves treatment levels:

1) Estonia: After Estonia joined the EU, a widespread campaign informing the public about the needed changes in water management was carried out. A close dialogue with citizens accompanied this and laid the groundwork for quick implementation of the EU water industry directives. Estonia managed to increase its water tariffs to cover operational costs within 10 years, which was accepted by the public and was based on close cooperation between government, companies and public interest groups.

2) Switzerland: In Switzerland public consultations were held on increasing treatment levels in priority treatment plants to deal with micropollutants. The vote was supported by information campaigns to show the benefits of treating waste water for micropollutants. The public was largely in favour (about 80%) and accepted an increase of about EUR 10 per year on their water services bill to pay for better treatment.<sup>46</sup>

These examples show that the public is interested in water services and that people are willing to pay more if the benefits of the increased costs are clearly communicated. These findings were confirmed by the public consultation: only about half of the respondents

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<sup>45</sup> The response rate to the Water Fitness Check public consultation was historically one of the highest compared to all other EU public consultations.

<sup>46</sup> Both examples were referred to and discussed in the stakeholder conference in November 2018.

stated that they have access to sufficient levels of information on waste water treatment, and the respondents who answered that they do not have enough information were mostly citizens. Respondents indicated the internet as their main source of information (215 of 562 replies), next to ‘other’ (214 of 562) and the water bill (124 of 562). They showed an interest in having information on: 1) how costs compare to those of similar households (63%, n=608); 2) how the costs are calculated (68%), and; 3) investments in infrastructure (63%). For these three information categories, only 13%, 6% and 4% of respondents, respectively, stated that they did not have this information and were not interested in it. For all three categories, roughly 17% of respondents did not provide an answer; this figure includes operators, public authorities and trade associations.

## 5.2. Efficiency

**Evaluation question:** To what extent has the Directive achieved its objectives efficiently without imposing administrative burden?

The UWWTD brings about **many benefits**, some of them going beyond its scope. These include:

- a reduction of organic pollution, nutrients and non-targeted chemicals in waste water effluent;
- an increase in water quality overall (important for tourism and landscape, drinking water sources, recipient ecosystems);
- health benefits from improved sanitation;
- cost savings thanks to the change from IAS to collection systems; and
- a marginal increase in water and sludge reuse
- reduction of greenhouse gas emissions through increase of centralised aerobic processes
- strong and internationally competitive water sector.

Due to the lack of recognised methodologies, it was only possible to quantify and monetise a few of the **benefits** attributed to the UWWTD:

- the removal of nitrogen;
- the improvement of bathing sites; and
- increased use of collection systems instead of IAS;

In total, the EU-wide benefits are estimated at **EUR 27.6 billion annually at current implementation levels, and** this increases to about **EUR 30.6 billion annually under full implementation**, although this estimate is based on assumptions and is subject to some uncertainties (see Annex 3, [costs and benefits](#)).

While health benefits are more directly associated with the DWD, requiring drinking water to be safe, and the BWD, requiring bathing water sites to be safe, it is undeniable that the treatment of waste water has significant functions as regards health, as shown by WHO data on other parts of the world. It was not possible to quantify these impacts with the existing methodologies. It was also not possible to quantify and monetise the benefit achieved from reducing non-targeted chemicals.

Another benefit is the strong EU waste water sector, with internationally competitive companies exporting their technologies and services globally and employing about half a million people in the EU. The UWWTD’s implementation also reduced greenhouse gas emissions in as much as it replaced anaerobic local treatment with centralised aerobic processes across the EU, thus helping to mitigate climate change.

These achievements were only possible through **large and continuous investments from Member States over recent decades** and substantial **support through EU funds**. At the current implementation level, the EU-wide costs for implementing the UWWTD are estimated to be about EUR 11.1 billion per year for collection and EUR 7.2 billion per year for treatment. Under full implementation, the combined costs for collection and treatment would increase to EUR 19.7 billion per year. On average, the total annual cost for treating 1 p.e. is EUR 31. Through the IAS provision, the Directive provides flexibility where collection systems entail excessive costs with no additional environmental benefit (see [IAS](#)). Also, the Directive is technology neutral, allowing Member States to choose the most efficient technologies to implement the Directive. The ECA found evidence of **over-**

**sized plants** in a few Member States. However, no evidence was found that plants of an inappropriate size were a systematic problem and that they would reduce the efficiency of the Directive.

The UWWTD contains few requirements that result in **administrative burden**. Most costs are borne by Member States and their relevant local authorities, and the Commission. **These costs are marginal compared to the infrastructure costs**. No direct administrative costs to other stakeholders (i.e. businesses, NGOs etc.) or citizens were observed.

In terms of **proportionality of costs and benefits**, implementing the UWWTD entails substantial costs. Nevertheless, the benefits outweigh the costs. The Directive's monetised and annualised benefits when fully implemented are estimated, at EU level, to be worth EUR 30.6 billion against EUR 19.7 billion annualised costs. Comparing costs, for which comparatively solid information is available, to benefits that are hard to estimate is a difficult exercise, with numerous limitations.

The analysis of the UWWTD's efficiency examines the relationship between the costs of implementing the Directive and the benefits achieved. This is mostly based on the effects discussed under [effectiveness](#). Member States are not obliged to report assessments on the cost and benefits of implementing the Directive.

### ***Benefits of the UWWTD***

The UWWTD brought a substantial number of benefits. However, only some of the benefits can be quantified and monetised. This stands in contrast to costs that can be easily quantified. The two most prominent effects of the UWWTD, namely the reduction of pollutant loads in treated waste water and the positive impact on water quality, translate into benefits: the **reduction of both targeted and non-targeted pollutants**, such as microbiological pollution and other hazardous substances (see Pistocchi *et al.*, 2019), leads to **preservation and/or improvement of (transboundary) surface and groundwater quality** (see [effectiveness](#))<sup>47</sup>. Good water quality is especially important for bathing water sites and it can increase the attractiveness of the affected zones, often leading to an increase in tourism. Furthermore, having clean surface water leads to reduced costs for treating drinking water (EC, 2016). Good water quality leads also to well-functioning ecosystems overall.

Reductions of nutrients and microbiological pollution were **monetised as benefits**. Based on extrapolations from willingness to pay (WTP) studies and a benefit transfer to calculate damage costs, **N reduction was monetised as a proxy for improved water quality**. In addition, the **reduction of microbiological pollution was assessed as a proxy for improved bathing water quality**, also based on extrapolations from WTP studies<sup>48</sup>. N and microbiological pollution reduction as proxy benefits were chosen, as only for these underlying studies were found. As shown under [effectiveness](#), the UWWTD's impact on N reduction is, compared to its impact on BOD and P, limited; therefore, the benefits are already underestimated due to this limitation. A low and a high benefit were derived both for N reduction and for bathing water improvement. For N, this

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<sup>47</sup> If waste water is not collected and treated it can infiltrate and pollute groundwater bodies. Badly maintained collection systems with leaks or non-functioning IAS can also lead to the deterioration of groundwater bodies due to waste water pressures.

<sup>48</sup> The WTP studies used for assessing benefits are the following: On reducing nitrogen a study on people's willingness to pay for a clean Baltic Sea was used (Sutton *et al.*, 2011). For clean bathing water, a study on people's willingness to pay for clean Scottish beaches was used (Phillips *et al.*, 2018).

is due to the underlying studies including high and low estimates for how much N needs to be reduced for a clean aquatic environment.

For **bathing waters**, the underlying study resulted in a willingness to pay between EUR 0.56-1.55 by domestic tourists, thus leading to both a low and a high estimate for the EU assessment as well. Foreign tourists potentially willing to pay for clean waters were not added to the assessment — only the resident population is accounted for. Thus, the monetised benefits from clean bathing water are potentially underestimated.

Another benefit is the **cost saving related to the change from IAS to collection systems**. This has been noted as a service level improvement as these households would no longer have to deal with full tanks nor have to arrange for tanks to be emptied or maintained.

These three benefits together lead – at current implementation levels – to an estimated aggregated cost savings **for the EU of EUR 27.6 billion annually**; this increases to about **EUR 30.6 billion under full implementation**. Benefits can be broken down by Member State (Annex 4, [annual benefits](#)), but as the benefits at times are only revealed downstream, another region or Member State may benefit downstream from the costs borne upstream<sup>49</sup>.

In terms of non-monetised benefits, the **removal of non-targeted micropollutants** is potentially very significant as removal efficiencies can be up to 50% and more, depending on the substance. The benefits of having cleaner **drinking water sources** were also not quantifiable. However, considering that about 38% of the EU's drinking water (from large supplies) comes from surface water (EC, 2016), the impact on treatment costs can be substantial.

According to the Intergovernmental Panel on Climate Change (IPCC) guidelines on greenhouse gas (GHG) inventories, collecting and treating waste water in centralised systems can also be associated with **GHG emissions reduction** compared to non-collection and untreated discharge. The IPCC argues that 'wastewater in closed underground sewers [which is the case in most parts of the EU] is not believed to be a significant source of CH<sub>4</sub>. The situation is different for wastewater in open sewers because it is subject to heating from the sun and the sewers may be stagnant allowing for anaerobic conditions to emit CH<sub>4</sub>.' (Doorn *et al.*, 1997 in IPCC, 2006, p. 11)<sup>50</sup>. Furthermore, centralised treatment allows biogas to be captured as an energy source and sewage sludge to be used either in agriculture or as an energy source itself, in both cases decreasing the use of fossil fuels in GHG emitting processes (*ibid.*).

In general, implementing the UWWTD also leads to a number of public **health** benefits. Having a collection system in place reduces the risk of exposure to pathogens (Kay, 2018). Untreated waste water can contain nutrients, viruses, parasites and other harmful contaminants. These can pose a risk, especially when untreated waste water enters bathing water sites. Having secondary treatment in place substantially reduces intestinal enterococci concentrations in treated effluents. When microorganisms contained in waste

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<sup>49</sup> At the dedicated workshop and during the stakeholder conference, stakeholders raised concerns about the assessment of the benefits. However, methodologically no better way was found and thus a mix of quantified benefits and qualitative discussion are provided here.

<sup>50</sup> WWTPs, on the other hand, can have large carbon footprints depending of the energy source used.

water effluent are ingested, these can lead to gastrointestinal diseases, cholera, typhoid and hepatitis. Untreated waste water in water bodies leads to the development of blue-green algae, which is toxic and can lead to rashes, skin and eye irritation as well as allergic reactions (Ricardo, 2019; EEA, 2016). The WHO, in its recent sanitation guidelines, lists the following as results of non-existent or malfunctioning sanitation systems: diarrhoea, helminth infection, vector-borne diseases, and the spread of antimicrobial resistance (WHO, 2018a)<sup>51</sup>. According to the WHO (2018b), globally ‘poor WASH<sup>52</sup> conditions still account for 842 000 diarrhoeal death every year’. In terms of health benefits, in those EU countries where collection and treatment levels were low before they joined the EU or before the Directive was adopted, the Directive helped to improve the levels of **service**, which comes with improvements to hygiene and the mitigation of health risks related to waste water.

Strong EU water legislation, including the UWWTD, has helped EU **companies** to become very **competitive internationally**, with 8 out of the 15 of the world’s largest water companies being from the EU (see [innovation](#)). Having a strong base in the EU enables exporting opportunities to non-EU countries. Several of the world’s major megalopolises have contracts with EU water companies.

According to Blue2 findings, in terms of **social benefits**, in the EU around 500 000 people are employed in the water supply and waste water sector (0.3% of total EU economy) (Spit *et al*, 2018). According to the 9<sup>th</sup> implementation report, it might even be up to 600 000 full time equivalents, generating a production value of about EUR 96 billion and an added value of EUR 41 billion each year. However, employment is only a benefit from a distributional perspective, as employing more people also leads to costs for society. Employment in the water sector also includes jobs in regions with high unemployment.

According to stakeholders replying to the public consultation, the UWWTD contributes largely to the following benefits: protection of the environment (78% of stakeholders), clean rivers and seas (78% and 70%), and health protection and the removal of pollutants (67% and 65%). Whereas about 17% of the respondents provided no answer, none indicated that the UWWTD did not result in any benefit (n=606). Almost half of the respondents (n=314) also stated that the Directive helped to create a skilled workforce in the EU.

### ***Costs related to the UWWTD***

The costs related to the Directive are more easily quantifiable than the benefits. The main Articles that can be quantified and monetised are Articles 3-5, which require the collection and treatment of waste water, and that lead directly to the achievement of the UWWTD’s general objectives. To assess collection and treatment costs, established cost functions were used, leading to comparably robust results. Administrative costs are discussed separately (see [administrative burden](#)). Non-implementation can also lead to high costs, in terms of foregone benefits and infringement fines (see [late implementation](#)).

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<sup>51</sup> Not all of these are necessarily applicable in EU Member States.

<sup>52</sup> WASH = Water, sanitation and hygiene.

The total annual costs in the EU are estimated at EUR 18 billion (*Table 8*). Human resources and sludge treatment account for the largest part of the operational costs in WWTPs. Energy use makes up on average 13% of these operational costs (see [energy](#)). Costs can be broken down into capital (one-off), and operation and maintenance (O&M) (recurrent) costs per Member State (Annex 4, [annual costs](#)).

	Collection (EUR billion)	Treatment (EUR billion)
<b>Capital costs</b>	7.5	4.8
<b>Operation and maintenance</b>	3.6	2.0
<b>Total</b>	11.1	6.8

*Table 8 Split of total EU collection and treatment costs*

As the main driver for costs is the amount of p.e. to be collected and treated, the larger Member States clearly incur higher costs (e.g. DE, ES, FR, UK, IT). Member States that are currently behind in implementing the Directive have lower costs, as investments are still outstanding in order to reach full compliance (e.g. RO). Costs for waste water collection and treatment is estimated to make up 50-60% of the total costs of the water supply and waste water sector. It is estimated that the UWWTD constitutes 25-30% of the total annual costs of the sector.

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In terms of efficient implementation, as discussed under IAS, the Directive provides the flexibility to make use of IAS if a collection system (which is the more cost-intensive part of the UWWTD) entails excessive costs or when it leads to no environmental benefit. The IAS must be able to deliver the same level of environmental protection. As estimated under benefits, it is assumed that moving from IAS to collection systems represents a cost saving. Given the maturity of the conventional technologies on the market, the margin to reduce costs is limited due to innovative technologies. However, the UWWTD is technology neutral and thus Member States and companies in the sector are regularly adapting to new technological developments that allow for more cost-efficient implementation.

In terms of costs, stakeholders replying to the public consultation ‘strongly disagreed’ and ‘disagreed’ (both 22%) that the legislation could be further simplified to reduce costs against only 9% who agreed it could be further simplified to reduce costs (n=299).

Also in terms of efficient implementation at treatment plant level, the ECA found that one third of the WWTPs assessed in its 2015 audit has been constructed with a significantly larger capacity than the current demand warrants<sup>53</sup> (ECA, 2015). Some of those plants operate at less than 50% of their capacity. In reply to the ECA, the Commission stressed that Article 4 of the UWWTD only requires the load to be calculated based on the maximum average weekly load entering the plant during the year. Member States with their regional or local authorities decide on the WWTP’s size. The selected capacity of the WWTP depends on several factors, including:

<sup>53</sup> The audit covered 28 treatment plants and was focused on implementation in CZ, HU, RO and SK.

- the requirement to comply with the UWWTD (including seasonal variations such as those linked to tourism or industrial activities, heavy rainwater runoff in combined systems);
- compliance with other water-related legislation;
- projected growth of the agglomeration.

Incorrect sizing of plants (oversized or undersized) can be due to a number of factors such as:

- inadequate or lacking data to sufficiently assess waste water flows;
- difficulties in assessing seasonal and future load variations;
- lack of technical and analytical capacities;
- lack of qualified and experienced teams;
- poor governance;
- lack of adequate planning for effectively and efficiently implementing the UWWTD at different governmental levels; and
- a desire to ‘build big’ because of financial benefits from having larger capital assets or from maximising the spend of a loan or other funds.

No evidence was found that the size of the plants (oversized or undersized) is a recurring issue in the EU that impedes the efficiency of the UWWTD.

Replies to the public consultation provided little insight on this topic, with many respondents having no opinion. From those few that replied (n=60), 12% of those representing Member State authorities considered that inadequate sizing might be a barrier to implementation.

#### *Administrative burden costs*

Administrative burden costs are associated with the monitoring, collecting, processing and transmitting of information, which are **solely** carried out due to the UWWTD’s reporting requirement. Under Articles 15-17 of the Directive information is required on different levels, but some of it is gathered as part of the ‘business as usual’ practices of those subject to the UWWTD (see [monitoring and reporting provision](#), see also Annex 4, [administrative burden](#)).

Under **Article 15**, in order to monitor compliance, the Commission requests Member States to submit data on their progress in implementing the Directive (see [monitoring](#)). As this is data on the quality of effluents, it is most likely that WWTP operators collect and provide data to regional and national level authorities before the Member States report this information to the Commission. The administrative cost is assessed as being low to moderate, assuming that most monitoring takes place due to other UWWTD requirements and part of it would also be done without the UWWTD (ICF *et al.*, 2017).

Under **Article 16** Member States are required to publish biennial situation reports on waste water and sludge (see [information provision](#)). These reports should be short and written for the public. Member States should initially collect information and later only update it. The administrative burden cost is assumed to be low once the reports only need to be updated (ICF *et al.*, 2017).

**Article 17** requires Member States to share updated information on their national implementation programmes (see [reporting](#)). This includes providing information on agglomerations and WWTPs that are compliant and information on planned investments.

This requirement does not necessarily require completely new information — updated information is adequate.

Reporting was streamlined in 2014 through [Commission Implementing Decision 2014/431/EU](#)<sup>54</sup>. The information provided is assessed and becomes part of the Commission's biennial implementation report. The administrative costs for Member States are estimated to be moderate when there are changes to report. For the Commission the burden (in terms of costs and time) is considered to be significant as regards reviewing all information and preparing the report. It is estimated to be about EUR 126 000 per year for all Member States together (ICF *et al.*, 2017). The complexity of the system provides potential for simplification – the recent DWD recast could be highlighted as an example. Any simplifications need to be assessed against the potential loss of valuable information.

### ***Proportionality of costs and benefits***

Overall, the **quantified and monetised benefits outweigh the costs on EU level** (*Figure 37*). It can be assumed that under full implementation costs would increase by approximately EUR 1.8 billion and benefits by EUR 3 billion. While the UWWTD's costs are well established, the assessment of the benefits comes with numerous shortcomings.

In some Member States that have not yet fully implemented the Directive the costs outweigh the benefits (see Annex 4, [annual costs](#)), and not all quantifiable and monetisable benefits are reaped. The benefits outweigh the costs in all those Member States that have fully implemented the Directive, except for two (Finland and Slovakia<sup>55</sup>).

Implementation costs are borne mainly by households connected to the collection system and a few industries covered by the Directive. Benefits are shared among all stakeholders that, through the Directive, are able to be connected to the collection system (higher service levels) and that profit from clean water. As is natural with (transboundary) water, the effort made in one Member State or region may lead to benefits downstream for another Member State. Whereas costs have to be accounted for now, benefits take time to materialise (see [effectiveness](#)). Member States have some flexibility regarding the establishment of collection system (see [IAS](#)). The administrative costs are deemed appropriate considering the benefits that the Directive brings, though some potential for reducing administrative burden was identified.

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<sup>54</sup> To note: This Decision did not have an impact on the information that is required to be made available to the public.

<sup>55</sup> In FL most of the infrastructure needed for UWWTD implementation was already existent prior to the UWWTD, thus comparatively little of the benefits can be attributed to the UWWTD. In SK high use is made of IAS, which might lead to lower cost savings and thus lower benefits compared to a situation where less IAS are used.

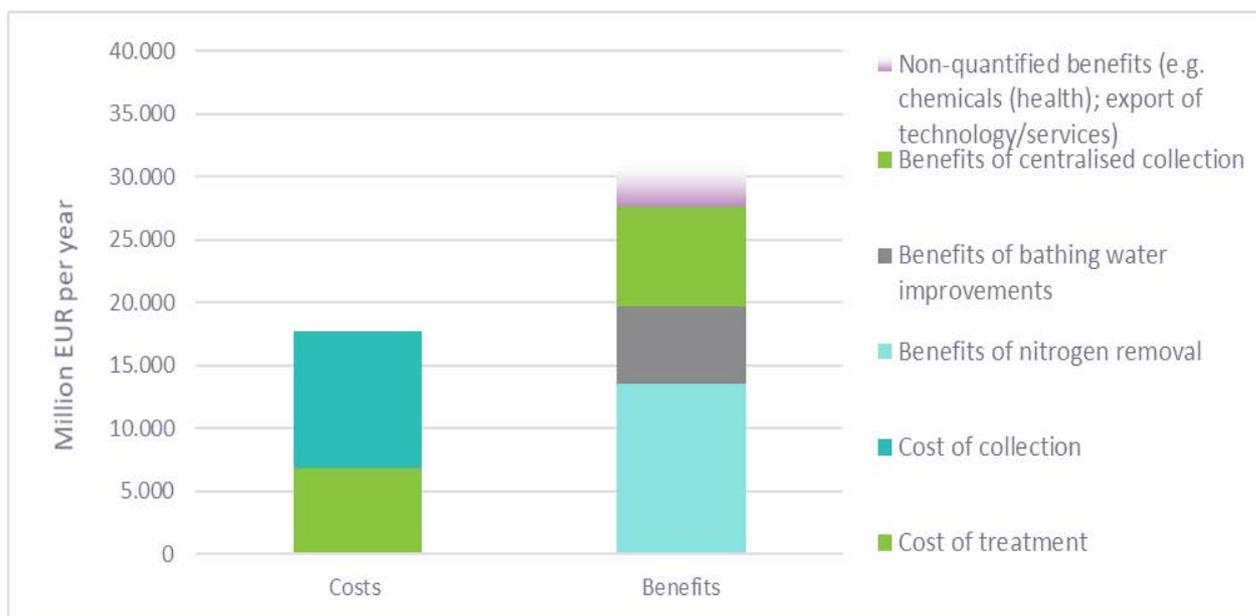


Figure 37 Comparison of annualised benefits and costs at current implementation levels

The findings on proportionality of costs and benefits were confirmed in the public consultation — 301 out of 606 respondents to the public consultation agreed that benefits outweigh the costs (89 provided no answer, and 48 indicated they did not know); citizens also concurred with this (representing 218 of the 301 replies). Similarly, operators mostly stated that benefits outweigh the costs; only a quarter of them deemed benefits and costs to be at similar level. Most respondents ‘strongly agree’ or ‘agree’ (35% and 44%, n=303) that the costs related to the UWWTD are justified, given its benefits, with citizens being the largest group being in favour. 81% ‘strongly agree’ or ‘agree’ that the costs are justified given the long-term benefits, with respondents being mostly citizens and private or public WWTP operators. 1% and 5% ‘strongly disagree’ and ‘disagree’ with this finding (n=302). Across the answer options, 9-13% indicated that they ‘neither agree nor disagree’ and 5-8% indicated ‘they did not know’.

### 5.3. Coherence

**Evaluation question:** To what extent is the Directive internally and externally coherent?

Overall, the Directive is internally consistent and only two minor cases of inconsistency were noted by stakeholders. These concern one threshold that is set differently for industries compared to the thresholds for households and one missing link between Article 4 and the Annexes. On the latter, the Court provided a ruling and the missing link seems to have no impact on the implementation of the Directive.

The UWWTD **interacts well with other EU water and environmental law** in terms of supporting other pieces of legislation in reaching their objectives (e.g. WFD, BWD). Overall, the interaction and links with the main water legislation - the Water Framework Directive - are clear and the Directives have been mutually supportive in reaching their objectives. Some issues were identified with the European pollutants release and transfer register (E-PRTR) and the Industrial Emissions Directive (IED), with the latter also currently undergoing Evaluation. Reporting could be further aligned with the SSD.

No major inconsistency with **other EU legislation** has been found. Many other directives seem to benefit from the UWWTD’s implementation. However, given the age of the Directive, the UWWTD is no longer up-to-date with all new policy developments, and it could play a larger role in some contexts. It could play a larger role in some contexts, for instance as regards **energy**, especially Governance regulation 2018/1999 and the Energy Efficiency Directive 2012/27/EU as amended by Directive

2018/2002, and **climate change** initiatives on EU and Member State levels. This is further explored under [relevance](#).

The **coherence** analysis assesses the Directive's 'internal' consistency, meaning the assessment of how different components of the intervention operate together, and 'external' consistency, meaning its interaction with other interventions at EU level.

### *Internal coherence*

Internal coherence means looking at how the various components of the same EU intervention operate together to achieve its objectives e.g. the different articles of a piece of legislation.

In terms of **internal coherence**, the UWWTD consists of a rather straightforward intervention logic, setting out clear measures for Member States to take within the deadlines set out in the Directive. Only two inconsistencies were noted. One pointed out by 18 Spanish WWTP operators relates to **different thresholds** in Article 13 concerning the threshold for treatment of industrial waste waters which is for above 4 000 p.e., whereas the UWWTD generally sets thresholds for urban waste water at above 2 000 p.e. There is, however, no evidence that this led to less effective or efficient implementation. Another inconsistency is a **missing link between Article 4 and Annex ID** (see [monitoring](#)).

The public consultation results on internal coherence showed that 28% and 53% of the respondents respectively think that the UWWTD is internally coherent to a large or to some extent. Only 2% think it is not at all coherent and 18% indicated that they do not know. The comments raised were rather inconclusive overall as stakeholders pointed to issues of external coherence or consistency with new issues rather than issues of internal coherence, apart from those mentioned above.

### *External coherence*

External coherence means that EU law and policies work together, with their objectives being complementary. Inconsistencies in objectives and actions should not exist. Apart from the objectives, coherence issues can arise from planning, monitoring and reporting obligations as well as from the practical application of the legislation.

### *Coherence with EU water law*

EU water law is governed by the **WFD, and its daughter Directives — the Environment Quality Standards Directive (EQSD) and the Groundwater Directive (GWD)**<sup>56</sup> classifying surface and ground water bodies and setting ecological and chemical quality and quantity objectives. The UWWTD sets minimum standards for collecting and treating waste water, and also classifies water bodies (i.e. sensitive areas), which are recognised as protected areas under the WFD. The UWWTD complements the WFD by setting load limits in treated waste water to protect the quality of water bodies from the adverse effect of untreated or inappropriately treated waste water discharges. These limits are uniform across the EU with additional parameters to be met when WWTPs discharge in sensitive areas (see [eutrophication](#)). Additional treatment can be

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<sup>56</sup> Even though the UWWTD and ND are older regarding their date of adoption, the WFD stems from the same origin – a Ministerial seminar in 1988, in which Member States called for more action to protect EU water bodies (Haigh, N. 2016).

required to satisfy the achievement of other directives. Similarly, the WFD requires Member States to take further action on identified pressures, which might be point sources (Article 11).

Regarding provisions for **reporting** and **diverging timetables**, these are not aligned between the Directives. Higher convergence to the lower frequency for reporting required under the WFD could lead to administrative burden being marginally reduced (EUR 84 000 annually for the entire EU under the UWWTD), but it is unclear whether there would be losses of benefits if UWWTD reporting was to be cut from every 2 to every 6 years. The existing reporting frequency is essential to regularly track progress made by Member States and ensure the UWWTD is enforced. In general, **no coherence issues** were identified in the legal texts; on the contrary, implementing the UWWTD is crucial to achieving the WFD's objectives.

Respondents to the public consultation confirmed that the WFD is to a large extent (50%) or to some extent (32%) aligned with the UWWTD (n=293). 17% indicated that they did not know.

Similarly to the WFD, the **MSFD** sets quality objectives for marine waters (which overlap with WFD waters in the coastal zone out to 1 nautical mile) and benefits from the UWWTD's implementation. It is difficult to establish how the improvement of the water quality affected fish stock, but the reduction of litter in marine water bodies should have boosted the quality of the fish. With regard to achieving the MSFD's objective — good environmental status by 2020 — it can be considered as inconsistent that, under the UWWTD, Member States can designate less sensitive areas in marine water bodies. Discharge of untreated waste water, or waste water only undergoing primary treatment, could potentially prevent Member States from achieving good environmental status for some of the descriptors under the MSFD. At the same time, this possibility is used only in two specific areas in Portugal. Apart from this, no inconsistency was found.

About half of the respondents to the public consultation (n=286) indicated that they did not know whether UWWTD and MSFD are well aligned.

Waste water is a major source of pollution for bathing sites (along with surface runoff from farms). During heavy rain events and flooding, this pollution increases due to SWOs. Heavy investments into waste water infrastructure over recent decades led to cleaner bathing sites (EEA, 2018c). This aligns with the JRC's modelling results on coliforms. The **BWD** requires bathing sites to be identified and classified. It contains two parameters to control microbial pollution in bathing water sites, whereas the UWWTD does not directly target microbial pollution. To meet the BWD's requirements, areas should also be designated as sensitive under Annex IIA criterion (c), and WWTPs would need to ensure that the BWD requirements are met. Overall, the two Directives are aligned.

The **DWD** sets out quality standards to ensure that drinking water is safe. To meet the DWD's requirements, areas have also been designated as sensitive under Annex II criterion (b) and WWTPs discharging in those areas have to use more stringent treatment under the UWWTD. In 2018, the Commission adopted a proposal for a recast of the DWD. At the time of the Evaluation, the proposal is under negotiation by Council and Parliament (EC, 2018c). Cleaner surface water and groundwater ensure that treatment costs of drinking water are lower.

In the public consultation, stakeholders stated that the BWD and the DWD are consistent to a 'large' or to 'some extent' (19%/49% and 18%/48%, n=290), providing little explanatory information. 27% and 22% indicated that they did not know.

The [Industrial Emissions Directive](#) (IED) covers industrial emissions, and also emissions to water. The IED sets out in Annex I that activities within the scope of the UWWTD are excluded. Plants under the UWWTD may also receive significant amounts of industrial waste water containing a range of pollutants, but this should be subject to a permitting process. However, it is not clear what activities are exactly covered by the UWWTD regarding industrial waste water. There is also an overlap in industries covered, with both Directives addressing the food, drink and milk sector. Also, while Article 15(1) of the IED provides that indirect releases of waste water from IED installations must not result in higher levels of pollution in the environment than direct releases complying with 'best available techniques conclusions', competent authorities report difficulties in implementing this provision. Furthermore, neither the IED nor the UWWTD contain clear requirements for treating sludge in order to reuse it – which might also fall under the Sewage Sludge Directive (SSD).

Those responding to the public consultation confirmed that further alignment between the Directives is possible, with only 9% stating that they are consistent to a large extent, while 20% stated that they are not consistent at all. Most (38%) stated that they did not know (n=288).

The [European Pollutant Release and Transfer Register](#) provides access to key environmental data from industrial installations across the EU<sup>57</sup>. WWTPs >150 000 p.e. are registered in the E-PRTR. However, this threshold is not consistent with thresholds set under the UWWTD. A recent EEA report on industrial waste water noted that more quality assurance checks on UWWTD reporting need to be carried out, and that UWWTD data needs to be streamlined to be included in the E-PRTR (EEA, 2018d; ETC/TCM, 2017).

About half of the stakeholders replying to public consultation on the consistency between the E-PRTR and the UWWTD stated that they did not know whether they are aligned (n=286).

The [Floods Directive](#) requires Member States to ensure that water courses and coast lines at risk of flooding are being assessed. Interaction with the UWWTD takes place on the level of urban planning and urban flooding due to heavy rainfall and consequent SWOs. For urban planning, local authorities need to balance the measures required by both Directives. Overall, no inconsistency was observed.

The **Nitrates Directive (ND)**, similar to the UWWTD, sets emission thresholds for a specific pollution source, i.e. nitrates from agricultural uses. The ND also requires the designation of areas, called 'nitrates vulnerable zones' (see [eutrophication](#)), based on pollution induced by nitrates from agriculture and the trophic status of the water. Like the UWWTD, the ND also requires reporting. No major inconsistencies were found.

Stakeholders replying to the public consultation provided mixed feedback on alignment with ND and Floods Directive: Whereas 19% and 32% think that these are not aligned at

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<sup>57</sup> + Iceland, Liechtenstein and Norway

all with the UWWTD, 39% and 27% think that they are to some extent. Additional written comments indicate that for stakeholders the interaction of the Directives during planning processes is important to be considered. However, this is a national issue rather than being directly related to the UWWTD.

The [Sewage Sludge Directive \(SSD\)](#), adopted in 1986, protects human health and the environment from the potentially harmful effects of the agricultural use of sludge. The SSD's focus is on heavy metals that can accumulate in sludge. Article 14 of the UWWTD requires the reuse of sludge 'whenever appropriate' without providing details on how reuse is meant to take place. Thus, the SSD's methodologies apply when sludge is used in agriculture. Both Directives define sludge slightly differently, with the SSD not being limited to sludge from urban waste water. The SSD's Evaluation found that the two Directives are complementary, but that there is room for alignment through clarifying links and analytical methods, and aligning reporting cycles<sup>58</sup>. The latter was confirmed by stakeholders who indicated that aligning reporting requirements would reduce burden and complexity as sludge is usually not dealt with by water authorities<sup>59</sup>. In this context, also the new [Fertilisers Regulation](#), which harmonises the requirements for fertilisers produced from phosphate minerals and from organic or secondary raw materials in the EU, needs to be considered.<sup>60</sup> This new regulation does not affect the application of the SSD and ensures in addition to it the protection of the soil.

#### *Coherence with other EU law and policies*

The [Birds and Habitats Directive](#) (Nature Directives), adopted in 1979 and 1992 respectively, do not refer to the UWWTD, though controlling waste water discharges is relevant to fulfilling their objectives too. The link between the Directives is implicitly made through the WFD, which requires protected areas under the Nature Directives to be included in the RBMPs and the programmes of measures. Overall no inconsistencies were found.

About half of the respondents to the public consultation (n=285) indicated that they did not know whether the UWWTD and the Nature Directives are aligned.

Other new policy areas that have significantly developed since the 1990s include the EU's **climate policy and energy agenda**. With a changing climate WWTPs play an increasingly important role in terms of quickly recycling water, helping to meet the challenges of increasing water quantity. Their potential was taken up in the 2018 Commission's water reuse proposal. Upgrading collection systems to deal with increasing amounts of water during heavy rainfall can be viewed as supporting EU policy on adapting to climate change. Furthermore, having centralised aerobic waste water treatment can help to achieve the EU's climate mitigation goals, as it has reduced GHG emissions compared to commonly used decentralised anaerobic systems such as septic tanks or anaerobic lagoons (IPCC, 2009). However, WWTPs use high amounts of

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<sup>58</sup> Some stakeholders during the SSD Evaluation held that although suitable to separate sanitation legislation and other functions (sludge), it might be inefficient. Any treatment requirements at UWWTD level have direct consequences on the usability of sludge for other purposes.

<sup>59</sup> The SSD reporting requirements have recently been amended: European Parliament and Council (2019) [Regulation on the alignment of reporting obligations in the field of legislation related to the environment](#).

<sup>60</sup> Council (2019). [EU adopts new rules on fertilisers](#).

energy, thus also contributing to GHG emissions. In recent years, some WWTPs have been retrofitted. They have thus become net energy producers, and now help to fulfil the objectives of the EU's [energy agenda](#) (see [UWWTD and climate change](#)). Overall, no formal/legal inconsistency was observed, but the potential for further alignment exists.

Respondents to the public consultation confirmed these findings; between 40-44% agree that the UWWTD is not aligned with the EU's climate (n=285) or energy policies (n=287), and argued in their comments that more needs to be done to reap the benefits of further alignment.

In contrast, the **UWWTD and the EU's cohesion policy** have been aligned since they came into existence. Both the European Regional Development Fund and the Cohesion Fund have over recent decades substantially supported Member States in developing waste water infrastructure. Overall, no inconsistency was found.

#### 5.4. Relevance

**Evaluation question:** To what extent is the UWWTD and its intervention logic still relevant and appropriate – especially in light of new societal problems and needs?

Over recent decades, some societal needs and problems, that are addressed by the UWWTD and which influence the UWWTD's functioning, have changed and new ones have emerged.

1. There is increasing evidence that **contaminants of emerging concern (CECs)**, such as pharmaceuticals and microplastics, are found in all types of water bodies worldwide. One pathway is waste water collection and treatment. The UWWTD does not contain provisions to deal with CECs. Technologies exist to significantly reduce some CECs in waste water, such as some pharmaceuticals, at treatment plant level, but this will drive up treatment costs. Due to effective capture at treatment level, some CEC can be concentrated in the sludge. Some Member States and non-EU countries have started to take action, which usually includes a mixture of upstream action as well as treatment at priority WWTPs. Any follow-up to this Evaluation should consider whether the scope of the Directive needs to be adapted to deal with these new pollutants. It is clear that costs and benefits to society of any action would need to be carefully assessed.
  - a. **Anti-Microbial Resistance (AMR)** is a recognised global threat and can be transmitted via waste water into the environment. The links between AMR in the environment to human health are not yet fully clear. More research is needed to better understand the issue at hand, and the links to source control, waste water collection and waste water treatment.
2. The Directive contains provisions that could encourage **water and sludge reuse** and thus circular economy integration, but the potential for the UWWTD to be embedded in the circular economy has not been fully exploited. The Commission's proposal for **water reuse** is a step in this direction. **Sludge reuse** can present some issues if sludge is contaminated with persistent chemicals. Many Member States have set stricter requirements or even banned reuse. Sludge used in agriculture could represent a diffuse source of pollution to the environment. Phosphorus recovery is possible from a technological perspective, but market demand for recovered phosphorus seems to be rather low at present.
3. Waste water treatment consumes a **high amount of energy** and uses about 0.8% of the total EU energy consumption. The UWWTD does not encourage any efficiency measures for energy consumption, while some WWTPs could actually be energy producers. It is not integrated to the extent possible into the EU's energy efficiency agenda.

The UWWTD is helping to achieve **SDG 6** and its targets as well as the European Citizens' Initiative's demand for access to water and sanitation. In terms of **innovation**, the UWWTD sets clear requirements in terms of parameters and threshold levels (see [monitoring](#)), but it does not contain clear requirements to take up new technologies. The EU water sector shows **business**

**leadership** when it comes to innovation, and strong regulation on EU level can be linked to this.

Assessing **relevance** considers whether the UWWTD’s intervention logic still satisfies societal needs and responds to societal problems. The assessment considers whether these needs and problems have changed over time, and to what extent the UWWTD is still fit for purpose.

The analysis so far has shown that the Directive is effective and tackles a major source of pollution to EU water bodies. A few Member States still need to make substantial progress in delivering and operating the necessary infrastructure, and the Directive is the driver for this action. By implementing the Directive fully and by upholding high compliance levels, Member States ensure that the environment and public health is protected from the adverse effects of urban waste water discharges. Apart from the need to address the remaining loads as discussed under [effectiveness](#), the UWWTD and its operation is also considered here in light of new societal issues, including: i) CECs for which the evidence base of their existence in all forms are water is increasing; ii) the UWWTD and the circular economy; and iii) the UWWTD and climate change, by assessing the use of energy by WWTPs, in light of increasing need to consider energy efficiency in all industries.

Furthermore, the relevance of the UWWTD in the context of innovation, business leadership and changing international contexts, which are now dominated by the SDGs, is discussed.

#### *Contaminants of emerging concern*

The UWWTD does not include any definition or requirements on Contaminants of Emerging Concern (CECs), whereas the EQSD as amended by the Priority Substance Directive refers to pollutants of emerging concern in its Recital 26. Two sub-groups of CECs are currently receiving a lot of media attention: pharmaceuticals and microplastics. The Commission’s PIE strategic approach and Plastics strategy require further assessment of treatment potential for pharmaceuticals and microplastics as part of this Evaluation.

#### **Mercury**

While mercury pollution is largely airborne and can travel long distances before being deposited, vast amounts of mercury are spread over land, seas and oceans. As mercury can, under certain conditions, be methylated into methylmercury (a highly toxic form of mercury) people could be exposed to mercury mainly through their diet, in particular by consuming contaminated seafood.

Mercury pollution, including water pollution, contains newly introduced mercury and re-emitted mercury. It results in over 40% of surface water bodies not achieving good status.

Although there is extensive monitoring of air, linking the source to the sink is a major challenge. Mercury in surface waters stems from a wide variety of sources, pathways, interactions and consequences.

Although a decrease can be seen in mercury releases to water from industry, WWTPs are still named one of the important pathway for mercury pollution. One possible source for such pollution could be dentistry (dental amalgam) whilst run-offs may also be a significant source.

Since 2018, the EU has new stricter rules on mercury use in dental amalgam and further actions are envisaged to reduce and ultimately end the use of dental amalgam. However, understanding spatial and temporal trends of mercury is crucial in assessing measures taken at EU level.

European Commission (2018d) [Mercury](#); EEA (2018e) [Mercury in Europe’s Environment](#).

CECs enter waste water collection systems and WWTPs through domestic use of household chemicals (detergents, cleaning products, textile fibres and personal care products), pharmaceuticals, disposal, as well as through urban runoff (which can contain tyre abrasions, pesticides and many other pollutants) (UNESCO, 2019). In the WWTPs, concentrations of some CECs are being reduced to a certain extent in one of the treatment steps (see Pistocchi *et al*, 2019)). From a water quality perspective, the release of chemical pollution as part of effluent into the environment was significantly reduced thanks to treatment being in place across the EU, even if chemical pollution was not directly targeted. In the **UK**, a study of over 160 WWTPs found that treatment processes achieved high standards of contaminant removal, often of 80 to 90%, but that this could still be insufficient to meet standards to protect water quality in rivers and streams (UKWIR, 2014).

As noted for nutrients, waste water is not the only source for this kind of pollution in our waters (EEA, 2018f). Although evidence at regional and Member State level is increasing in terms of what kind of CECs are in EU water bodies, there is not yet an EU-wide overview of which CECs are most often found and at what concentration levels. This is because CECs are not consistently monitored and more evidence needs to be collected.

Some countries, both EU and non-EU, are taking action to deal with CECs. In 2019, the **Rhine Commission** issued its recommendation suggesting a number of upstream solutions, as well as, based on priority criteria and experience, to choose relevant WWTPs which should be equipped with an additional purification stage (e.g. ozonation, active carbon). (International Rhine Commission, 2019). Similarly, and given that EU law principally regulates the placing of substances on the market, the **German Environment Agency** argues that additional downstream measures that ensure safe disposal are necessary. This could be done by upgrading (i.e. retrofitting) WWTPs to the fourth treatment stage. The right combination of different measures needs to be established to ensure that any investments are efficient and effective. Additionally, suitable measures to deal with micropollutants that enter water bodies through rainwater and CSO need to be found (Umweltbundesamt, 2015). In **Switzerland**, based on public consultation, it was decided that about 100 prioritised WWTPs would gradually be upgraded to the fourth treatment stage by 2040<sup>61</sup>. Instead of treating specific pollutants, the focus in Switzerland is on 12 proxy substances (VSA Plattform, n.d.).

#### **Anti-microbial resistance (AMR)**

AMR is recognised as a growing threat to human health, as it is rising worldwide. More and more antibiotics may be losing their effectiveness. The threat of AMR was also recognised by the EU's AMR action plan. It is estimated that AMR is responsible for about 33,000 deaths per year in the EU, as well as resulting in about EUR 1.5 billion per year in healthcare costs and productivity losses. AMR bacteria have been found downstream in WWTPs. WWTPs are reducing the amounts of bacteria in sewage, with secondary treatment already reducing parts of the bacterial load. In this regard disinfection is especially effective as a treatment. A Dutch study shows that UWWT can reduce bacteria by 100-1000 times. Overall, further research is needed to understand the risks AMR poses to the environment, the risks of discharges and to understand UWWT's role in limiting risks to the environment and human health risks. Further monitoring of data is needed to understand what technology and management options are adequate. Also, the consequences of AMR in sludge being applied to land needs to be better understood.

WHO (2019); EC (2017c); EC (2019d); Swedish EPA (2017); EEA (2019b); Schmitt et al. (2017); Bloomer & McKee (2018).

Those respondents to the public consultation, who suggested topics not yet adequately addressed by the UWWTD, most often named emerging pollutants. During the stakeholder conference micropollutants were also recognised as the most pertinent future challenge.

One group of CECs, **pharmaceuticals, along with their residues**, are increasingly found in surface waters and drinking water worldwide (*Figure 38*)<sup>62</sup>. Though pharmaceuticals are essential for human and animal health, there is increasing concern about their impact on the environment (OECD, 2019b). The Commission's 2019 PIE strategic approach stresses that pharmaceuticals reach the environment through excreted and unused pharmaceuticals entering collection systems and WWTPs (EC, 2019a, WHO,

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<sup>61</sup> Focused upgrade: WWTPs are chosen according to where they discharge (whether into sensitive water bodies or drinking water resources or if they are very large (> 80 000 pe.).

<sup>62</sup> The WHO concluded that based on the evidence found so far it is very unlikely that pharmaceuticals in drinking water pose a threat to human health.

2017, OECD, 2019b)<sup>63</sup>. With an ageing society residues of pharmaceuticals are becoming an increasingly worrying issue. Another source is the spreading of sludge that potentially contains pharmaceuticals and other contaminants that have been transferred during treatment (EC, 2019a). Evidence shows that certain pharmaceuticals stay in the environment, and can be spread through water and soil<sup>64</sup>. Effects on aquatic life show that some male fish exposed to the residues of the contraceptive EE2 may change sex, and fish exposed to antidepressants change their behaviour, which could affect their survival. The WHO highlights that a precautionary approach is needed in relation to long-term exposure of vulnerable groups.

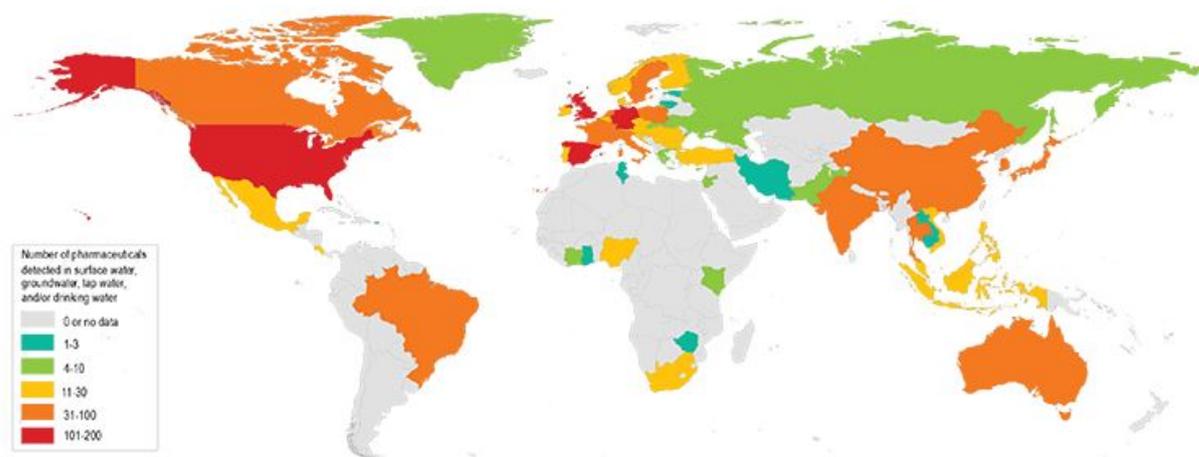


Figure 38 Number of pharmaceuticals detected in surface water, groundwater or drinking water globally. Source: aus der Beek et al., 2015, taken from OECD (2019b).

In a study of influent to and effluent from over 40 WWTPs over a year, **the UK water industry research** studied twenty substances including antibiotics, analgesics, anti-hypertensives and antidepressants. They found that the majority of substances studied were removed to a high degree. However, some were less effectively treated and were present in effluents at concentrations, which might cause concern (UKWIR, 2018a).

The **Swedish Environmental Protection Agency** found that there is a need to introduce treatment for pharmaceutical residues in waste water. Its findings identified the human excretion of residues as the largest source of pharmaceuticals in the environment. Such treatment would also reduce other hazardous substances. Given the costs involved in upgrading treatment, it is still unclear how many WWTPs need to be upgraded and which ones should be prioritised (Swedish EPA, 2017).

Another group of CECs that receive a lot of public attention are **microplastics**. The European Commission plastics strategy identified microplastics and other plastic items such as wet wipes ending up in waterways as an increasingly important issue to tackle. Evidence shows that untreated waste water can contain high amounts of microplastics (Prata, 2018). One source of microplastics in waste water and water bodies are those that

<sup>63</sup> 'Between 30 and 90% of the orally administered dose is generally excreted as active substance in the urine of animals and humans. However, the nature and amount of medicinal residues mainly depend on the volumes and nature of the administered substances, their modes of administration, and metabolism rates' (BIO Intelligence service, 2013).

<sup>64</sup> A large amount also comes from veterinary use.

are intentionally added to products, meaning they stem from personal care products, detergents, paints, coatings and inks, medicinal products and food supplements (ECHA, 2019)<sup>65</sup>. The second source is unintentionally released microplastics that can come from clothing, tyre abrasions, and road markings, with the latter two entering the environment, via runoff (Eunomia, 2018).

When microplastics reach WWTPs they are mostly, though not completely, captured in one of the treatment steps and transferred to the sludge. ECHA estimates that primary treatment captures up to 80.5% of microplastics, secondary treatment up to 97.5% and tertiary treatment up to 99.7% (Figure 39). Advanced treatment technologies such as bioreactors only have a marginally higher removal efficiency, which is not surprising as this treatment is often focused on N and P removal with limited or no additional removal of solids compared to secondary treatment.

Treatment type	Microplastic retention (%)	Reference and notes (size of particles)
Primary	83	Dris et al. (2015)
	78	Murphy et al. (2016)
	<b>Mean 80.5</b>	
Secondary	95	Dris et al. (2015)
	98.4	Murphy et al. (2016)
	98.3	Lares et al. (2018)
	99.6	Talvitie et al. (2017b)
	96	Michielssen et al. (2016)
	99	Magnusson and Noren (2014) cited by Talvitie et al. (2015)
	<b>Mean 97.5</b>	
Tertiary	99.9	Magnusson and Noren (2014) cited by Talvitie et al. (2015)
	99.9	Carr et al. (2016)
	97	Mintenig et al. (2017)
	99.4	Lares et al. (2018)
	99.7	Michielssen et al. (2016)
	<b>Mean 99.2</b>	

Figure 39 Microplastics retention in waste water treatment. Source: ECHA (2019).

When microplastics are removed during treatment, they end up in sludge, with the **Danish Environmental Protection Agency** (2017) reporting “a median concentration of microplastics in dewatered sludge sampled from five WWTPs of 4.5 mg/g, which corresponds with microplastics comprising 0.7% of the dewatered sludge” (ECHA, 2019) (see [UWWTD and circular economy](#)). Some EU regions have also recognised the need to tackle microplastics in water bodies and for further research (Kompetenzzentrum, n.d.).

There are also other polluting items such as biomedica - Surfrider (2018) found that biomedica, used for treatment in WWTPs, are often found in the aquatic environment, released through overflow events in tanks in which they are used, or released due to malfunctioning in the WWTP. Furthermore, a UK study found that larger items, such as wet wipes, are often inappropriately disposed of and can cause sewer blockages. These wet wipes are not meant to be flushed and consist of non-degradable material (Water UK, 2017).

<sup>65</sup> This list is not exhaustive. See: ECHA (2019).

Stakeholders (mostly WWTP operators and trade associations) also raised the issue of microplastics and pharmaceuticals in the public consultation and at the stakeholder conference.

### *The UWWTD and circular economy*

The main resources coming from waste water (treatment) that are usually considered for integration into circular economy closed-loop thinking are reclaimed water, sludge, recovered phosphorus and nitrogen, and energy.

Article 12 of the UWWTD requires Member States to **reuse treated waste water** whenever appropriate. The Council and the Parliament recently agreed on a Regulation for water reuse in agriculture (EC, 2019h, EC, 2018e). In the accompanying impact assessment, the Commission concluded that the dealing with water reuse on EU level could lead to water reuse in agricultural irrigation in the magnitude of 6.6 billion m<sup>3</sup> per year, as compared to 1.7 billion m<sup>3</sup> per year in the absence of any EU legal framework. Re-using more than 50% of the total water volume theoretically available for irrigation from WWTPs in the EU would avoid more than 5% of direct abstraction from water bodies and groundwater, resulting in a more than 5% reduction of water stress overall (EC, 2018f).

Article 14 of the UWWTD requires Member States to **reuse sludge** whenever appropriate, but this has never been strongly enforced partly due to the lack of strong EU-level standards on how to do this without endangering human health. When Member States want to reuse sludge, they need to comply with the SSD (EC, 2016b). Many Member States have set more stringent requirements on concentration limits of heavy metals, (synthetic) organic compounds and microbial content for sludge reuse (Hudcova *et al.*, 2018). Data from 2014 shows that:

- 8.7 million tonnes of dry solid matter of sludge were produced in the EU, with 58% of it reused, mostly in agriculture;
- half of the P removed from waste water was reused or recycled with a value of EUR 900 per tonne;
- N was also recycled with a value of EUR 1,300 per tonne (EC, 2017d).

Sludge is also an energy source through digestion but the Directive does not encourage this (see [energy](#)). Using sludge in agriculture is the most direct way to ensure that nutrients (N and P) are recovered. Mineral N production requires high levels of energy. In the EU, there are only small reserves of P and its price has been volatile in the past. It is mainly used in feed and fertiliser in the EU. A major reason for P losses is the inefficient use of waste water (EC, 2015). Technologies exist for cost-efficient P recovery from sludge, but according to the water industry association EurEau ‘access to the market is limited because of its low-quality waste image’ (EurEau, 2018).

A major problem regarding sludge reuse is that many pollutants being removed from the waste water could consequently be transferred to the sludge (*Figure 40*). *Figure 40* is only indicative as no total emission data for these chemicals were available. The sludge can also contain polycyclic aromatic hydrocarbons (PAH) and perfluorinated surfactants (PFAs) (Wood *et al.*, 2019b) as well as microplastics. A recent Norwegian study sampled **microplastics** captured by one WWTP: 181,679,012 microplastic particles were transferred from the waste water into the sludge each day. They further estimated that ‘between 110 000 and 730 000 tonnes of microplastics are transferred every year to agricultural soils in Europe and North America’ (Niva, 2018).

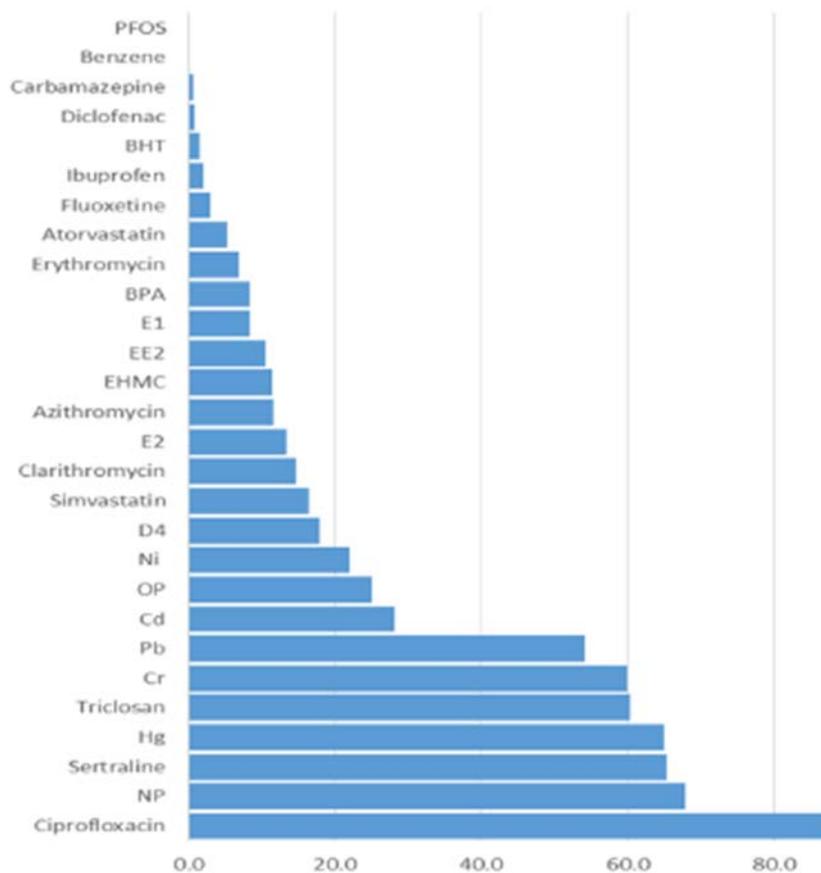


Figure 40 Modelled % of pollutant load incoming to a WWTP, which is retained in sludge, based on the assumed properties of chemicals

There is limited understanding of the behaviours of contaminants of emerging concern in sludge. A study of sludge from 11 WWTPs in the UK suggested that pharmaceutical residues in sludge should not lead to concentrations of concern in soils (UKWIR, 2018b). Pollution reduces the quality of the sludge and using it for agricultural purposes transfers the environmental problem from water to soil where it may become a source of diffuse pollution or be taken up into crops. More analysis of the actual sludge composition and more research is needed to fully understand how these chemicals behave in sludge and how they behave when sludge is reused in agriculture.

Respondents to the public consultation were rather negative when asked to assess the Directive's alignment with circular economy principles. Between 41-47% (n=297-300) believe that the UWWTD does not promote safe water reuse, sustainable approaches such as phosphorus and nitrogen recycling, and safe sludge reuse. Only 6-8% believe that it is aligned to a large extent. Replies of 'I do not know' were received by 14-17% for all answer options. On sludge reuse, academics, companies, private and public associations as well as authorities at different governance levels indicated that the Directive is not compatible with circular economy principles (n=300).

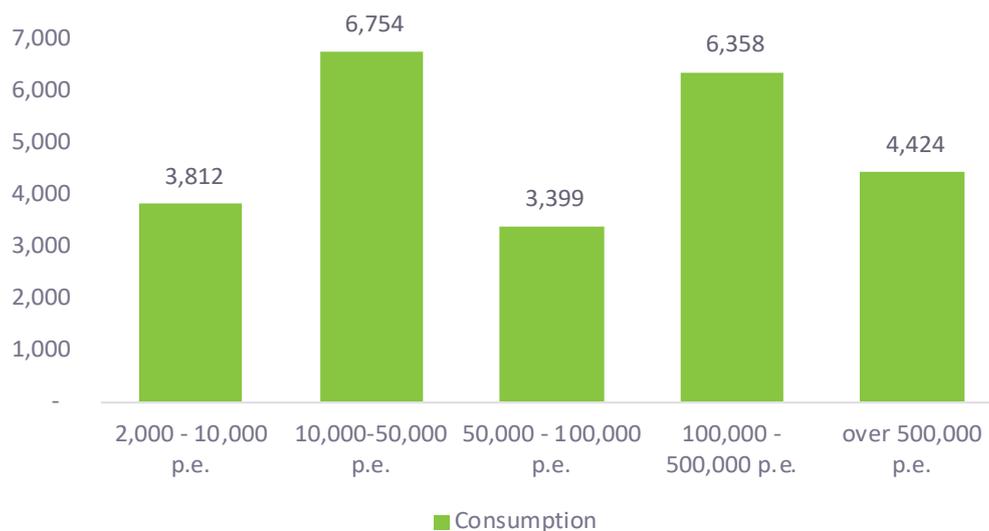
#### *The UWWTD and climate change*

Climate change has already increased and will continue to increase the number of heavy precipitation events that lead to storm water overflows and more urban run-off, which means there is a growing need to tackle these issues. They are discussed in more detail under [storm water overflows](#).

In this context also the water-energy nexus needs to be considered: The energy generation sector is the largest consumer of water, accounting for 44% of consumption.<sup>66</sup> The water and wastewater sectors account for 3.5% of electricity use in the EU and that share is expected to rise.<sup>67</sup> At the same time, leaks account for 24% of total water consumed in the EU, representing significant wastage and a loss in terms of wasted water resources and in terms of the energy used to treat those resources.

The effective and energy efficient management of water can contribute significant energy savings. According to the International Energy Agency, 10% of global water withdrawals relate to energy production and this figure is expected to increase significantly with the promotion of several low carbon but water intensive processes, including electricity generation, biofuel production and carbon capture and storage.<sup>68</sup> Member States could therefore explore the potential for energy savings through the use of smart technologies and processes.

In this context, also the energy use of WWTPs has been considered. The UWWTD does not include requirements on energy consumption and/or production. Estimates show that EU WWTPs (those falling under the UWWTD) use 0.8% of all energy consumed in the EU; small plants use 42% of the total energy used for waste water treatment and large plants 58% (*Figure 41*). This roughly amounts to two power plants' worth of energy annually. Usually the higher the treatment level, the more energy is needed.



*Figure 41 Energy consumption in GWh per year, estimates per WWTP-size in EU. Source: adapted from Ganora et al. (2019).*

Energy costs can constitute 25-56% of a WWTP's O&M costs. These costs can make up 20% of the municipality's bill, which is estimated to cost the public EUR 2 billion per year. Shifting the least efficient plants to an average level of efficiency would enable a saving of 5 500 GWh annually, while if they complied with the standards of the most efficient plants this would save 13 000 GWh/ year (Ganora et al, 2019). Very little information was available to assess energy use in waste water collection systems and potentials to reduce this use.

<sup>66</sup> See recital 22 of amending Directive (EU) 2018/2002 and C(2019) 6621 final.

<sup>67</sup> See recital 22 of amending Directive (EU) 2018/2002 and C(2019) 6621 final.

<sup>68</sup> For further information, see the IEA's [World Energy Outlook 2018](#).

The collection and treatment of waste water allow for biogas to be captured as an energy source, and the use of sewage sludge either in agriculture or as an energy source itself, in both cases decreasing the use of fossil fuels in GHG emitting processes. It is estimated that treatment plants could produce energy of up to 87 500 GWh per year, which is equal to the output of 12 big power stations (POWERSTEP, 2018). Across the EU, there are several examples of WWTPs that are energy neutral or that even produce energy. For instance, the Danish Marselisborg plant produces 230% of its energy. This was achieved through process improvements, such as upgrading of sensors and thorough energy audits. The energy that is not reused within the WWTP is used for pumping and district heating. Overall, its water bill was reduced by about 20% over 2 years. Similarly, the Sofyska Voda WWTP in BG has achieved 123% energy self-sufficiency through improvements of aerations processes, anaerobic digestion of sludge, use of on-site combined heat and power co-generation (Ganora *et al.*, 2018).

To achieve these energy efficiency potentials, WWTP operators need to make (potentially high) initial investments such as replacing inefficient technologies and carrying out energy audits. The potential for savings probably varies between bigger and smaller plants, with the bigger ones having higher potential to achieve more with less effort. As the waste water sector is usually in public hands, it might often be difficult to have access to funding to carry out the initial investments. Additionally, it needs to be ensured that if WWTPs were to become clean energy producers, they would be able to feed the energy into the network.

Energy savings in the water sector are also incentivised by the amending Directive (EU) 2018/2002 on energy efficiency, and can relieve municipalities' budgets. As, for example, the awareness, experience, capacities can vary largely from one municipality to the other, regional or national programmes can be useful to facilitate experience sharing, technological support and financial aids could thus increase the energy savings potential. With the entry into force of the Governance Regulation (EU) 2018/1999 and the Energy Efficiency Directive 2012/27/EU as amended by Directive (EU) 2018/2002 on energy efficiency, the 'energy efficiency first' principle applies. The water sector can be amongst the beneficiaries of this principle.

44% of respondents to the public consultation (n=285) felt that the Directive was not aligned with EU energy policies, with 7% believing that it was aligned to a large extent and 32% 'did not know'. In particular, those involved in the waste water technology industry took the opportunity to stress the need for further alignment in position papers and comment sections. Stakeholders noted that WWTPs' high use of energy is an unexpected negative impact of the UWWTD.

### *The UWWTD, the Sustainable Development Goals and citizens' demands*

Regarding the United Nation's (UN) Sustainable Development Goals (SDGs), the one that the UWWTD is most associated with is SDG 6 'Clean Water and Sanitation' (UN, n.d.a)<sup>69</sup> The UWWTD, being older than the SDGs, lays the groundwork for part of SDG 6 to be achieved. By requiring that collection systems (e.g. transport) be established and ensuring that treatment adequately takes into consideration the sensitivity of the

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<sup>69</sup> WHO definition of sanitation: 'access to and use of facilities and services for the safe disposal of human urine and faeces. A safe sanitation system is a system designed and used to separate human excreta from human contact at all steps of the sanitation service chain from toilet capture and containment through emptying, transport, treatment (in-situ or offsite) and final disposal or end use.' WHO (2018a).

receiving water body, the Directive has increased EU citizens access to the collection systems and to clean water. Reaching full compliance with the UWWTD would help to achieve SDG 6.2, as according to 2014 data 10 million people in the EU were still not connected to the collection system (EC, 2017d). Globally, more than 80% of urban waste water is still discharged without being treated (UN, n.d.b) and according to the WHO more than 842 000 deaths can be related to unsafe or inappropriate water, sanitation and health conditions (WHO, 2018b).

However, the UWWTD does not contain provisions that require Member States to guarantee access to waste water services for all EU citizens, neither does it set out how exactly people can be connected to the collection system. Furthermore, as a directive, it cannot enshrine this as a human right. The subsidiarity principle needs to be respected and thus it is the Member States' responsibility to ensure that citizens have the possibility to connect to the collection system, as appropriate.

Citizens have been clearly demanding access to clean water, as shown through the first successful European Citizens Initiative 'Right2Water' and the 368 000 citizen responses to the public consultation of the Water Fitness Check<sup>70</sup>. More recently, a **Eurobarometer study** in 2017 showed that more than a third (36%) of EU citizens picked the pollution of rivers, lakes and groundwater as one of the four most important environmental issues in their lives<sup>71</sup>. SDG 6.3 also requires the improvement of 'water quality by reducing pollution, eliminating dumping and minimising the release of hazardous chemicals and materials, halving the proportion of untreated waste water and substantially increasing recycling and safe reuse globally' (UN, n.d.). As shown under [effectiveness](#), the UWWTD strongly contributes to reducing organic pollution and hazardous chemicals from waste water (see Pistocchi *et al*, 2019), and is thus helping to protect the aquatic environment.

Respondents to the public consultation agreed that the UWWTD is aligned to some extent (n=153) with the SDGs.

#### *The UWWTD, contribution to EU leadership on water services sector and innovation*

The recitals to the UWWTD require that a 'Committee should be established to assist the Commission on matters relating to the implementation of this Directive and to its adaptation to technical progress.' Furthermore, Annex IA states that 'the design, construction and maintenance of collecting systems shall be undertaken in accordance with the best technical knowledge not entailing excessive costs' ([Case C-310/10<sup>72</sup>](#)).

Regarding the Innovation Principle<sup>73</sup> it can be considered whether the UWWTD had positive or negative impacts on research and innovation capacities of the sector. The

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<sup>70</sup> A large majority of the responses (from more than 368,000 citizens) were identified as being part of campaigns promoted by several environmental organisations).

<sup>71</sup> After climate change, air pollution and waste management.

<sup>72</sup> Judgment of the Court (First Chamber), 18 October 2012 European Commission v United Kingdom of Great Britain and Northern Ireland; Failure of a Member State to fulfil obligations – Pollution and nuisance – Urban waste water treatment – Directive 91/271/EEC – Articles 3, 4 and 10 – Annex I(A) and (B); Case C-301/10.

<sup>73</sup> As published in February 2016 and further outlined under [Tool 21 of the Better Regulation guidelines](#).

UWWTD's main purpose is to reduce pollutant loads in treated waste water, and it does not require that any particular technology is used. Nevertheless, there have been many technological advances in the context of waste water over recent decades e.g. regarding treatment, nature-based solutions and integrating WWTPs into climate change mitigation activities. These innovative solutions, which are actively implemented across the EU Member States, show that the UWWTD does not negatively impact wide-spread innovativeness and research in the sector.

This can be further substantiated by considering the patenting activity in the sector: The EU holds 41% of the internationally granted patents in the water technology sector, whereas other economic zones of comparable size hold significantly smaller amounts, such as the USA which holds 29%, or Japan which holds 17% (see Annex 4, [patenting](#)). The UWWTD's implementation also triggered the financing of a high number of LIFE projects (between 2000-2017: about 138 LIFE projects dealt with waste water treatment) (EC, 2019d). LIFE project leaders argue that 'legalisation is a key driver for development of emergent systems, without a legal requirement, industry is unlikely to find the financing to make progress with advanced techniques' (Barrat & People, 2019).

Furthermore, of the leading global water companies, 8 out of the 15 largest in terms of estimated revenues in 2015 are from the EU (GWI, 2015). The implementation of strict EU water law, including the UWWTD, can be considered as a driver for innovation and business leadership. According to the 9<sup>th</sup> implementation report the waste water sector generates a production value of about EUR 96 billion and an added value of EUR 41 billion each year. If one assumes that 1% of the global water service sector is being related to the action of the UWWTD, this translates into EUR 5-6 billion per year for businesses (see Annex 4 [overview of cost-benefits](#)). However, this is based on assumptions and no clear evidence was identified in this regard.

This mixed picture is reflected by the results of the public consultation. 42% of the respondents agree that the UWWTD has encouraged research and development (n=317); this opinion was expressed particularly by NGOs, public associations, and public authorities. Also, public and private WWTPs largely stated that the Directive has encouraged research and development (95% and 90%). 25% of respondents strongly agreed and 52% agreed that stronger links could be made with technical progress, with 9% either disagreeing or neither agreeing or disagreeing (n=296).

## 5.5. EU added value

**Evaluation question:** To what extent is it necessary to address urban waste water on EU level and what would have happened without the Directive?

The UWWTD addresses an EU-wide problem that can substantially affect EU water quality and that is still persistent today. Although the WFD is now in place, a targeted approach is very effective to address one specific pollution type.

Considering the **subsidiarity principle**, EU-level action was and is necessary to tackle this issue, as Member States would not have achieved the same results on their own. **Ensuring that waste water is tackled across the EU in the same time frame ensures that downstream action is not jeopardised by upstream inaction.** The establishment of the necessary infrastructure required substantial investments in the water sector, but thanks to the UWWTD Member States had access to EU-level funding. This allowed them to improve the situation without endangering affordability. The UWWTD led to improved sanitation and equal levels of protection for human health in the EU, and improved bathing water sites (increased tourism) and water bodies in general. It also helped to set up a globally competitive EU water industry.

Without this Directive, only some Member States would have achieved the same level of protection that we have today, and the benefits outlined would not have been attained.

The assessment of the UWWTD's **EU added value** considers the changes that the Directive brought about at EU level and what Member States would have done without EU-level action. It considers whether the UWWTD is in line with the subsidiarity principle, which requires that EU action only be taken when measures are better achieved at EU level and not by Member States individually.

### *Addressing waste water at EU level and hypothetical impacts of withdrawal*

Evidence gathered under the other four Evaluation criteria assessed above, especially under effectiveness and relevance, shows that addressing waste water at EU level protects the environment from the adverse effects of waste water discharges, even beyond the Directive's objectives (see Pistocchi *et al.*, 2019). This comes with a number of benefits (see [efficiency](#)) that are shared among a large variety of stakeholders because of the transboundary nature of EU water bodies. Transboundary rivers cover 60% of the EU. Having no Directive on waste water in place, which imposes a similar rhythm of establishing waste water collection and treatment infrastructure, would likely have jeopardised the efforts made by neighbouring Member States, and thus part of the [benefits](#) described would have been lost or not have been attained. Requiring the same action to be taken across the EU on a transboundary issue ensured that citizens benefit from the same level of human health and environment protection.

Waste water services, which include collections, treatment and proper discharge, is a basic societal need that comes at a high cost regarding the infrastructure built-up and maintenance. Without the Directive, there would not have been the incentive nor the possibility of funding to do this in a relatively short time span (see [costs](#)). Having access to EU funding also ensured that affordability concerns remained marginal in those Member States where substantial investments were needed. Furthermore, the UWWTD does not prescribe to Member States how to make their citizens connect to the collection system and allows for IAS where these are more appropriate in terms of costs and are not harmful to the environment.

The UWWTD has yet to be fully implemented in many EU Member States and even Member States that are fully compliant need to be continuously vigilant in maintaining such compliance (enlargement, upgrade and maintenance of systems). It can be assumed that withdrawing the UWWTD would have negative consequences for all. EU citizens would no longer enjoy the same level of protection and Member States would no longer apply the same high standards, which could be detrimental for the environment. Furthermore, driving factors such as funding, legal action and promoting compliance would no longer exist to support Member States in developing waste water infrastructure.

Based on these findings, it can be argued that the Member States still cannot sufficiently achieve the UWWTD's objectives as:

- 1) the Directive has yet to be fully implemented, and analysis under effectiveness and efficiency showed that continued EU co-funding and EU legal action are needed to achieve full implementation and to reap all benefits;
- 2) in terms of water quality, the same level of protection cannot be attained if Member States do not apply the same standards, which thus jeopardises the efforts made downstream;

- 3) new societal needs have arisen within the context of waste water that make further action even more relevant, especially once the Directive is fully implemented.

Continuous action on EU level will better achieve the objectives. The UWWTD therefore complies with the subsidiarity principle.

The UWWTD also enabled waste water service and technology companies to compete on the same basis and thus helps the internal market to operate effectively. It does so by demanding the same standards across the EU. Over the past decade, the waste water sector grew substantially in size and grew from about EUR 13 billion in 2008 to about EUR 18 billion in 2016. The size is significantly larger in the EU-15 compared to the EU-13 though in terms of percentages the growth for EU-13 was 27% whereas for the EU15 it was only 15%. This might be linked to a large number of EU-13 countries having to meet the first UWWTD deadlines. Furthermore, strong water legislation has supported the development of a strong water sector, with 8 out of the 15 worldwide largest water businesses being based in the EU.

Stakeholders have also been vocal about the need for EU-level action: Two thirds of the stakeholders across all categories who replied to the public consultation (n=309) agreed that to deal with waste water EU-level action is needed to a large extent, and 86% (n=307) argued that withdrawing the Directive would have negative effects. This was reflected in the general part in which 69% of the stakeholders stated that EU law is needed in order to continue regulating the collection and treatment of waste water (n=608). Only 1% of the stakeholders stated that there is no need for regulation and 15% provided no answer. Furthermore, stakeholders, mostly citizens and NGOs, agreed that progress would not have happened without the Directive or would have happened more slowly (29% and 16% respectively), with only 7% arguing that changes would have happened anyway (n=608). Of that 7%, 44% were from Germany and 60% were citizens.

## 6. CONCLUSIONS

The UWWTD is one of the older pieces of EU water legislation, having been adopted in the early 1990s. The Directive works in the context of a number of pieces of water legislation and is the EU-level measure to deal with urban waste water. When the Directive was adopted, the extent of urban waste water treatment in the then 12 Member States differed vastly from today. Over the past three decades, the UWWTD's implementation has substantially progressed, with most Member States now having high compliance rates for collection and secondary treatment. Several Member States still need to make substantial efforts to be compliant, especially as regards reducing nutrients to required levels. Some of the initial 12 Member States are not yet fully compliant, whereas some Member States that joined the EU after 2004 have made remarkable progress within a relatively short time. A substantial number of infringement cases were launched over that period.

The Evaluation of the UWWTD provides a detailed assessment of the Directive's effectiveness, efficiency, coherence, relevance and EU added value. Regarding **effectiveness**, it finds that, where and when it is well implemented, the Directive led to **substantial reductions of pollutant loads being released to the environment**. These reductions have **supported the protection and improvement of EU water quality and helped to achieve the objectives of other water-related directives**. Further improvements are to be expected when Member States fully implement the Directive. Well maintained and operated waste water collection and treatment systems have protected aquatic ecosystems and bathing waters from pollution, thereby also ensuring

that **human health is protected**. While treatment that is required by the UWWTD does not directly target specific **chemicals** (other than N and P) **and microplastics**, it nonetheless helped to reduce the loads of these pollutants discharged directly from WWTPs to receiving waters. WWTPs remain a pathway for mercury to the aquatic environment. Certain WWTPs receive significant quantities of industrial waste water; depending on the constituents of industrial waste water and/or the levels of pre-treatment, a WWTP may only be capable of partially treating this industrial influent.

There are some **factors that reduce the Directive's effectiveness**. It has yet to be fully implemented in some Member States, which is mainly due to lack of funding and governance issues. The Commission **promoted compliance** by providing extensive funding, research and innovation programmes, through dialogues with Member States and by steering implementation by means of infringement procedures, when needed.

The implementation of the Directive requires substantial and focused investments in infrastructure. This was supported with Member States allocating to the EU water sector **the highest amounts of all environment-related Cohesion policy funds available**. A limited number of Member States still rely on EU funding. Whereas similar types of funding are likely to continue, the amounts available are likely to decrease over time. Preliminary OECD estimates show that an additional EUR 253 billion has to be spent in the EU until 2030 to maintain or achieve full compliance. Further re-investments in existing waste water infrastructure assets (collecting systems and waste water treatment plants) will be required to maintain compliance with the Directive. This is due to the ageing of assets, changes in the composition and quantities of loads to plants etc., through the adaptation or refurbishment of existing assets, development of additional/replacement assets and the need to uptake innovative solutions. In terms of financing the water sector, a few Member States have managed to move to almost **full cost recovery** for their water supply and waste water sector, and to apply the 'polluter pays' principle by charging households and industries. The vast majority of Member States rely on a mix of tariffs, taxes and EU funding to finance the investments. In general, **affordability** is not at risk except in some vulnerable countries, such as Romania and Bulgaria (in these Member States some major investments in the waste water infrastructure are still lacking, and large amounts of EU funding are still allocated to water management). Where costs are being fully recovered through water tariffs, the picture could substantially change if these are not coupled with social support measures.

Another **positive factor** that substantiates the effectiveness of the Directive is the clarity of its provisions: one of the success factors of the Directive is its **simplicity**. Overall, the Directive's requirements are straightforward and the associated deadlines are clear, which makes it **easily understandable and 'enforceable'**. Some of its provisions are, however, not entirely clear or are limited in their scope and thus reduce its overall effectiveness. These provisions concern SWOs, the use of malfunctioning IAS, small agglomerations and non-connected dwellings and eutrophication (apart from non-compliant agglomerations). The UWWTD's requirements on monitoring, reporting and providing information were also assessed and found to be generally adequate for monitoring compliance, with some shortcomings in terms of:

- 1) the time needed to make these available;
- 2) the level or amount of information provided;
- 3) the lack of progress with technological advances and innovation uptake; and
- 4) limitations in providing relevant and readily accessible information to the public.

As regards the Directive's **efficiency**, many of its effects (i.e. clean environment, health protection, competitiveness) directly benefit citizens, companies and Member States. However, only a few of its **benefits** can be quantified and monetised, such as: 1) the reduction of pollutants in effluent; 2) the improvement of bathing sites; and 3) cost savings related to moving from IAS to collection systems. In total it is assumed that these lead to an **annual benefit of up to EUR 30.6 billion in the EU once the Directive is fully implemented**. Note, however, that the assessment of benefits is based on assumptions, and subject to uncertainties. The Directive has also had a positive impact on the **global competitiveness** of the EU water sector — many EU water companies are strong global players and there is a high number of European water technology patents.

The costs for collection and treatment of waste water are **estimated at EUR 19.7 billion annually under full implementation**. It should be noted that the Directive allows for cost-efficient solutions: where excessive costs or lack of environmental benefits do not justify the installation of collection systems, Member States can use **individual or other appropriate systems** instead. The UWWTD contains few requirements that result in **administrative burden**. Most of the costs are borne by Member States, their competent local authorities and the Commission. **These costs are marginal compared to the costs of infrastructure**. Overall, it is concluded that the **benefits outweigh the costs**.

As regards the **coherence** of EU legislation and policies, the UWWTD **interacts well with other EU water and environmental laws** from a legal perspective, as well as in terms of supporting the implementation of other water legislation (for instance the Bathing Water Directive). Overall, the links with the main over-arching piece of water legislation, the Water Framework Directive, are clear and the directives are mutually supportive in reaching their goals. Many other environmental directives benefit from the UWWTD's implementation, with no substantial inconsistencies with other EU law or policies. Even with the adoption of the Water Framework Directive, the targeted UWWTD approach remains very effective in addressing one specific type of pollution.

The assessment also considered the UWWTD's **relevance** and whether it is still fit for purpose. It is clear that waste water remains a major source of pollution and that Member States need to continuously make efforts to address this. The Directive is a major driver of action in this area. Furthermore, a number of new societal problems were identified:

- 1) There is an increasing need to tackle **contaminants of emerging concern**, including pharmaceuticals and microplastics. Modern treatment technologies remove many of these pollutants substantially. Nonetheless, some of them are not captured by WWTPs and, even when captured in sewage sludge, they may cause issues when this sludge is reused in agriculture. Few Member States and non-EU countries have taken action (or consider taking action) and use targeted approaches to adapt their waste water treatment and reduce micropollutants discharged through effluent.
- 2) Although the Directive contains some provisions on water and sludge re-use, the potential for aligning the UWWTD with the **circular economy** has not been fully exploited, (e.g. recovery of valuable components from sewage sludge). Higher treatment at WWTP level may transfer more pollution to the sludge, which might be consequently not adequate for re-use. Control of targeted pollutants at source would reduce treatment requirements.
- 3) WWTPs and collection systems require **high amounts of energy**, with waste water treatment using about 0.8% of the total EU energy consumption. The UWWTD, however, does not incentivise the efficient use of energy and thus is not in line with the EU's energy efficiency agenda. At the same time, there are many examples in

different EU Member States where some of the larger WWTPs adopted innovative solutions to be energy neutral or even energy generating.

Despite not being fully integrated in the Directive, the relevance and potential of the UWWTD to foster innovation is well recognised. Furthermore, the UWWTD is also relevant tool to support Member States to reach internationally agreed objectives such as Sustainable Development Goal 6.

Considering these findings in terms of the UWWTD's **EU added value**, without the Directive only some Member States would have achieved the same level of protection of the environment and health that we have today. The UWWTD addresses a problem that is EU-wide and often transboundary. Thus, action taken on EU level is likely to be more effective than a segmented approach by Member States. As a result of the Directive, Member States have set themselves ambitious collection and treatment goals. To support their delivery, Member States had access to additional EU funding, and enjoyed benefits gained from knowledge sharing. To support their delivery they also had access to additional EU funding, and enjoyed benefits of knowledge sharing.

Based on these conclusions, this Evaluation thus notes the following lessons learnt and shortcomings of the Directive:

- **Implementation:** Urban waste water is still a pressure on EU water bodies. Though the Directive is effective, **more efforts are needed to achieve full compliance** and ensure that all urban waste water is collected and treated adequately.
- **Deadlines:** Despite high levels of implementation overall, there were also **delays**, sometimes significant, in several Member States. Reasons include Member States not planning the necessary investments in time to meet the **deadlines**, lack of a long-term financing strategy, problems stemming from governance arrangements at central, regional and local level, and in particular a lack of resources and administrative capacity.
- **Storm water overflows:** SWOs constitute a sizeable remaining source of loads, and are only addressed by a footnote in the Directive. The Court of Justice of the European Union has pointed out the need to develop guidance in this area. **Urban runoff**, which is only covered by the Directive as regards combined sewage, is also an increasingly significant source of pollution, as regards heavy metals, plastics and microplastics. These issues are likely to be further aggravated by an increasing number of heavy precipitation events under the changing climate.
- **Individual or other appropriate systems (IAS):** The Directive's provision on IAS ensures that Member States have sufficient flexibility to avoid excessive costs where no additional benefit would be achieved through a collection system. The analysis shows that badly managed IAS can have detrimental effects on water quality, however, and the UWWTD does not require the monitoring of IAS performance.
- **Small agglomerations and non-connected dwellings:** Agglomerations below the thresholds of the UWWTD and non-connected dwellings located outside of agglomerations are not addressed in the Directive substantively, whilst established to be one of the significant pressures on EU surface water bodies.
- **Sensitive areas:** The UWWTD requires the designation of **sensitive areas**, but it does not prescribe to a Member State how it should monitor eutrophication in this context. The CJEU has set out four criteria for assessing eutrophication under the UWWTD. However, it is evident that, for instance, neighbouring Member States do not always consistently apply the rules on designating sensitive areas and this may lead to inconsistencies as regards the protection of eutrophic areas or those areas that

are at risk. Also, consistent implementation with similar requirements under the WFD and ND is not always ensured.

- **Contaminants of emerging concern:** Pollutants not included in the **scope** of the UWWTD are receiving more attention and may be increasingly important to address; these include pharmaceuticals and microplastics. Some pollutants are removed through waste water treatment to varying degrees, while others pass through the WWTPs untreated and are discharged directly to receiving water bodies. Where treatment is successful in capturing these pollutants in waste water sludge, the reuse of this sludge for agriculture etc. is a potential issue to be considered.
- **Costs of the UWWTD:** Some Member States need to find new, sustainable approaches to finance their water sector by completely implementing the ‘polluter pays’ principle and acting in accordance with Article 9 of the Water Framework Directive on cost recovery. To avoid unwanted negative social impacts, they should design and put in place appropriate social measures.
- **Monitoring:** More links between water bodies’ actual water quality and treatment should be ensured in the future. The UWWTD does not require or encourage the uptake of new methodologies, innovative technologies or increased monitoring frequency.
- **Reporting:** Further alignment with other pieces of EU water legislation and gains in effectiveness and efficiency (e.g. timelines) are possible, e.g. by using modern monitoring and reporting technologies, in particular at Member State level. Some coherence issues also may deserve attention (e.g. some small issues with the Industrial Emissions Directive and the related database on industrial emissions should be further investigated as well as, where relevant, further integration with the Water Framework Directive, Sewage Sludge Directive and potentially water reuse).
- **Providing information:** There could be potential for strengthening the provisions that enable better communication with the public, particularly in countries where compliance with Articles 3-5 is low.

Beyond the topics that are closely linked to the existing UWWTD, this Evaluation also provides evidence that the UWWTD does not encourage any approaches to reducing **energy** use or even producing clean energy, to harvesting the potential to reduce GHG emissions, and to aligning the waste water sector with **circular economy** principles. Moreover, the UWWTD did not promote sufficiently the uptake and deployment of innovation, though there is also no evidence that it hindered it.



Brussels, 13.12.2019  
SWD(2019) 700 final

PART 2/2

**COMMISSION STAFF WORKING DOCUMENT**

**EVALUATION**

**of the Council Directive 91/271/EEC of 21 May 1991, concerning urban waste-water  
treatment**

{SEC(2019) 448 final} - {SWD(2019) 701 final}

## Annex 1: Procedural information

### Lead DG, Decide Planning/CWP references

This Evaluation is led by DG Environment. It was included as item PLAN/2017/1657 in the DECIDE/Agenda Planning database.

### Organisation and timing

In 2017, a joint inter-service group for the UWWTD Evaluation and the Water Fitness Check was set up, including members from all from all relevant Directorate Generals:

- Secretariat General (SG)
- Legal Service (SJ)
- Agriculture and Rural Development (AGRI)
- Climate Action (CLIMA)
- Communications Network, Content and Technology (CNECT)
- Economic and Financial Affairs (ECFIN)
- Environment (ENV)
- Energy (ENER)
- European Civil Protection and Humanitarian Aid Operations (ECHO)
- Financial Stability, Financial Services and Capital Markets Union (FISMA)
- Health and Food Safety (SANTE)
- Internal Market, Industry, Entrepreneurship and SMEs (GROW)
- Joint Research Centre (JRC)
- Maritime Affairs and Fisheries (MARE)
- Migration and Home Affairs (HOME)
- Mobility and Transport (MOVE)
- Regional and Urban Policy (REGIO)
- Research and Innovation (RTD)

The group met three times during the Evaluation process. On a number of deliverables, the group was consulted in writing. The members of the group were invited to all events organised in the context of the consultation process described in Annex 2.

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<i>DATE</i>	<i>TOPICS OF DISCUSSION</i>
08 Nov 2017	1st ISG meeting: discussion of overall process, roadmap
01 March 2018	Written consultation on consultation strategy
26 April 2018	Written consultation on draft public consultation questionnaire
3 April 2019	2nd ISG meeting: discussion of support study (+ written consultation on support study)

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*Table 9 ISG meeting dates and topics of discussion*

### **Exceptions to the better regulation guidelines**

No exceptions were made to the [Better Regulation Guidelines](#) during this Evaluation.

### **Consultation of the RSB**

An upstream meeting was held with the Regulatory Scrutiny Board on 10 July 2018.

On 17 July 2019 the RSB meeting on the draft SWD was held. The RSB gave a positive opinion on 19 July and suggested a few improvements. *Table 10* shows how these were addressed.

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<i>Main considerations by the RSB</i>	<i>How they were addressed</i>
The evaluation does not analyse reasons behind compliance difficulties in some Member States.	Further information has been added to the section on late implementation and the underlying factors as well as the following sections: SWOs, IAS, to provide further analysis of compliance difficulties. These sections have also been moved to “effectiveness” to explain how some unclear obligations of the UWWTD lead to reduced effectiveness of the Directive in terms of meeting its overall objective of protecting the environment from the adverse effects of waste water discharges.
There are many pieces of legislation and many factors that have an impact on water quality. The evaluation does not sufficiently explain the wider context and the links between overall water quality objectives and the specific measures of the Urban Waste Water Treatment Directive.	Under section 2.1. a description of the water law context was added as well as how the UWWTD fits in there. Urban waste water as pollution source has been contextualised in this section. Reference to these interactions is made throughout the revised text where appropriate.
The evaluation’s conclusions do not fully reflect all of the evidence presented in the body of the report. They should also be more explicit about the issue of the new pollutants and whether it has an impact on the relevance of the Directive’s scope.	The conclusions have been revised to be more aligned with the body of the report. Text has been added to clarify the issue of new pollutants and their relevance regarding the scope of the UWWTD.

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### *Further considerations and recommendations*

### *How they were addressed*

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The evaluation should better explain why some Member States have difficulties with compliance. It is important to distinguish between issues of legislation and issues of implementation, as well as between financial difficulties and governance challenges. The evaluation should provide more analysis of practices in different Member States and on the various compliance measures taken by the Commission.

It is important to present the Directive in the wider context in which it operates, taking into account how it interacts and complements other water related legislation. The report should explain how the changes in the water policy context require to put the objectives and the ambitions of the Directive into a broader perspective.

The report could give more detail on the effectiveness of technical solutions and financing models to reach the water policy objectives.

The conclusions should be strengthened to help policy makers understand how the Directive performed and the shortcomings identified through the analysis. The conclusions are introduced with a summary which focuses too much on the positive aspects. The conclusions should also address the issue of the pollutants to be targeted in the changed context of the Directive.

More information on late implementation, on IAS and SWO practices was added under the respective sections.

More distinction on legislation vs implementation issues added under late implementation, IAS, SWOs and small agglomerations.

More information on practices in Member States was added.

Under section 2.1. a description of the water law context is provided as well as how the UWWTD fits in there. Additionally urban waste water as pollution source has been contextualised in this section.

Reference to these interactions is made throughout the revised text where appropriate.

More detail on the effectiveness of technical solutions and financing was added.

The conclusions have been revised to be more aligned with the body of the report. Text has been added to clarify the issue of new pollutants and their relevance regarding the scope of the UWWTD.

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*Table 10 RSB comments*

**Evidence, sources and quality**

*Support study*

A contract study "**Evaluation Study to support the Evaluation of the UWWTD**" provided substantial support for the Commission's Evaluation of the Directive. The contract was signed on 08 February 2018. The contract was carried out by a consortium of experts led by Wood, and also comprised of IEEP, COWI, Cenia, HR Wallingford. The final report for the study contract was accepted on 07/12/2019.

*Water quality modelling*

The European Commission's Joint Research Centre developed a Science for Policy report "Water quality in Europe: effects of the Urban Wastewater Treatment Directive" (see Annex 3, [Science for Policy – the effects of the UWWTD](#)).

#### *Cooperation with the OECD*

A [cooperation project with the OECD](#) on investment needs in the EU water sector and financing options for the way forward was launched in December 2017. As part of this project, the investment needs stemming from the DWD and UWWTD implementation were assessed across all EU28 Member States. Additionally, 10 Member States were visited to discuss the findings and potential ways forward to ensure that compliance is reached, and that investments in their water sector are sustainable.

#### *Stakeholder consultation*

Stakeholder consultation was an important element of gathering all information and validating data and preliminary findings (see Annex 2, [Stakeholder consultation](#)).

#### *Evidence from selected studies and policy documents*

Additional in-house research supported the Commission's assessment and references are made throughout the text. All references can be found here: Annex 5, [References](#).

## **Annex 2: Stakeholder consultation**

### **1. Introduction**

The objective of the consultations was to gather further evidence to substantiate the analysis of relevance, effectiveness, efficiency, coherence and EU added value as required by the Better Regulation Guidelines for Fitness Checks and Evaluations. The activities were coordinated with the [Water Fitness Check](#). The consultation approach was set out in the [Consultation strategy](#) published in May 2018.

### **2. Stakeholder groups covered by the consultation activities**

- Member State authorities (national, regional and local authorities);
- Public and private waste water operators, or associations representing experts;
- Businesses/business associations concerned by the Directive;
- Citizens;
- EU institutions;
- Academics/researchers and trade unions;
- International organisations;
- Non-Governmental Organisations and citizens' initiatives.

These stakeholders were consulted in different settings and all provided valuable input.

### **3. Consultation activities in chronological order**

- Feedback mechanism to the roadmap of the UWWTD Evaluation,
- Key issue scoping interviews,
- Public consultation,
- Thematic expert workshops,
- Stakeholder conference,
- Written consultation of Member State experts on modelling aspects.

#### ***Feedback to the Evaluation Roadmap***

The Evaluation [roadmap](#) was published in October 2017, at the same time as the roadmap for the Water Fitness Check. Both roadmaps were subject to a feedback mechanism. Apart from 3 anonymous contributions and 1 citizen reply, 8 NGOs, 4 research organisations, 1 public services association, 10 representatives from the water industry and 1 competent authority provided feedback during the consultation period.

Topics stressed as important included:

- Storm water managements;
- Pollutants of emerging concern;
- The need for sustainable long-term investments and application of the polluter pays principle;
- Assessment of the links with the Water Framework Directive and with the Sewage Sludge Directive;
- The links to the SDGs, particularly SDG 6.

This feedback fed into the development of the Terms of Reference for the Support Study and the development of the key issues.

### *Key issue interviews*

In the initial phase of the Evaluation, scoping interviews with experts from industry associations, an environmental and a human rights NGO, and a water technology association were held. These interviews shaped the key issues and provided indications of available data.

Most immediate and prominent agreement was provided on storm water overflows (SWO), pollutants of emerging concern, individual and other appropriate systems (IAS) and energy efficiency. Mixed feedback was received on the key issues of monitoring and sizing of plants. These were kept as key issues as they had also been identified by the ECA as important topics.

Overall experts agreed that the UWWTD was crucial for ensuring the establishment of collection and treatment infrastructure. There was also strong agreement on the clarity and simplicity of the Directive. The investment that are needed for the implementation were stressed as high and sometimes as a hindering factor for implementation. Nevertheless, there was also agreement on the benefits outweighing the costs.

### *Public consultation*

The [public consultation](#) was launched online in July 2018. The questionnaire was published in all 23 official EU languages on the Commission’s website for consultations and remained open for 14 weeks. It consisted of a general part and an expert part that was structured along the Better Regulation Evaluation criteria.

In total 608 replies (606 via the online portal and two via e-mail due to technical problems) were received. **As none of the content questions was mandatory to be answered, the total number of respondents varies for each question.** Whereas main findings of the replies to the public consultation are discussed here, specific findings are included throughout the main text of the Evaluation.

More than half of the replies came from citizens (57%), and 17% from private or public WWTP operators. The remaining respondents represented public authorities, NGOs, academia, industry, private and public associations, and EU institutions. In terms of nationalities, almost all EU Member States were represented by stakeholders apart from Estonia, Latvia, Lithuania and Hungary. The largest share of respondents came from Germany (22%) and Spain (21%). One small campaign from WWTP operators in Spain was identified and their comments fed into the main analysis of the internal coherence of the Directive.

### *Effectiveness*

As part of the expert section of the questionnaire, stakeholders were asked to judge how effective the Directive has been regarding its key provisions. Feedback varied across the provisions, showing that most provisions are judged very or somewhat effective. Stakeholders do not think that the UWWTD has been very effective to ensure proper application of IAS or that Member States deal adequately with SWOs. Across all answers, no trend was visible in terms of replies from different stakeholder categories.

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Objectives	Very effective	Somewhat effective	Somewhat ineffective	Very ineffective	Neither effective	I do not know
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		<b>e</b>	<b>tive</b>		<b>e nor</b>	<b>ineffec</b>	<b>tive</b>
Protecting the environment from adverse effects of urban waste water discharges (N=345)	46%	42%	3%	1%	4%	4%	
Protecting human health from adverse effects of urban waste water discharges (N=343)	31%	54%	3%	1%	6%	5%	
Collecting waste waters (N=341)	46%	37%	3%	1%	8%	4%	
Ensuring a proper application of IAS (Individual or other Appropriate System) (N=332)	7%	28%	14%	5%	25%	22%	
Ensuring a proper use of CSO (Combined Sewer Overflow) (N=337)	6%	25%	20%	7%	23%	18%	

Table 11 Replies across stakeholder categories regarding the effectiveness of a number of the Directive's provisions

### Efficiency

In terms of proportionality of costs and benefits, stakeholders very or slightly familiar with the Directive strongly agree or agree that costs and benefits are proportionate, especially in the long-term. These stakeholders came from across all categories.



Figure 42 Stakeholders views on the proportionality of costs and benefits.

Overall 79% of all respondents agreed or strongly agreed that the costs are justified given the benefits, with a majority of respondents being citizens.

### Coherence

The assessment of internal coherence led to mixed feedback with most agreeing that the Directive is to a large extent or to some extent internally coherent (27% and 53%, n=299). It was pointed out that the Directive contains diverging thresholds when it comes to industrial waste water. Reviewing comments shows that many stakeholders included

in their judgment external coherence aspects or the UWWTD’s partial insufficiency to address new societal needs. Regarding external coherence, stakeholders view the UWWTD to be to some extent coherent with other water law, with many pointing out coherence to a large or to some extent with the WFD (32% and 50%, n=293).

Regarding newer policies on energy and climate, stakeholders raised that the UWWTD does not integrate sufficiently.

*Relevance*

Stakeholders also assessed the UWWTD’s capacity to deal with new challenges and agreed across all stakeholder categories that there are problems that the Directive does not completely address. When cross-checking with the stakeholders’ familiarity with the Directive, it is visible that also those very familiar with the Directive do not believe that the Directive is sufficient to deal with new challenges.

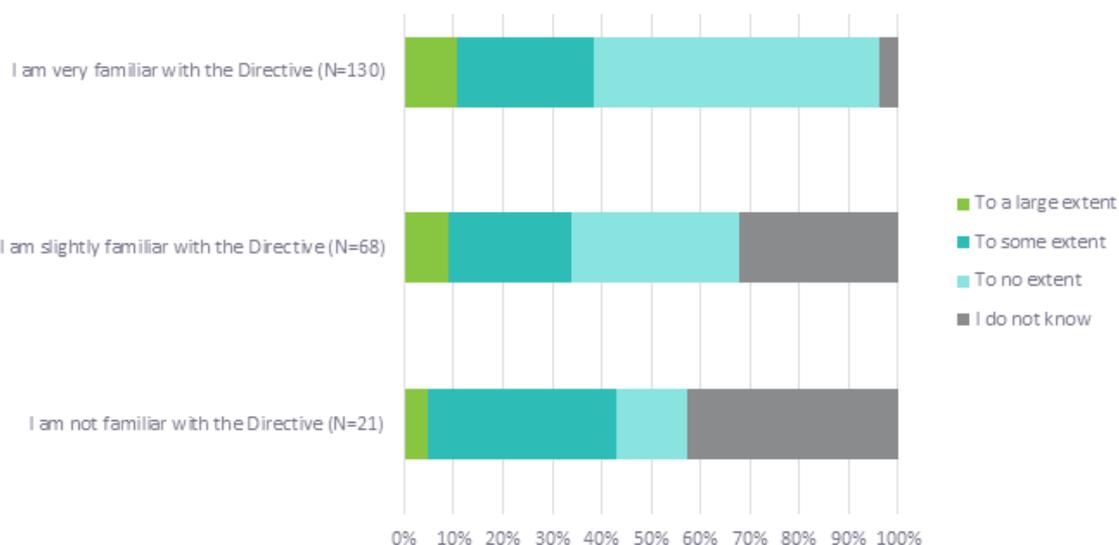


Figure 43 Stakeholders view on the capacity of the UWWTD to deal with new challenges by level of familiarity.

When asked which challenges are not addressed sufficiently by the Directive, trade associations and WWTP operators raised that it does not sufficiently deal with resource recovery, especially sludge, and that there is a need to deal with emerging pollutants.

In terms of substances that might be found in waste water and that might be of concern to stakeholders’ endocrine disruptors were ranked highest (52% and 19% of all respondents are very strongly concerned and strongly concerned, and came from all stakeholder categories (220 citizens, 27 operators, 7 academics). Other substances mentioned were pharmaceuticals and industrial pollutants (48% very strongly concerned), pesticides (47% very strongly concerned), and microplastics (46% very strongly concerned) (n=608).

Asking who should pay for additional treatment to remove these substances there was a split between those saying that the initial polluter (e.g. industry) should pay (40%) and those saying that a price increase of the water bill is acceptable (25%) (n=608). Whereas only 3 replied “I do not know”, 16% did not provide an answer. Those in favour of the industry paying were largely citizens, NGOs and water companies.

*EU-added value*

Asking stakeholders whether there is a need to continue EU level action on waste water, most agreed to a large extent (63%) or to some extent (26%). The main stakeholder group in favour of continuing EU level intervention are citizens. Most stakeholders agree that withdrawing the UWWTD would have negative impacts (86%, N=307) with only 2% thinking that a withdrawal would have positive consequences. Stakeholders argued that a withdrawal would be negative for water quality and human health. It would also reduce incentives to develop the needed infrastructure to protect the environment.

The findings of the public consultation were substantially integrated in the analysis of the Evaluative support study and underpinned the Commission's assessment.

In addition, a few position papers were received:

- **Swedish Environment Protection Agency:** Position paper provided further additions and clarifications to the EPA's replies to the public consultation. The EPA identified as shortcomings of the UWWTD its inflexibility to adapt to local conditions and its lack of ambition with regard to phosphorus.
- **Danish Environment and Technology Association:** The position paper noted that progress on treatment technologies has been made over the past decades and that the UWWTD missed the opportunity of including aspects of energy efficiency, as well as to incentivising recovery and reuse of resources in waste water.
- **EurEau:** Position papers on micropollutants, microplastics in waste water explained the extent of this problem and the challenges to deal with them. Further, a position papers on energy efficiency, on the treatment terminology in the Directive and views on the waste water treatment opportunities and challenges in regards to single-use plastics were submitted.
- **World Green Infrastructure Network:** the position paper provided insights in how green infrastructure can help addressing storm water overflows. Further, it was noted that since adoption of the UWWTD external factors such as climate change and rise of pollutants of emerging concern have led to new societal needs.
- **Xylem:** The technology provider identified the ageing infrastructure and the lack of sufficient funding as a key challenge. It was suggested to further incentivise cost recovery, and to consider new cost-efficient solutions to deal with SWOs. Additionally, the promotion of resource recovery and energy efficiency was suggested.
- **Centre for Water Security and Cooperation:** The centre provided feedback on the potential tension between access to water and cost recovery, the new challenges coming with climate change (e.g. extreme weather events leading to new challenges for sewers and WWTPs), and non-connected dwellings, pharmaceuticals and EU-added value.

### *Thematic expert workshops<sup>74</sup>*

The information gathered during the workshops fed into the Evaluative study report and the Evaluation. Additionally, some of the workshops discussion served to confirm the JRC's modelling approach and the assessment of costs and benefits. All workshops were attended by experts representing Member States, academia, business association/industry, environmental NGOs and Commission staff.

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<sup>74</sup> Minutes and presentation can be found on circabc.

*Workshop on pollutants of emerging concern jointly with the Water Fitness Check (24<sup>th</sup> October)*

*Objective:* Assessment of the impact of pollutants of emerging concern on the aquatic environment and the assessment of WWTPs' potential to reduce the impact.

*Summary:* Pollutants of emerging concern cover a broad range of substances, and WWTPs are recognized as on the one hand reducing some of them through the treatment already in place and on the other hand to be considered by some as the point of release into the environment. There is not yet one individual treatment technique that could ensure that all pollutants of emerging concern are removed. For some pollutants of emerging concern their impact on the environment has been noted (e.g. Diclofenac) whereas for others it is unclear how they behave in the environment and what kind of cumulative effects they might have with other substances.

In some countries, first steps towards addressing pollutants of emerging concern have been taken. For instance, in Switzerland it was to install the fourth treatment stage in a number of priority plants.

*Workshop on storm water overflows and individual or other appropriate systems (25<sup>th</sup> October 2018)*

*Objective:* Discussion on legal and environmental aspects of storm water overflows (with strong focus on combined sewer overflows) and IAS. The JRC presented its draft modelling results on the impacts of these two topics. Stakeholders had the opportunity to discuss and validate this approach.

*Summary:* Storm Water Overflows: These are covered only by a footnote in the UWWTD, which some participants found to be insufficient. The terminology covers both, overflows in combined and separate systems. However, there is no definition of what constitutes a 'spill', or an 'overflow event'. The first 15 minutes of an overflow contain the 'first flush' which might contain the most pollutants. Another important problem is the content of urban runoff, which mixes additional pollutants into the waste water when it enters the sewers. Member States use different approaches to deal with overflows, including monitoring, investing in separate sewers or making use of green infrastructure/nature-based solutions, such as wetlands.

Individual and other appropriate systems: IAS are in use in agglomerations < and > 2 000 p.e., with only the latter being covered by the UWWTD. Member State experts explained different frameworks for dealing with IAS in their countries. Even with advanced frameworks in place, it is difficult to ensure the well-functioning and the adequate handling of IAS.

*Workshop on costs and benefits (8<sup>th</sup> November 2018)*

*Objective:* In this workshop results from the UWWTD Evaluation support study were compared to similar studies conducted by the World Bank (2018), by the OECD (ongoing, jointly with DG ENV) and [Blue2](#) (ongoing, commissioned by DG ENV).

*Summary:* The costs functions used for the assessment of costs related to the UWWTD are known to the stakeholder community and they are considered to be fairly stable though also very data intensive. Given the costs involved with the UWWTD, a discussion on affordability, cost recovery and EU-funding cannot be missed in the Evaluation. Discussions on the benefits showed that a damage costs approach was

favoured. Overall, there was strong agreement that it is difficult to capture, quantify and monetise all benefits brought by the UWWTD. The World Bank in its study on 8 Member States accounted for different benefits as was done in the Evaluative support study, and the difference in approach leads in some scenarios to the costs outweighing the benefits in the World Bank study.

### ***Stakeholder conference***

*Objective:* On 16<sup>th</sup> November 2018, a stakeholder conference was held at the premises of the Committee of the Regions and was attended by around 90 participants, including Member States representatives, waste water services representatives, NGOs, international organisation and academia. The objective of this conference was to share the preliminary findings of the support study and first results from the analysis of the replies to the public consultation.

*Summary:* Overall stakeholders see clear progress regarding the collection and treatment of waste water in the EU. This progress is attributed to the UWWTD. SWOs and dealing with IAS are a known problem and the JRC's modelling results clearly show their environmental impact. Presentation from Member State experts confirmed that implementing the UWWTD is possible in a short amount of time and leads to improved water quality.

Regarding benefits assessment, the stakeholders agreed that the benefits are substantial and outweigh the costs. There was strong support that the UWWTD led to benefits beyond protection of the aquatic environment, as well as health and well-being benefits. It is also well known that it is difficult to assess these benefits.

Stakeholders noted as future challenges: micropollutants, reaching energy efficiency, reducing the impact of overflows and IAS as well as dealing with water and sludge reuse.

Stakeholders generally confirmed that the UWWTD aligns well with other law and is important for reaching other Directive's objectives. Considering EU law more broadly, stakeholders identified that more alignment with energy and climate policies could be beneficial.

### ***Written consultation***

Representatives from the UWWTD Expert Group were consulted in written form on information related to: 1) IAS, 2) SWOs and 3) costs and benefits. In total 20 out of 28 Member States reacted and either validated information or provided further data. This information was used to feed into the JRC's modelling and the analysis in the Evaluative support study.

## Annex 3: Methods and analytical models

### 1. SCIENCE FOR POLICY – THE EFFECTS OF THE UWWTD

The JRC prepared a [Science for Policy report](#) in support of the UWWTD Evaluation, assessing the effects of the UWWTD. The following gives a brief overview of the approach chosen, the scenarios and the underlying assumptions and uncertainties. For a more complete overview, see Pistocchi *et al.* (2019).

#### *Points of comparison/assessment*

The aim of the Science for policy report was to assess the UWWTD’s impact in terms of reaching its objectives which are the reduction of emissions of certain pollutants and through this protect the quality of EU water bodies.

The UWWTD addresses directly four parameters: BOD, COD, N and P. Removal obligations for N and P depend on the size of the agglomeration and whether the discharge point lies in an area designated as being “sensitive”.

Additionally, waste water treatment also removes coliforms and chemicals. Both are not directly targeted by the UWWTD, but are relevant for other Directives such as the Bathing Water Directive and the Water Framework Directive.

In the modelling exercise, it was quantified to what extent the UWWTD supports the improvement of water bodies’ quality.

Pollutant	Protection goal		
	Aquatic ecosystems	Drinking Water	Bathing Waters
N	X	X	
P	X		
BOD	X		
Indicator coliforms			X
Chemicals	X	X	

Table 12 Assessment endpoints, and corresponding relevant EU legislation

The Bathing Water Directive (BWD) sets threshold levels for intestinal enterococci and *Escherichia coli* (E.coli) in bathing water sites. E.coli is correlated in its presence to coliforms and thus coliforms were used as a proxy in modelling the effectiveness of

waste water treatment to reduce faecal contamination loads. ‘Coliforms’ refer to a group of bacteria that include thermotolerant coliforms as well as bacteria of faecal origin. Presence of coliforms can thus indicate the presence of faecal pollution, though this pollution can also have other sources,<sup>75</sup> though urban areas are the dominant source.

The proposal for a recast of the **DWD** also sets quality parameters for water intended for human consumption. Only those parameters that can be related to waste water were considered.

The **WFD** sets out requirements for good ecological status that reflect conditions of nutrients and organic matter. For BOD, N and P values were derived from different sources. For nutrient concentrations there is an even higher variety and, based on a study by Grizetti et al. (2017) the predicted concentrations for rivers in good status are usually about 4 mg/L for total N and 0.1 mg/L for total P.

The **EQSD** sets limit values for 45 priority substances (some of them overlapping with DWD parameters). Those values that can be related to pollution from waste water were also considered.

Additionally, a number of **pharmaceuticals** were considered: medicines Ibuprofen, Carbamazepine, Ciprofloxacin, Fluoxetine, Sertraline, Atorvastatin, Simvastatin, antibacterial Triclosan, and Octamethylcyclotetrasiloxane (D4) used in cosmetics. For these no environmental quality standard exists. These micropollutants are often significantly affected by urban waste water treatment. No quantification of absolute loads was possible, but the relative reduction could be assessed.

### ***Modelling approach***

The model used for nutrients and BOD in this study is the **Geospatial Regression Equation for European Nutrient losses (GREEN+)** model.<sup>76</sup> This model was generalised to describe organic matter in rivers. For this the parameterisation of retention in rivers and lakes was made following the MAPPE model. For BOD the following were included: point sources (WWTPs) and industrial discharges, and for diffuse sources livestock, and runoff from urban and forestry areas. For N and P the following sources are accounted for in the model: industrial and domestic emissions, scattered dwellings, organic and mineral fertilizers, atmospheric deposition and nitrogen fixation, and background emissions from forestry. IAS are described in any case either as equivalent to the WWTPs of the respective agglomerations, or as primary treatments.

These are the estimated removal efficiencies of different treatment levels of BOD, N and P in wastewater treatment plants (*Table 13*):

<b>Substance</b>	<b>Primary treatment</b>	<b>Secondary treatment</b>	<b>More stringent treatment</b>
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<sup>75</sup> WHO (1996) Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes.

<sup>76</sup> Additional details on the model setup can be found in Pistocchi et al., 2017

N	25%	55%	80%
P	30%	60%	90%
BOD5	50%	94%	96%

Table 13 WWT removal efficiency for organic matter and nutrients

For **coliforms no specific model exists**, but the same one as for BOD can be used. Only emissions from urban waste water were accounted for.<sup>77</sup> Thus the model results should be seen in relative terms by comparing the scenarios, and the results not be interpreted in absolute terms. An overview of the removal efficiencies is presented in Table 14.

Level of treatment	Lower removal eff. <sup>78</sup>	Higher removal eff. <sup>78</sup>	Assumed
No treatment	0%	0%	0%
Primary	29.2%	68.4%	40%
Secondary	90.0%	99.9%	95%
More stringent		Up to 100%	99.9%

Table 14 Removal efficiencies and  $\eta_T$  for coliforms after wastewater treatment.

For **chemicals** the **SimpleTreat** model was used, which describes WWTPs as a combination of a primary settler, a biological activated sludge bioreactor and a secondary settler. The model allows quantifying the removal of a chemical through sorption to sludge and removal through degradation and/or volatilization. Many chemicals may not be appreciably retained in solids but can be rather persistent. The relative importance of removal through sorption and through degradation/volatilization allows categorizing 6 classes of chemicals in terms of their behaviour in WWTPs:

- Chemicals practically bypassing wastewater treatment, virtually unaffected
- Slowly removed chemicals, with limited or no accumulation in sludge;
- Moderately removed, with limited or no accumulation in sludge;
- Removed, with limited or no accumulation in sludge;
- Sorbed to sludge and slowly removed;
- Sorbed to sludge (but not appreciably removed).

Modelling considers families of chemicals (“metachemicals”) rather than real chemicals. Metachemicals are “virtual” chemicals, each representing a whole class of substances displaying similar behaviour in WWTPs and rivers. The grouping of chemicals to

<sup>77</sup> Other important sources are urban runoff and livestock.

<sup>78</sup> Range suggested for primary treatment and conventional activated sludge processes by Oakley, 2018, and Naughton and Rousselot, 2017, respectively.

metachemicals can be found in the Science for Policy Report by Pistocchi *et al.* (2019). The same model as for coliforms was used.

For **combined sewer overflows**, no systematic EU-covering information exists. The JRC thus undertook the first-ever modelling of CSO volumes at the larger scale and their interpretation in terms of pollutants loads.

### *Scenarios modelled*

For the assessment a baseline for the current situation was established and compared to five scenarios (*Table 15*).<sup>79</sup>

<b>Scenario</b>	<b>Short name</b>
Present situation as per the latest WISE report (2014)	Baseline
Situation before entry into force of the Directive (circa 1990)	Pre-directive
“What-if-no-Directive”	WIND
Full Implementation of the Directive	Full compliance
Full implementation with systematically ineffective individual and appropriate systems (IAS)	IAS
Full implementation with effectiveness of IAS depending on management	IAS+

*Table 15 Overview of modelled scenarios*

#### *Baseline*

For the baseline in 2014, data reported by Member States under the UWWTD were used. No data on agglomerations below 2 000 pe is available. This part of the population was estimated by Vigiak *et al.* (2018), through a comparison of the existent population and the reported pe per Member States, assuming 1.23 pe/resident. P.e. per resident is highly variable depending on industrial activities in the area served by the treatment plant, but 1.23 p.e./resident was found to be rather stable. Overall the population living in agglomerations below 2 000 p.e is rather small in the EU, but in some EU Member States may make up about 10% of the population.

#### *Pre-directive scenario*

The same kind of data as reported by Member States under the UWWTD does not exist for the situation before 1991/before Member States acceded to the EU. However, EUROSTAT provides population at different treatment levels per country. Through this information a picture of the situation before adoption of the Directive was established.

#### *Full compliance scenario*

<sup>79</sup> In the main text, the baseline is the situation in 1990, whereas in the JRC report the 2014 situation constitutes the baseline.

This scenario can be established by setting all WWTPs of the baseline to the adequate level of treatment in accordance with the UWWTD. Those WWTPs already in compliance in 2014 (baseline) will remain in compliance.

#### *What if no Directive (WIND) scenarios*

This is a hypothetical scenario to present an idea of what would have happened without the Directive. For each country an intermediate situation between the pre-directive scenario and the baseline is established. It is thus based on a weighted average of the two scenarios. The weights were established through expert judgement. The discussion behind this can be found in the support study to the Evaluation.

Since progress of achieving compliance with the UWWTD is not only linked to factors driving the implementation when a Member State is already part of the EU, but also to factors before a Member State joins (e.g. accession funding etc.), two WIND scenarios were established. WIND scenarios are merely speculative, but can give an appreciation to the progress brought by the Directive.

Under WIND1 a weight of 0 is used for BE, EL, PT, MT, CY, BG, IT, IE, ES and RO, assuming thus that all progress made is due to the Directive. A weight of 1 is applied to AT, DE, DK, FI, NL, SE, assuming that given the high compliance these countries had already in the 1990s, no real progress can be attributed to the implementation of the UWWTD. The other Member States have weight=0.5. A weight of 0.5 means it would be at intermediate conditions.

Under WIND2 the 13 most recent members of the EU (EU13) are assigned a weight of 0.25, while the other members (EU15) are assigned the same weights as above.

#### *Individual or other appropriate systems (IAS and IAS +)*

Art. 3 of the UWWTD allows the use of IAS instead of building collection systems if the establishment of a collection system comes at excessive costs without additional environmental benefits. When much of the load is collected and sometimes also treated with IAS, it is unclear how Member States ensure that these are at an appropriate level of performance.

To assess the impact of IAS the full compliance scenario is compared with a modified scenario in which all IAS are assumed to be at primary treatment (**IAS scenario**). This is of course not the case in reality. Thus, under the **IAS+ scenario** it is taken into account that Member States have established mechanisms to deal with IAS. These mechanisms were researched and then consulted with Member States and based on expert judgement each Member State was assigned what level of treatment all its IAS can be assumed to be at.

The following levels of treatment were assigned for all IAS: AT, CY, DE, EE, UK have IAS equivalent to the agglomeration's WWTP, hence weight is 1; CZ is midway (50% of IAS are assumed to be equivalent to the agglomeration's WWTP and 50% equivalent to primary treatment), hence weight is 0.5; the other countries are assumed to have IAS equivalent to primary, hence weight is 0.

#### *Combined sewer overflows*

No EU-wide modelling of CSOs was attempted in the past. In a first scenario, it is assumed that these overflows take place without management measures. This

corresponds to a worst-case scenario likely overestimating the loads associated to CSO in many regions. An additional scenario assesses the loads attributable to overflows with considerations for some management measures in place in Member States. These management measures were quantified after consultation with Member States (*Table 16*). However, it is likely that the model is still overestimating loads under CSO management measures due to other conservative assumptions (e.g. on the extent of the impervious area) as discussed in the JRC report. At the time of writing this report, an extensive evaluation of the model with the participation of experts from different EU Member States is ongoing, and is expected to bring new insights on the issue in the near future (*Table 16*).

Country	Correction factor	Dilution rate	# days
AT	44%	8	
BE	50%	7	18.71 <sup>80</sup>
DE	47%	4	17.32 <sup>81</sup>
DK	32%	4	10
ES	44%	8 <sup>82</sup>	
FI	100%	4	
FR	52%	4	20
EL	52%	7	
IE	78%	5	
IT	62%	6	
LU	100%	4	
NL	29%	4	10
PT	62%	6	
SE	100%	4	
UK	100%	4	
CY	100%	4	

<sup>80</sup> This is the geometric mean of reported values for Brussels, between 7 and 50 per year.

<sup>81</sup> This is the geometric mean of reported values for Land Bavaria, between 15 and 20 per year.

<sup>82</sup> For Spain and Czechia, d is prescribed between 5 and 8, the latter assumed to apply as the most favorable case for these countries.

CZ	44%	8 <sup>82</sup>	
EE	100%	4	
HU	100%	4	
LT	100%	4	
LV	100%	4	
MT	100%	4	
PL	67%	4	30
SI	100%	4	
SK	100%	4	
BG	78%	5	
RO	100%	4	
HR	100%	4	

*Table 16 Correction factors to apply to default CSO loads taking into account the provisions of minimum dilution rate (d) and a number of days of CSOs allowed in different Member States.*

The assessment does not take into account that some CSO may be treated, it only focuses on potential loads. CSO treatment is required in some Member States, notably AT, DE, BE, SK and RO.

### ***Uncertainties and model verification***

The main uncertainties are as follows:

- All scenarios are subject to uncertainties regarding the estimations of p.e.
- All estimations are based on data submitted by Member States, which are the best available data, but also have been subject to issues in the past.<sup>83</sup>
- The quantification of the situation before adoption of the UWWTD (and thus before official reporting) is based on data from Eurostat, and although comparison on Member State levels are probably robust, there might be less certainty when it comes to comparisons on regional level.
- There is uncertainty of pollutant emissions to each river basin overall, and there is no real benchmark. Thus, the model cannot go beyond capturing continental trends, distributions of concentrations and hot spots.

The **models for organic matter and nutrients** were calibrated based on the information of concentrations and load data. The model has been shown to be sensitive to the efficiency of treatment and the event-mean concentrations of urban run-off.

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<sup>83</sup> European Commission (n.d.) UWWTD implementation reports.

Predicted loads are correlated with observations and with error within one order of magnitude. Loads in catchment areas and concentrations are not as well correlated with observations.

For **coliforms** the model is not calibrated but aligned with emission and die-off parameters set out in other studies. The model neglects all other sources for coliforms and thus a general underestimation of concentrations and loads can be expected.

The approach for **CSO and IAS** modelling was presented in various workshops and discussed with Member State experts. Member State experts were consulted on management measures in place. Not all Member States were present at meetings and not all reacted to the consultation (in total 20/28 replies were received).

For **CSO** an extra workshop was held, but not sufficient evidence could be collected to confirm all estimates. Thus, the estimates need to be considered as being conservative, thus over-representing the loads of CSO as management measures are probably underestimated. Verification of the model has been launched and more fine-grained results are expected for the future.

Modelling **chemicals'** behaviour in WWTPs is very complex. The complexity was reduced by using representative metachemicals. No EU-wide emission data was available. Literature shows that there is high variability of chemical's behaviour in treatment plants. The approach chosen is meant to show possible impact of treatment on a large variety of chemicals.

## **2. COST AND BENEFITS**

This Annex provides a short overview of the methodology chosen for assessing cost and benefits. More details on the methodology and sub-results of the assessment can be found in the external support study.

The assessment of costs and benefits of the UWWTD was discussed in a dedicated workshop with experts on 8<sup>th</sup> November 2018. Their feedback on the methodology and the preliminary findings was taken into account in the external support study.

Additionally, Member States were consulted in writing on the preliminary findings and were invited to validate these or to send in further information. Few Member States provided own assessments, with most arguing that the assessment is complex. Those that reacted to the numbers reported numbers at similar orders of magnitude.

For both, costs and benefits, it was accounted for the existing infrastructure in the Member States before adoption of the Directive or accession through cost and benefit correction factors. This allows to single out the impact of the UWWTD.

### ***Approach to modelling costs***

Three Articles of the UWWTD lead to one-off and regular operation and maintenance costs. These Articles are Art. 3-5 on the establishment of collection systems, and different treatment plants. Member States do not report on cost for the implementation of the Directive. Under Art. 17 projected capital costs for reaching compliance with the UWWTD are submitted, however, it is not always clear what is contained in these figures (e.g. maintenance, rehabilitation or only new collection systems and plants).

It was possible to monetise the costs for the three Articles per Member State, broken down into investment costs and operation and maintenance costs. The cost assessment takes into account infrastructure already existent in Member States in the early 1990s (see Annex 4, [baseline](#)). The costs levels were adapted to corresponding price levels in the Member States, and a discount rate of 4% was applied in accordance with Better Regulation Guidelines.

Two cost functions were used to assess the costs per Member State: one cost function for collection and one for treatment (i.e. the COWI cost function) based on the FEASIBLE model.

FEASIBLE is a software tool developed to support the preparation of environmental financing strategies for water, waste water and municipal solid waste services. The name FEASIBLE stands for: **Financing for Environmental, Affordable and Strategic Investments that Bring on Large-scale Expenditure**. The FEASIBLE model is freeware and can be obtained through the web pages of the OECD, DEPA/DANCEE and COWI. **FEASIBLE can be used to facilitate the iterative process of balancing the required finance with the available finance**. It provides a systematic, consistent and quantitative framework for analysing feasibility of financing environmental targets. Being a computerised model, FEASIBLE may be used to analyse “what if” a certain policy is changed and to document its financial impacts in a systematic and transparent manner.

FEASIBLE calculates investment, maintenance and operational expenditure that would be required to reach specific targets determined by local policy makers. The calculation of the expenditure need is based on a number of generic cost functions which are incorporated into FEASIBLE. These cost functions allow an easy estimation of the costs of alternative service and environmental targets with a limited data collection effort. They cover a number of technical measures within each sector. The cost functions have been estimated by technical experts and validated with actual costs during test applications of the model.

The model has been used by OECD to develop financing strategies in number of countries.

Source: OECD, n.d.

### Collection systems

For collection the following cost function was used:

Collection type	CAPEX: Investment cost (EUR, 2008)		OPEX: Annual operational and maintenance cost (EUR, 2008)
	PE < 1,000,000	PE ≥ 1,000,000	
<b>Combined</b>	$(-190.3 * LN(PE) + 2828.8) * PE$	$(-190.3 * LN(1,000,000) + 2828.8) * PE$	CAPEX * 0.03
<b>Separate</b>	$2.5 * (-190.3 * LN(PE) + 2828.8) * PE$	$2.5 * (-190.3 * LN(1,000,000) + 2828.8) * PE$	CAPEX * 0.03

Table 17 Cost functions for collection systems. Source COWI (2010) and Blue2 (2019) B2 report.

An asset life of 50 years assumed for both types of sewer systems.

### Treatment

The following costs functions for treatment were used.

Treatment level	Investment cost (€ 2008)		Operational and maintenance cost (€ 2008)
	PE < 100,000	PE > 100,000	
Primary	$10^{-0.2073 \cdot \log(PE) + 3.6385} * 0.2 * PE$	92	CAPEX * 0.03 + PE * 15 * Ep
Secondary (mechanical/biological)	$10^{-0.2632 \cdot \log(PE) + 4.0149} * 0.23 * PE$	115	CAPEX * 0.03 + PE * 25 * Ep
Advanced with P-removal	$10^{-0.2808 \cdot \log(PE) + 4.1823} * 0.23 * PE$	138	CAPEX * 0.03 + PE * 40 * Ep
Advanced with N-removal	$10^{-0.2612 \cdot \log(PE) + 4.2600} * 0.23 * PE$	207	CAPEX * 0.03 + PE * 40 * Ep
Advanced with N & P removal	$10^{-0.2722 \cdot \log(PE) + 4.3608} * 0.23 * PE$	230	CAPEX * 0.03 + PE * 40 * Ep
Other advanced - not specified	$10^{-0.2808 \cdot \log(PE) + 4.1823} * 0.23 * PE$	138	CAPEX * 0.03 + PE * 40 * Ep

Table 18 Cost functions for different treatment levels. p.e.=population equivalent and Ep=electricity price in EUR per kWh. Source: Cowi (2010).

For WWTPs economies of scales are considered as costs go down with the amount of p.e. treated as shown in Figure 44.

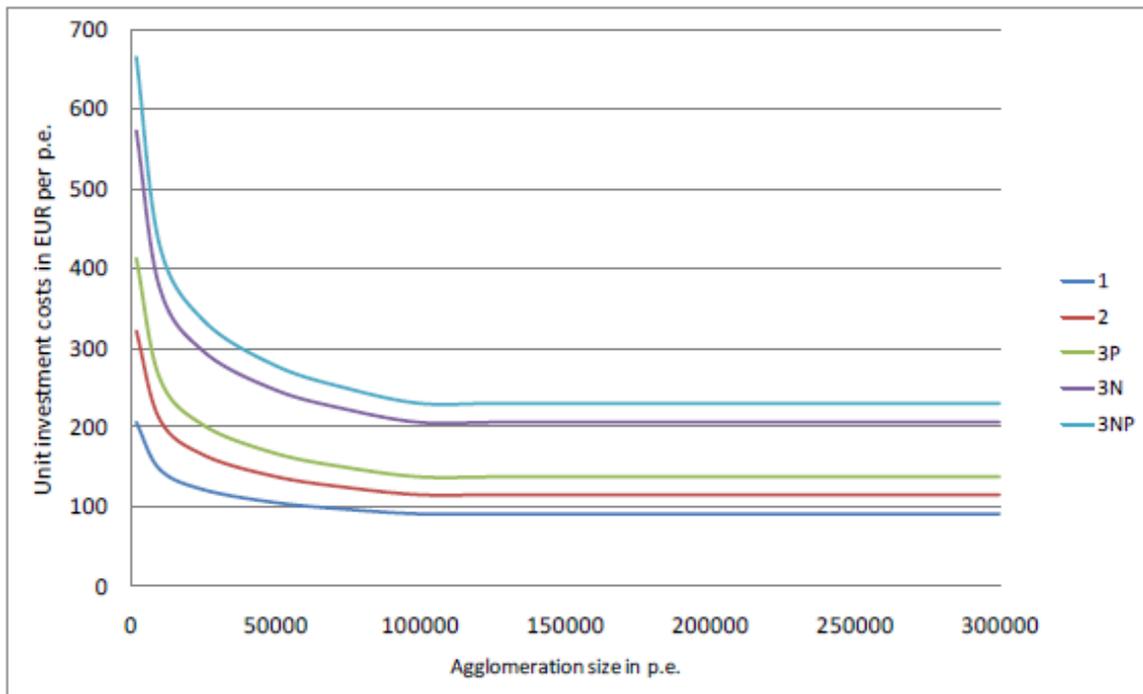


Figure 44 Unit investment costs in function of agglomeration sizes.

The COWI cost functions are also used by the World Bank and in the recent Commission study Blue2.

The amount of p.e. treated can be extracted from what is reported by Member States under the UWWTD. An asset life of 25 years was assumed. Where data was lacking, the date of compliance of a WWTP was used as the “beginning of life” date in the assessment.

As the cost assessment takes into account a baseline per Member State, meaning what existed in terms of collection and treatment infrastructure only the effects of the UWWTD are counted.

### ***Approach to modelling benefits***

Regarding benefits, a number of benefits were assessed. It was difficult to quantify and monetise these. In this section the methodology behind the quantified and monetised benefits is laid out.

For the UWWTD Evaluation the reduction of nitrogen, bathing improvements and cost savings related to the move from individual systems to centralised collection systems were quantified and monetised.

Nitrogen reduction in terms of reduction of N loads in treated waste through using a unit value per kilogram of N removed services as a proxy for water quality improvement. Less nitrogen loads in treated waste water leads to less risks of eutrophication, and can increase ecosystem services such as fisheries and drinking water provision. No site specific assessment was possible, instead the assessment was based on a study that assessed the nitrogen cycle.<sup>84</sup> Benefits were assessed based on Willingness to Pay to

<sup>84</sup> Sutton et al. (2011), The European Nitrogen Assessment, Chapter 22

remove 1 kg of nitrogen from the Baltic Sea (Sutton et al, 2011). The underlying study assumed that a 50% reduction N would be sufficient. Based on the WTP a benefit transfer for a damage cost can be derived per Member State.

For bathing water the reduction of microbiological pollution was assessed, and the willingness to pay for a clean beaches in Scotland. It was possible to estimate the benefit of improved bathing water quality by measuring the reduction of bathing waters with a ‘failing’ bathing water quality status, in line with the findings of the JRC. The assessment is based on a study assessing WTP to pay for clean bathing water in Scotland (Phillips et al, 2018). The underlying study assessed how much people would be willing to pay for improved water quality at Scottish beaches.

A benefit transfer approach, as exemplified by Navrud (2016)<sup>85</sup> was used: A benefit transfer means using the monetary valuation of a benefit estimated in one situation for estimating the benefits in another situation.

Where there in compliance with the UWWTD has been a change from individual collection systems to central collection systems, there has been a service level improvement as these households would no longer experience filled tanks and would not have to arrange for tanks to be emptied or maintained. To monetise this reduction, a conservative estimate of the costs of Individual and Appropriate Systems (IAS) provided by the World Bank (2017) has been used.

Challenges for the quantification of and monetisation of benefits were: 1) There are no studies that have previously attempted to monetise the benefits of the UWWTD; 2) Benefits are reflected in the water quality, however waste water is only one of the sources of pollution; 3) Benefits can depend on local conditions and therefore can strongly differ; 4) Benefits are also time specific.

Furthermore, monetising benefits of water quality is inherently difficult as one improvement does not necessarily immediately transform into the increase of one ecosystem service – as often other the ecosystem is influence by a high variety of factors.

For both assessments the JRC’s work on the effectiveness of the Directive were used to the extent possible, which had isolated the effects of the UWWTD – thus the benefits quantified and monetised can directly related to the UWWTD. For a detailed description of how the baseline was established for collection and treatment, see the key issue report “costs and benefits”.

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<sup>85</sup> Navrud, S (2016). Possibilities and challenges in transfer and generalization of monetary estimates for environmental and health benefits of regulating chemicals, OECD Workshop on socioeconomic impact assessment of chemicals management, ECHA, Helsinki July 6-8

## Annex 4: Supporting evidence

### *Overview: Mapping of replies to Evaluation questions*

Evaluation criteria	Sub-section under Evaluation criterion	Evaluation question answered	Key issue
<b>Effectiveness</b>  Overarching question:  To what extent has the UWWTD reached its objectives and what are factors that affect its effectiveness?	Achievement of the Directive's objectives	E.Q.1	
			To what extent have the objectives of the UWWTD been achieved?
		E.Q.8	What have been the (quantitative and qualitative) effects of the UWWTD?
		E.Q.9	To what extent can these changes/effects be credited to the UWWTD?
	Factors influencing the effectiveness of the UWWTD	E.Q.5.	Late implementation  Storm water overflows and urban runoff  Individual and other appropriate systems  Small agglomerations and scattered dwellings

E.Q.3

To what extent are the provisions of the Directive translated into concrete, appropriate and clear requirements?

E.Q.2

To what extent is the intervention logic of the Directive still appropriate?

E.Q.16

To what extent is the UWWTD still relevant to achieve its objectives of protection of the environment from the adverse effects of waste water discharges?

Late implementation

E.Q.4

What are the main barriers and drivers to full implementation of the UWWTD?

Late implementation

E.Q.10

What factors influenced the achievements observed?

Late implementation

Financing the UWWTD implementation

E.Q.13

What are the main financing, investment and management issues, also with regards to EU funding for

implementation?

E.Q.14

How does compliance with the Directive impact on the affordability of water services?

Monitoring

E.Q.17

Monitoring

To what extent are the limit values for pollutants still valid?

Reporting

Reporting and information to the public

Information to the public

**Efficiency**

Overarching question:

To what extent has the Directive achieved its objectives in an efficient way without imposing administrative burden?

Benefits of the UWWTD

E.Q.12

Quantification of costs and benefits

What are the costs and benefits associated with the implementation of the UWWTD and how proportionate are these costs and benefits?

Costs related to the UWWTD

Proportionality of the UWWTD

Administrative burden

E.Q.15

To what extent is the administrative burden incurred by Member States and the Commission through monitoring and reporting proportionate?

	Costs	E.Q.11	Individual and other appropriate systems
	Individual or other appropriate systems	Has the Directive achieved the expected results in an efficient manner, at MS and EU level?	Dimensioning of plants
<b>Coherence</b>	Legal clarity and internal coherence	E.Q. 22	Overall clarity and coherence of the UWWTD, in particular clarity of legal provisions, internal coherence and coherence with other EU water related policies and other policies
Overarching question:		Is the UWWTD internally coherent?	
To what extent is the Directive internally and externally coherent?			
		E.Q.23	
		Is the UWWTD coherent with related EU water legislation?	
	Coherence with EU water law	E.Q.24	Is the UWWTD coherent with downstream legislation such as the Sewage Sludge Directive and the Bathing Water Directive?
		E.Q.25	
		Is the Directive coherent with wider EU policies?	
<b>Relevance</b>		E.Q.2	
Overarching question:	General relevance and remaining challenges	To what extent is the intervention logic of the Directive still appropriate?	
To what extent is the UWWTD and its intervention logic still relevant			

and appropriate – especially in light of new societal problems and needs?

E.Q.16

To what extent is the UWWTD still relevant to achieve its objectives of protection of the environment from the adverse effects of waste water discharges?

Contaminants of emerging concern

E.Q.19

How are pollutants of emerging concern covered by the Directive?

Contaminants of emerging concern

The UWWTD and circular economy

E.Q.7

How well does the Directive promote a sustainable approach, for example for phosphorus and nitrogen recycling, for treatment plants to be neutral from energy / GHG emissions

Energy-efficiency, greenhouse gas emissions

Energy

E.Q.20

To what extent is the Directive relevant to achieve a circular economy in the EU?

Energy-efficiency, greenhouse gas emissions

The UWWTD and innovation

E.Q.18

To what extent does the Directive encourage / facilitate innovation and adaptation?

The Sustainable Development Goals, citizens'

E.Q.21

How relevant is the Directive

	demands and the role of the UWWTD	in the light of the changing international contexts, such as the Sustainable Development Goals in 2030?
<b>EU added value</b>	Addressing waste water at EU level and hypothetical impacts of withdrawal	E.Q.9
Overarching question: To what extent is it necessary to address urban waste water on EU level and what would have happened without the Directive?	Addressing waste water at EU level and hypothetical impacts of withdrawal	To what extent can these changes/effects be credited to the UWWTD?
	Addressing waste water at EU level and hypothetical impacts of withdrawal	E.Q.26
		To what extent do the issues addressed by the UWWTD continue to require action at EU level?
	Addressing waste water at EU level and hypothetical impacts of withdrawal	E.Q.27
		What would be the most likely consequences of stopping or withdrawing the existing EU intervention?

*Table 19 Overview interlinkages of sections, Evaluative questions and key issue reports.*

### **Implementation**

#### *Deadlines for the implementation of the UWWTD*

<b>Date</b>	<b>Objective</b>
<b>30 June 1993</b>	Transposition of the Directive [Art. 19]
<b>31 December 1993</b>	Designation of sensitive areas and their catchments (review – every four years). [Art. 5]
	Identification of less sensitive areas if there are reasons for the Member State to do so (review – every four years). [Art. 6]
	Discharge of industrial waste water into collecting systems and urban waste water treatment plants subject to prior regulation and authorisation. [Art. 11]
	Requirements for authorisation of direct discharges of industrial waste water from food processing industries to surface water in place. [Art. 13]
	Establishment of programme for the implementation of the Directive.

	[Art. 17]
<b>30 June 1994</b>	Implementation programmes communicated to the Commission (After this deadline, the programmes shall be updated by 30 June every two years, if necessary i.e. if there are changes). [Art. 17]
<b>30 June 1995</b>	Situation reports on collection, treatment and the disposal of urban waste water and sewage sludge in their areas are published every two years and transmitted to the Commission. [Art. 15]
<b>31 December 1997</b>	1 <sup>st</sup> review of designation of sensitive areas, their catchments (and less sensitive areas – if appropriate); – review every four years. [Art. 5; Art. 6]
<b>31 December 1998</b>	Collecting systems for agglomerations >10 000 p.e. for discharges into a sensitive area and its catchment. [Art. 3]
	All discharges from agglomerations >10 000 p.e. into a sensitive area and its catchment subject to more stringent treatment. [Art. 5]
	Disposal of sludge from urban waste water treatment plants subject to general rules of registration or authorisation. [Art. 14]
	Disposal of sludge to surface waters is banned. [Art. 14]
<b>31 December 2000</b>	Collecting systems for agglomerations >15 000 p.e. for discharges into normal areas. [Art. 3]
	All discharges from agglomerations >15 000 p.e. into a normal area subject to secondary treatment. [Art. 4]
	Direct discharges of industrial biodegradable waste water from plants representing the load of > 4 000 p.e. to surface water subject to prior regulation and authorisation. [Art. 13]
<b>31 December 2005</b>	Collecting systems for all agglomerations between 2 000 and 15 000 p.e. [Art. 3]
	All discharges from agglomerations 10 000 – 15 000 p.e. subject to secondary treatment. [Art. 4]
	Discharges to freshwater and estuaries from agglomerations between 2 000 and 10 000 p.e. subject to secondary treatment. [Art. 4]
	Discharges to freshwater and estuaries from agglomerations <2 000 p.e. subject to appropriate treatment. [Art. 7]
	Discharges to coastal waters from agglomerations <10 000 p.e. subject to appropriate treatment. [Art. 7]
	Review of identification of sensitive areas and less sensitive areas. [Art. 5; Art. 6]

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*Table 20 Overview implementation deadlines for EU 15.*

**Table: Transitional periods and interim targets<sup>1</sup> for the implementation of UWWTD in EU-10 and EU-2**

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<b>Cyprus</b>	3, 4, and 5(2) – if sensitive areas have to be identified	31 December 2008 – for 2 aggl. (Limassol and Paralimni) with >15,000p.e. 31 Dec 2009 – for 1 aggl. (Nicosia) with > 15,000 p.e. 31 Dec 2011 – for 1 aggl. with >15,000p.e.	<b>31 Dec 2012</b>
<b>Czech Republic</b>	3, 4, 5(2)	01 May 2004 – for 18 agglom. >10,000 p.e. 31 Dec 2006 – 36 aggl.	<b>31 Dec 2010</b>
<b>Estonia</b>	3, 4, 5(2)	31 December 2009 - for aggl. >10,000 p.e.	<b>31 Dec 2010</b>
<b>Latvia</b>	3, 4, 5(2)	31 Dec 2008 – for aggl. with > 100,000 p.e. 31 Dec 2011 – for aggl. between 10,000 and 100,000 p.e.	<b>31 Dec 2015</b>
<b>Lithuania</b>	3, 4, 5(2)	31 Dec 2007 – compliance with Art.4 and 5(2) for all aggl. > 10,000 p.e.	<b>31 Dec 2009</b>
<b>Hungary</b>	3, 4, 5(2)	31 Dec 2008 – for aggl. in sensitive areas with >10,000 p.e. 31 Dec 2010 – for aggl. in normal areas with >15,000 p.e.	<b>31 Dec 2015</b>
	13	-	<b>31 Dec 2008</b> – for biodegradable industrial waste water from plants belonging to industrial sectors from Annex III <sup>2</sup>
<b>Malta</b>	3	01 May 2004 – compliance for Marsa land and Gozo-Main representing 24% of total biodegradable load 30 June 2004 – for Malta South representing further 67% of total	<b>31 Oct 2006</b>

<sup>1</sup> Information extracted from the Accession Treaty, OJ L 236, 23.9.2003, p.809-922, Annexes V – XIV

<sup>2</sup> Pannontej Rt. (Répcelak); Bácsbokodi Tejuzem (Bácsbokodi); Papp Kereskedelmi Kft. Konzervgyár (Nyirtas); Vépisz Szövetkezet, Konzervuzem.(Csegold); Sztalmári Konzervgyár Kft. (Tyukod); Petisfood Kft. Konzervuzem (Vasmegyer); Atev Rt. (Debrecen-Bánk); Mirsa Rt. (Albertirsa); Makói Tejuzem (Máko); Zalka Tej Rt. (Nagybányegyes)

**Table: Transitional periods and interim targets<sup>1</sup> for the implementation of UWWTD in EU-10 and EU-2**

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<b>Cyprus</b>	3, 4, and 5(2) – if sensitive areas have to be identified	31 December 2008 – for 2 aggl. (Limassol and Paralimni) with >15,000p.e. 31 Dec 2009 – for 1 aggl. (Nicosia) with > 15,000 p.e. 31 Dec 2011 – for 1 aggl. with >15,000p.e.	<b>31 Dec 2012</b>
<b>Czech Republic</b>	3, 4, 5(2)	01 May 2004 – for 18 agglom. >10,000 p.e. 31 Dec 2006 – 36 aggl.	<b>31 Dec 2010</b>
<b>Estonia</b>	3, 4, 5(2)	31 December 2009 - for aggl. >10,000 p.e.	<b>31 Dec 2010</b>
<b>Latvia</b>	3, 4, 5(2)	31 Dec 2008 – for aggl. with > 100,000 p.e. 31 Dec 2011 – for aggl. between 10,000 and 100,000 p.e.	<b>31 Dec 2015</b>
<b>Lithuania</b>	3, 4, 5(2)	31 Dec 2007 – compliance with Art.4 and 5(2) for all aggl. > 10,000 p.e.	<b>31 Dec 2009</b>
<b>Hungary</b>	3, 4, 5(2)	31 Dec 2008 – for aggl. in sensitive areas with >10,000 p.e. 31 Dec 2010 – for aggl. in normal areas with >15,000 p.e.	<b>31 Dec 2015</b>
	13	-	<b>31 Dec 2008</b> – for biodegradable industrial waste water from plants belonging to industrial sectors from Annex III <sup>2</sup>
<b>Malta</b>	3	01 May 2004 – compliance for Marsa land and Gozo-Main representing 24% of total biodegradable load 30 June 2004 – for Malta South representing further 67% of total	<b>31 Oct 2006</b>

<sup>1</sup> Information extracted from the Accession Treaty, OJ L 236, 23.9.2003, p.809-922, Annexes V – XIV

<sup>2</sup> Pannontej Rt. (Répcelak); Bácsbokodi Tejuzem (Bácsbokodi); Papp Kereskedelmi Kft. Konzervgyár (Nyirtas); Vépisz Szövetkezet, Konzervuzem.(Csegold); Sztalmári Konzervgyár Kft. (Tyukod); Petisfood Kft. Konzervuzem (Vasmegyer); Atev Rt. (Debrecen-Bánk); Mirsa Rt. (Albertirsa); Makói Tejuzem (Máko); Zalka Tej Rt. (Nagybányegyes)

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
	4	biodegradable load 31 Dec 2005 – for Gharb in Gozo and Nadur in Gozo representing further 1% of total biodegradable load 01 May 2004 – for Marsa Land representing 19% of total biodegradable load 31 Oct 2004 – for Gozo-Main representing further 5% of total biodegradable load 31 Dec 2005 - for Gharb in Gozo and Nadur in Gozo representing further 1% of total biodegradable load 31 Oct 2006 – for Malta North representing further 8% of total biodegradable load	31 March 2007
Poland	3, 4, 5(2), 7  13	31 Dec 2005 – in 674 all. representing 69% of total biodegradable load 31 Dec 2010 – in 1069 aggl. representing 86% of total biodegradable load 31 December 2013 – in 1165 aggl. representing 91% of total biodegradable load	31 Dec 2015  31 Dec 2010 <sup>3</sup>
Slovenia	3, 4, 5(2)	31 Dec 2008 – in sensitive areas for aggl. with > 10,000 p.e. 31 Dec 2010 – in aggl. with > 15,000p.e.	31 Dec 2015
Slovakia	3, 4, 5(2)	31 Dec 2004 – for 83% of the total biodegradable load 31 Dec 2008 – for 91% of the total biodegradable load 31 Dec 2010 – all agglomerations > 10,000 p.e.	31 Dec 2015

<sup>3</sup> In accordance with table presented in the Accession Treaty (ref. OJ L 236, Annexes V – XIV, 23.9.3003, p.893; Industries under points 8-9 listed in Annex III in UWWTD has to be compliance with article 13 on the date of accession (01/05/2004)

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
	4	biodegradable load 31 Dec 2005 – for Gharb in Gozo and Nadur in Gozo representing further 1% of total biodegradable load 01 May 2004 – for Marsa Land representing 19% of total biodegradable load 31 Oct 2004 – for Gozo-Main representing further 5% of total biodegradable load 31 Dec 2005 - for Gharb in Gozo and Nadur in Gozo representing further 1% of total biodegradable load 31 Oct 2006 – for Malta North representing further 8% of total biodegradable load	31 March 2007
Poland	3, 4, 5(2), 7  13	31 Dec 2005 – in 674 all. representing 69% of total biodegradable load 31 Dec 2010 – in 1069 aggl. representing 86% of total biodegradable load 31 December 2013 – in 1165 aggl. representing 91% of total biodegradable load	31 Dec 2015  31 Dec 2010 <sup>3</sup>
Slovenia	3, 4, 5(2)	31 Dec 2008 – in sensitive areas for aggl. with > 10,000 p.e. 31 Dec 2010 – in aggl. with > 15,000p.e.	31 Dec 2015
Slovakia	3, 4, 5(2)	31 Dec 2004 – for 83% of the total biodegradable load 31 Dec 2008 – for 91% of the total biodegradable load 31 Dec 2010 – all agglomerations > 10,000 p.e.	31 Dec 2015

<sup>3</sup> In accordance with table presented in the Accession Treaty (ref. OJ L 236, Annexes V – XIV, 23.9.3003, p.893; Industries under points 8-9 listed in Annex III in UWWTD has to be compliance with article 13 on the date of accession (01/05/2004)

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
		31 Dec 2012 – for 97% of the total biodegradable load	
<b>Bulgaria<sup>4</sup></b>	3, 4, 5(2)	31 Dec 2010 – for aggl. with > 10,000 p.e.	<b>31 Dec 2014</b>
<b>Romania<sup>5</sup></b>	3, 4, 5(2)		<b>31 Dec 2018</b>
	3	31 Dec 2010 – 61% of the load in p.e. 31 Dec 2013 – 69% of the load in p.e. 31 Dec 2015 – 80% of the load in p.e.	
	3	31 Dec 2013 – all agglomerations > 10,000 p.e.	
	4, 5(2)	31 Dec 2010 – 51% of the load in p.e. 31 Dec 2013 – 61% of the load in p.e. 31 Dec 2015 – 77% of the load in p.e.	
		31 Dec 2015 – all agglomerations > 10,000 p.e.	

<sup>4</sup> Accession Treaty, ref. OJ L 157, 21.6.2005, p.298

<sup>5</sup> Accession Treaty, ref. OJ L 157, 21.6.2005, p.169-170

<i>State</i>	<i>Articles</i>	<i>Interim target dates to comply with *</i>	<i>Final deadline of transitional period</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
		31 Dec 2012 – for 97% of the total biodegradable load	
<b>Bulgaria<sup>4</sup></b>	3, 4, 5(2)	31 Dec 2010 – for aggl. with > 10,000 p.e.	<b>31 Dec 2014</b>
<b>Romania<sup>5</sup></b>	3, 4, 5(2)		<b>31 Dec 2018</b>
	3	31 Dec 2010 – 61% of the load in p.e. 31 Dec 2013 – 69% of the load in p.e. 31 Dec 2015 – 80% of the load in p.e.	
	3	31 Dec 2013 – all agglomerations > 10,000 p.e.	
	4, 5(2)	31 Dec 2010 – 51% of the load in p.e. 31 Dec 2013 – 61% of the load in p.e. 31 Dec 2015 – 77% of the load in p.e.	
		31 Dec 2015 – all agglomerations > 10,000 p.e.	

<sup>4</sup> Accession Treaty, ref. OJ L 157, 21.6.2005, p.298

<sup>5</sup> Accession Treaty, ref. OJ L 157, 21.6.2005, p.169-170

*Figure 45 Deadlines for Member States that joined in and after 2004*

*Member State baselines 1990s/ upon accession to the EU*

The baseline per Member State below is taken directly from the support study and was not modified.

The table below presents the overall score that were derived based on several indicators including:

- Date of implementation of the UWWTD
- Status on compliance with the UWWTD
- Number and length of enforcement cases
- Level of EU funding in comparison to costs

Reference date	Country code	Population with treatment (%)	Comments and Sources	WIND 1 Weight	WIND 2 Weight
before 1995	<b>AT</b>	72.0	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	1	1
before 1995	<b>BE</b>	28.9	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	0	0
before 1995	<b>DE</b>	86.1	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	1	1
before 1995	<b>DK</b>	85.4	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	1	1
before 1995	<b>ES</b>	48.1	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	0	0
before 1995	<b>FI</b>	76.0	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	1	1
before 1995	<b>FR</b>	69.0	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	0.5	0.5
before 1995	<b>EL</b>	11.4	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	0	0
before 1995	<b>IE</b>	44.0	earliest possible value for the period 1990-1995 / Source: <a href="#">OECD Wastewater treatment indicator</a>	0	0
before 1995	<b>IT</b>	63.0	earliest possible value for the period 1990-1995 / Source:	0	0

<u>OECD Wastewater treatment indicator</u>					
before 1995	<b>LU</b>	90.4	earliest possible value for the period 1990-1995 / Source: <u>OECD Wastewater treatment indicator</u>	0.5	0.5
before 1995	<b>NL</b>	94.0	earliest possible value for the period 1990-1995 / Source: <u>OECD Wastewater treatment indicator</u>	1	1
before 1995	<b>PT</b>	20.9	earliest possible value for the period 1990-1995 / Source: <u>OECD Wastewater treatment indicator</u>	0	0
before 1995	<b>SE</b>	86.0	earliest possible value for the period 1990-1995 / Source: <u>OECD Wastewater treatment indicator</u>	1	1
before 1995	<b>UK</b>	79.0	earliest possible value for the period 1990-1995 / Source: Eurostat [ <u>env_ww_con: Population connected to wastewater treatment plants</u> ]	0.5	0.5
2004	<b>CY</b>	28.4	value for 2004 or first earliest year / Source: Eurostat [ <u>env_ww_con: Population connected to wastewater treatment plants</u> ]	0	0
2004	<b>CZ</b>	71.1	value for 2004 or first earliest year / Source: OECD <u>Wastewater treatment indicator</u>	0.5	0.5
2004	<b>EE</b>	72.0	value for 2004 or first earliest year / Source: OECD <u>Wastewater treatment indicator</u>	0.5	0.25
2004	<b>HU</b>	58.1	value for 2004 or first earliest year / Source: OECD <u>Wastewater treatment indicator</u>	0.5	0.25
2004	<b>LT</b>	59.1	value for 2004 or first earliest year / Source: Eurostat [ <u>env_ww_con: Population connected to wastewater treatment plants</u> ]	0.5	0.25
2004	<b>LV</b>	66.1	value for 2004 or first earliest year / Source: Eurostat [ <u>env_ww_con: Population connected to wastewater</u>	0.5	0.25

treatment plants]:  
[http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_ww\\_con&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ww_con&lang=en)

2004	<b>MT</b>	13.3	value for 2004 or first earliest year / Source: Eurostat [ <a href="#">env_ww_con: Population connected to wastewater treatment plants</a> ]	0	0
2004	<b>PL</b>	59.0	value for 2004 or first earliest year / Source: OECD <a href="#">Wastewater treatment indicator</a>	0.5	0.5
2004	<b>SI</b>	48.4	value for 2004 or first earliest year / Source: Eurostat [ <a href="#">env_ww_con: Population connected to wastewater treatment plants</a> ]	0.5	0.25
2004	<b>SK</b>	54.1	value for 2004 or first earliest year / Source: OECD <a href="#">Wastewater treatment indicator</a>	0.5	0.25
2007	<b>BG</b>	42.3	value for 2007 or first earliest year / Source: Eurostat [ <a href="#">env_ww_con: Population connected to wastewater treatment plants</a> ]	0	0
2007	<b>RO</b>	28.3	value for 2007 or first earliest year / Source: Eurostat [ <a href="#">env_ww_con: Population connected to wastewater treatment plants</a> ]	0	0
2013	<b>HR</b>	52.9	value for 2013 or first earliest year / Source: Eurostat [ <a href="#">env_ww_con: Population connected to wastewater treatment plants</a> ]	0.5	0.25

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*Table 20 Baseline assumptions per MS.*

*Information on investments*

Copy from 9th Impl. Report:

In 2014-2020, about €10 billion, goes to wastewater treatment infrastructure, including the construction or upgrading of plants and sewerage networks, with some funding also going to sludge management.

Copy from 8th Impl. Report:

The EU dedicated a significant amount of funding under the EU Cohesion Policy funds (€7.8 billion in the 2007-2013 programming period, which is still subject to changes).

Copy from 7th Impl. Report:

Despite the significant support from EU funding, the "Fitness check of EU freshwater policy" underlined that the majority of funds necessary to implement EU water policy needs to be generated within the Member States. According to a study of 22 Member States, there is still a significant financing gap in relation to future compliance with the Directive in those Member States (COWI, 2010).

Copy from 6th Impl. Report:

In the current funding period 2007 to 2013, the planned investments into infrastructure related to collection or treatment of waste water will amount to about € 14 billion. Twenty-one Member States have allocated Cohesion policy funding to waste water treatment, the biggest share (about 98%) being used in the 'Convergence regions' (mostly EU-12 and DE, IT, PT, ES and EL)

Copy from 3rd Impl. Report:

As it is not obligatory for Member States to provide information on investments, the data received by the Commission were not sufficiently complete to be presented here. However, the European Commission study on "investment and employment related to EU policy on air, water and waste" (2000), estimates that about 152 billion Euro were invested for waste water infrastructure over the period 1990-2010. The European Commission provides support for the implementation of the Urban Waste Water Treatment Directive in Member States and Candidate States of about 5 billion Euro per year.

## **Austria**

Austria joined the EU in 1995.

In 1995, 4 years after the UWWTD was adopted at the EU level, it is estimated that the connection of the population to collecting systems or urban wastewater treatment plants exceeded 70%. All the cities provided at least secondary treatment and many cities provided tertiary treatment (e.g. Wien, Linz and Salzburg).

The last deadlines for Austria to develop the necessary infrastructure required by the Directive expired on 31<sup>st</sup> December 2005 (last deadline also in the Directive).

Overall IAS use is very low (<1% of total generated load in agglomerations >2000 p.e.).

Austria is one of the few countries with no ruling of the CJEU related to the implementation of the UWWTD.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **Belgium**

Belgium is one of the founding members of the EU (EC). By 1991, when the UWWTD was adopted at EU level, it is estimated that less than 30% of the population was connected to treatment, being one of the lowest connection rates in the EU. There was no treatment in Brussels and for large shares of the population in Charleroi and Liege, and only few cities had secondary treatment.

The last deadlines for Belgium to develop the necessary infrastructure required by the Directive expired on 31<sup>st</sup> December 2005

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

Belgium has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 3 final rulings by the CJEU under Art. 258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations, as well as for failures to establish and report implementation programmes (Art.17). Belgium was also sent to the CJEU under Art. 260 for groups of agglomerations missing collecting system or tertiary treatment. Belgium has been fined with a lumpsum fine up to EUR 10 million and one penalty payment amounting to EUR 0.86 million for every 6-month period of non-compliance.

The national contribution to comply with the UWWTD was EUR 3,101 million for the period 2000-2006 and EUR 2,997 million for 2007-2013. No information for EU funds is available.

## **Bulgaria**

Bulgaria joined the EU in 2007.

In that year, around 42% of the country's population was connected to treatment.

In the early 1990s the connection to treatment was around 35%. It should be highlighted that after entering EU the progress in treatment level has speeded up, since it reached 62% by 2015.

The last deadlines for Bulgaria to develop the necessary infrastructure required by the Directive expired on the 31<sup>st</sup> December 2014, according to the Accession Treaty signed with the Commission.

Overall IAS use is very low (almost 0% of total generated load in agglomerations >2000 p.e.).

Bulgaria has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art.258.

Through Cohesion policy and other funds, the EU committed to provide EUR 246 million between 2000 and 2006, which have partly funded the efforts to comply with the UWWTD. In the same period, the national funds allocated were EUR 4 million.

## **Cyprus**

Cyprus joined the EU in 2004.

In that year, the existing waste water collection and treatment infrastructure was very limited, with only 28% of its population connected.

The two largest cities, Nicosia and Limassol, provided secondary treatment since the mid-1990s, but small agglomerations were mainly served by septic tanks and cesspits.

Overall IAS use is 1.6% of total generated load (in agglomerations >2000 p.e.).

The last deadlines for Cyprus to develop the necessary infrastructure required by the Directive expired on the 31<sup>st</sup> December 2012.

Cyprus has no final ruling against it by the CJEU yet.

The national contribution to comply with the UWWTD were EUR 395 million for the period 2000-2006 and EUR 1,513 million for 2007-2013 (no information for EU funds).

## **Croatia**

Croatia joined the EU in 2013.

In that year, less than 55% of its population was connected either to collecting or urban wastewater treatment.

Overall IAS use is not available.

Croatia has not been assessed for compliance yet, because its first interim deadline expired at the end of 2018 and it still has pending deadlines up to 2020 and 2023.

Tariffs represent the largest source of financing for the sector. In 2012, water use and water protection fees represented 18% of the sector funding. Tariffs collected by utilities accounted for 57% of the total financing coming into the sector but failed to fully cover O&M utility costs.

## **Czechia**

Czechia joined the EU in 2004.

By then, 79% of the population was connected to the collecting system and 71% to urban waste water treatment.

All its territory has been designated as sensitive.

Overall IAS use is 6.9% of total generated load (in agglomerations >2000 p.e.). The use of IAS shows mixed trends over the years.

The last deadlines for Czechia to develop the necessary infrastructure required by the Directive expired on the 31<sup>st</sup> December 2010.

Czechia has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Czechia with EUR 397 million between 2000 and 2006 and EUR 1,344 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 177 million and EUR 4,732 million.

## **Denmark**

Denmark joined the EU in 1973.

Before the UWWTD was adopted at EU level, the existing wastewater treatment infrastructure was already well-developed, serving over 85% of the population.

All major cities were already provided with tertiary treatment.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Denmark to develop the necessary infrastructure required by the Directive expired on the 31<sup>st</sup> December 2005.

Denmark is one of the few countries with no ruling of the CJEU related to the implementation of the UWWTD.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **Estonia**

Estonia joined the EU in 2004.

By then, 72% of its population was connected to collecting or urban wastewater treatment.

The capital city of Estonia, Tallin, and the two large cities of Rakvere and K-Järve provided secondary treatment already since the 1990s.

Overall IAS use is 2.5% of total generated load (in agglomerations >2000 p.e.). The use of IAS has shown a decreasing trend over the years.

The last deadlines for Estonia to develop the necessary infrastructure required by the Directive expired on the 31<sup>st</sup> December 2010.

Estonia has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Estonia with EUR 110 million between 2000 and 2006 and EUR 203 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 197 million and €83 million.

## **Finland**

Finland joined the EU in 1995.

By then, the existing wastewater treatment infrastructure was already developed, covering 76% of the population.

Major cities like Helsinki, Espoo, Tampere and Turku already provided tertiary treatment since the early 1990s.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Finland to develop the necessary infrastructure required by the Directive expired on 31<sup>st</sup> December 2005.

Finland has been sent to the CJEU and found in breach of the UWWTD once. There has been 1 final ruling by the CJEU under Art. 258 for failing to establish more stringent treatment (Art.5) for groups of agglomerations.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **France**

France is one of the founding members of EU (EC).

At the beginning of the 1990s, when the UWWTD was adopted at EU level, it was estimated that 69% of the population was connected to treatment.

By then, large cities such as Nantes, Anger and Colmar provided tertiary treatment, Paris provided partly secondary and partly tertiary treatment, while other cities such as Lille, Marseille and Bordeaux provided primary treatment only.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The default deadlines for France to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

However, France had to meet additional deadlines, because of the designation of new sensitive areas on its territory after 2007. The additional investments on infrastructure were implemented by 2012 and 2013. Furthermore, it has additional pending deadlines for one of its overseas territories, Mayotte (2020 and 2027).

France has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 4 final rulings by the CJEU under Art. 258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations, as well as for failures related to monitoring and reporting (Art.15). However, France has no ruling under Art. 260, which means that the breaches have been addressed effectively without reaching the stage of a second ruling for the same case. France has a pending case under Art. 258.

The total investments on infrastructure related to the UWWTD are estimated at EUR 90 billion between 1994-2004.

## **Germany**

(West) Germany is one of the founding members of EU (EC).

At the beginning of the 1990s, when the UWWTD was adopted at EU level, the existing waste water collecting and treatment system was one of the most developed in Europe, already covering more than 86% of the population.

Overall IAS use is 1.8% of total generated load (in agglomerations >2000 p.e.).

The last deadlines for Germany to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

Germany has been sent to the CJEU and found in breach of the UWWTD once. There has been 1 final ruling by the CJEU under Art. 258 for late transposition of the UWWTD

(Art.5) for groups of agglomerations. Germany plead that the delay was due to the federal structure of the state, which required a separate process of transposition in each federal state.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **Greece**

Greece joined the EU in 1981.

By 1991, when the UWWTD was adopted on EU level, the existing wastewater collecting and treatment infrastructure was very limited in the Member State. It is estimated that half of the population was connected to the collecting system, but almost 40% of the wastewater load was discharged to fresh water and coastal areas without treatment. Less than 1% of the wastewater load received primary treatment and 10% received biological (secondary) treatment.

Major cities such as Athens, Elefsina, Aspropyrgos and Patra, provided no treatment.

Overall IAS use is 10.4% of total generated load (in agglomerations >2000 p.e.). The use of IAS has shown a steady trend of reduction over the years, but it is still very high.

Greece has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 4 final rulings by the CJEU under Art. 258 and 2 final rulings under Art. 260 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations. Greece was also sent once more to the CJEU under Art. 258 for late transposition of the UWWTD (Art.19; due by 1993, but accomplished in 1997). Greece has been fined with 2 lump sum fines up to EUR 5 and 10 million each and with penalty payments around EUR 3.3 and 3.6 million each for every 6-month period of non-compliance.

Greece was also granted very high access to Cohesion policy funds both at EU-15 and EU-28 level and has used more than EUR 6 billion to construct the necessary facilities for wastewater collection and treatment. Several WWTPs for agglomerations between 2 000 – 10 000 p.e. are still pending.

## **Hungary**

Hungary joined the EU in 2004.

At that time, the existing wastewater infrastructure allowed 62% of its population to be connected to collecting systems and 58% to be connected to urban wastewater treatment.

Budapest provided secondary treatment, and partly phosphorous removal, already from the 1990s.

Overall IAS use is 13.1% of total generated load (in agglomerations >2000 p.e.). The use of IAS has shown a steady trend of reduction over the years, but it is still very high.

The last deadlines for Hungary to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2015.

Hungary has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Hungary with EUR 493 million between 2000 and 2006 and EUR 1,536 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 1,434 million and EUR 754 million.

## **Ireland**

Ireland joined the EU in 1973.

By 1991, when the UWWTD was adopted on EU level, 44% of the country's population was connected to urban wastewater treatment.

Dublin provided only primary treatment, whereas cities like Cork and Dundalk provided no treatment at all.

Overall IAS use 5% of total generated load (in agglomerations >2000 p.e.).

The default deadlines for Ireland to develop the necessary infrastructure expired on 31<sup>st</sup> December 2005.

Furthermore, Ireland had to meet additional deadlines, because of the designation of new sensitive areas on its territory after 2007, which is related to Art.5 provisions on the review of sensitive areas.

Ireland has been sent to the CJEU and found in breach of the UWWTD only once. There has been 1 final ruling by the CJEU under Art. 258 for failing to establish secondary treatment (Art.4) for groups of agglomerations. Ireland has a pending case under Art. 258.

However, the Member State made substantial progress in reducing the number of the above agglomerations by investing in relevant infrastructure in the following years.

Through Cohesion policy and other funds, the EU committed to provide Ireland with EUR 282 million between 2000 and 2006 and EUR 1,536 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the period 2000-2006, the national funds allocated to the UWWTD were EUR 2,147 million (no data identified for the period 2007-2013).

## **Italy**

Italy is one of the founding members of the EU (EC).

By 1991, when the UWWTD was adopted, the population connected to urban wastewater treatment exceeded 60%.

All major cities provided at least secondary treatment in early 1990s, except for Milan, which provided no treatment at all, and Florence which provided partly primary treatment.

Overall IAS use is 4.4% of total generated load (in agglomerations >2000 p.e.). The use of IAS remains steady over the years.

The default deadlines for Italy to develop the necessary infrastructure expired on 31<sup>st</sup> December 2005.

Furthermore, Italy had to meet additional deadlines, because of the designation of new sensitive areas on its territory after 2007, which is related to Article 5 provisions on the review of sensitive areas.

Italy has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 5 final rulings by the CJEU under Art. 258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations, as well as for delays in the transposition of the UWWTD (Art. 19) and failures to ensure the necessary performance of WWTPs (Art.10). Italy was also sent to the CJEU under Art. 260 for groups of agglomerations missing collecting system or secondary treatment. Italy has been fined with a lumpsum fine of EUR 25 million and one penalty payment amounting to EUR 30.1 million for every 6-month period of non-compliance. Italy has a pending case under Art. 258 and a pending case under Art. 260.

Through Cohesion policy and other funds, the EU committed to provide Italy with EUR 228 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD.

## **Latvia**

Latvia joined the EU in 2004.

By then, the wastewater collecting and treatment system served 66% of the national population.

Riga provided tertiary treatment already since early 1990s.

Overall IAS use is 5.2% of total generated load (in agglomerations >2000 p.e.). The use of IAS has shown a decreasing trend over the years.

The last deadlines for Latvia to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2015.

Latvia has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide EUR 7 million between 2000 and 2006, which have partly funded the efforts to comply with the UWWTD (no data identified for the period 2007-2013).

## **Lithuania**

Lithuania joined the EU in 2004.

In that year, 70% of the population was connected to collecting systems and 59% was connected to urban wastewater treatment.

Overall IAS use is 4.9% of total generated load (in agglomerations >2000 p.e.). The use of IAS shows mixed trends over the years.

The last deadlines for Lithuania to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2009.

Lithuania has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Lithuania with EUR 269 million between 2000 and 2006 and EUR 206 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD.

## **Luxembourg**

Luxembourg is one of the founding members of EU (EC).

Before the adoption of the UWWTD, the existing connection rate to wastewater collection and treatment was already around 90%.

Luxembourg City provided secondary treatment with phosphorous removal.

Overall IAS use is very low (<1% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Luxembourg to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

Luxembourg has been sent to the CJEU and found in breach of the UWWTD twice. There has been 1 final ruling by the CJEU under Art. 258 for failing to establish more stringent treatment (Art.5) for groups of agglomerations. Luxembourg was also sent to the CJEU under Art. 260 for groups of agglomerations missing tertiary treatment. Luxembourg has been fined with a lumpsum fine up to EUR 2 million and one penalty payment amounting to EUR 0.003 million for every 6-month period of non-compliance.

The national contribution to comply with the UWWTD amounted EUR 294 million for the period 2000-2006.

## **Malta**

Malta joined the EU in 2004.

By then, all its population was connected to collecting systems but only 13% was connected to urban wastewater treatment, which was the lowest rate among the rest MSs that entered EU in the same year.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Malta to develop the necessary infrastructure expired on the 31<sup>st</sup> March 2007.

Malta has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Malta with EUR 42,5 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD.

## **Netherlands**

The Netherlands is one of the founding members of EU (EC).

By 1991, when the UWWTD was adopted, the existing infrastructure for wastewater collection and treatment system already served more than 94% of the population.

Major cities, such as Amsterdam, Eindhoven, Rotterdam and The Hague already provided at least secondary treatment.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for the Netherlands to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

The Netherlands is one of the few countries with no ruling of the CJEU related to the implementation of the UWWTD.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **Poland**

Poland joined the EU in 2004.

In that year, almost 60% of the population was connected to collecting systems and urban wastewater treatment.

Warsaw partially provided secondary treatment already from early 1990s. Poland's whole territory is designated as sensitive area.

Overall IAS use is 8.7% of total generated load (in agglomerations >2000 p.e.). The use of IAS shows mixed trends over the years.

The last deadlines for Poland to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2015.

Poland has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art.258.

Through Cohesion policy and other funds, the EU committed to provide Poland with EUR 1,254 million between 2000 and 2006 and EUR 3,164 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 2,360 million and EUR 1,529 million.

## **Portugal**

Portugal joined the EU in 1986.

By 1991, when the UWWTD was adopted, the population connected to urban wastewater treatment was as low as 20%.

In early 1990s, there was no treatment in Porto, whereas Lisbon and Aveiro provided partly secondary and partly primary treatment.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Portugal to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

Portugal has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 4 final rulings by the CJEU under Art. 258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations, as well as for failure to identify less sensitive areas (Art. 6) and prior authorisation for industrial discharges (Art.11). Portugal was also sent to the CJEU under Art. 260 for groups of agglomerations missing collecting system or secondary treatment. Portugal has been fined with a lumpsum fine of EUR 3 million and one penalty payment amounting to EUR 0.008 million for every 6-month period of non-compliance. Portugal has a pending cases under Art. 260.

Through Cohesion policy and other funds, the EU committed to provide Portugal with EUR 505 million between 2000 and 2006 and EUR 765 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 935 million and EUR 593 million.

## **Romania**

Romania joined the EU in 2007.

In that year, the population connected to urban wastewater treatment was lower than 30%, which was among the lowest rates among the rest MSs that entered EU in the same year.

Overall IAS use is very low (<1% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Romania to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2018.

Romania has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Romania with EUR 679 million between 2000 and 2006 and EUR 1,338 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 114 million and EUR 2,496 million.

## **Slovakia**

Slovakia joined the EU in 2004.

By then, the connection rate of the population to collecting and treatment was around 55%.

The major cities in Slovakia provided secondary treatment already from the 1990s.

Overall IAS use is 16.5% of total generated load (in agglomerations >2000 p.e.). The use of IAS shows increasing trends over the years.

The last deadlines for Slovakia to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2015.

Slovakia has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art.258.

Through Cohesion policy and other funds, the EU committed to provide Slovakia with EUR 259 million between 2000 and 2006 and EUR 691 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 66 million and EUR 1,433 million.

## **Slovenia**

Slovenia joined the EU in 2004.

By then, 63% of the population was connected to collecting systems and 48% was connected to urban wastewater treatment.

Overall IAS use is 6.3% of total generated load (in agglomerations >2000 p.e.). The use of IAS shows mixed trends over the years.

The last deadlines for Slovenia to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2015.

Slovenia has no final ruling against it by the CJEU yet. However, the MS has pending cases under Art. 258.

Through Cohesion policy and other funds, the EU committed to provide Slovenia with EUR 117 million between 2000 and 2006 and EUR 157 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD. In the same periods, the national funds allocated to the UWWTD were respectively EUR 390 million and EUR 321 million.

## **Spain**

Spain joined the EU in 1986.

By 1991, when the UWWTD was adopted, 48% of the population was connected to treatment.

Already various cities like Almeria, Bilbao, Valladolid and Zaragoza provided tertiary treatment, but for instance La Coruña and Cádiz provided no treatment at all. Barcelona provided primary treatment and cities, such as Madrid, Sevilla and Valencia, provided secondary treatment.

Overall IAS use is 1.3% of total generated load (in agglomerations >2000 p.e.).

The last deadlines for Spain to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

Spain has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 5 final rulings by the CJEU under Art. 258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations. Spain was also sent to the CJEU under Art. 260 for groups of agglomerations missing collecting system or secondary treatment. Spain has been fined with a lumpsum fine up to EUR 12 million and one penalty payment amounting to EUR 0.95 million for every 6-month period of non-compliance. Spain has a pending case under Art.260.

Through Cohesion policy and other funds, the EU committed to provide Spain with EUR 2,968 million between 2000 and 2006 and EUR 3,108 million between 2007 and 2013, which have partly funded the efforts to comply with the UWWTD (no data about national investments were identified).

## **Sweden**

Sweden joined the EU in 1995.

By then, the existing collecting and treatment system served more than 85% of the national population.

All major cities with more than 150,000 p.e. provided at least secondary treatment, whereas cities such as Stockholm, Malmö and Helsingborg already provided tertiary treatment.

Overall IAS use is negligible (0% of total generated load in agglomerations >2000 p.e.).

The last deadlines for Sweden to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

Sweden has been sent to the CJEU and found in breach of the UWWTD once. There has been 1 final ruling by the CJEU under Art. 258 for failing to establish more stringent treatment (Art.5) for groups of agglomerations. Sweden has a pending case under Art. 260.

No information regarding EU and national funds for the implementation of the UWWTD were identified.

## **United Kingdom**

The UK joined the EU in 1973.

By 1991, when the UWWTD was adopted, 79% of the population was already connected to urban wastewater treatment.

Cities such as Dundee, Brighton, Portsmouth and Middlesbrough provided no treatment at all, whereas London and other big cities provided at least secondary treatment.

Overall IAS use is very low (<1% of total generated load in agglomerations >2000 p.e.).

The last deadlines for the UK to develop the necessary infrastructure expired on the 31<sup>st</sup> December 2005.

The UK has been sent to the CJEU and found in breach of the UWWTD multiple times. There have been 4 final rulings by the CJEU under Art.258 for failing to establish collecting systems (Art.3), secondary (Art.4) or more stringent treatment (Art.5) for groups of agglomerations, as well as for failing to ensure the necessary performance of WWTPs (Art.10). However, the UK has no ruling under Art. 260, which means that the breaches have been addressed effectively without reaching the stage of a second ruling for the same case.

The national investments to comply with the UWWTD were EUR 5 101 million in 2000-2006 and EUR 3 184 million in 2007-2013.

**Sources used:**

- CURIA, [Court of Justice of the European Union](#),
- European Commission, [Case Laws](#),
- European Commission, [Implementation reports of the UWWTD](#)
- European Commission, DG Environment, “[Compliance Costs of the Urban Waste Water Treatment Directive. Final report](#)”, September 2010.
- OECD, [Waste water treatment](#).

**Effectiveness**

*What if no Directive results – water quality*

The WIND scenarios were developed to have a hypothetical judgment of what would have happened without the Directive. Each Member State was assigned two “weights” (see baseline table for the weight). These weights are based on different expert judgment and consider the population levels connected to treatment before the Directive and take into account facts found per Member States such as funding received and number of infringement cases.

None of these reflect the reality, this is only meant to provide an indication of what, according to experts, would have happened without an EU level intervention. For a discussion of the assumptions, see Wood *et al.*, (2019), Evaluative study and Pistocchi *et al.*, (2019).

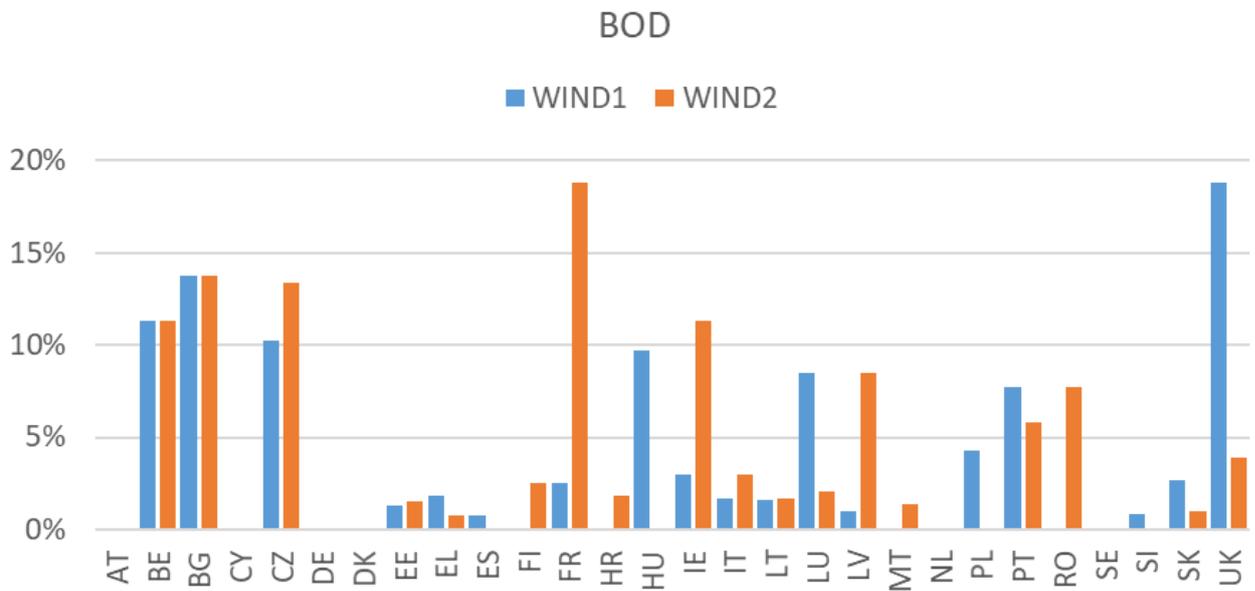


Figure 46 Hypothetical case of BOD loads reductions under 2 "What-if-no-Directive" scenarios compared to baseline (present) scenario.

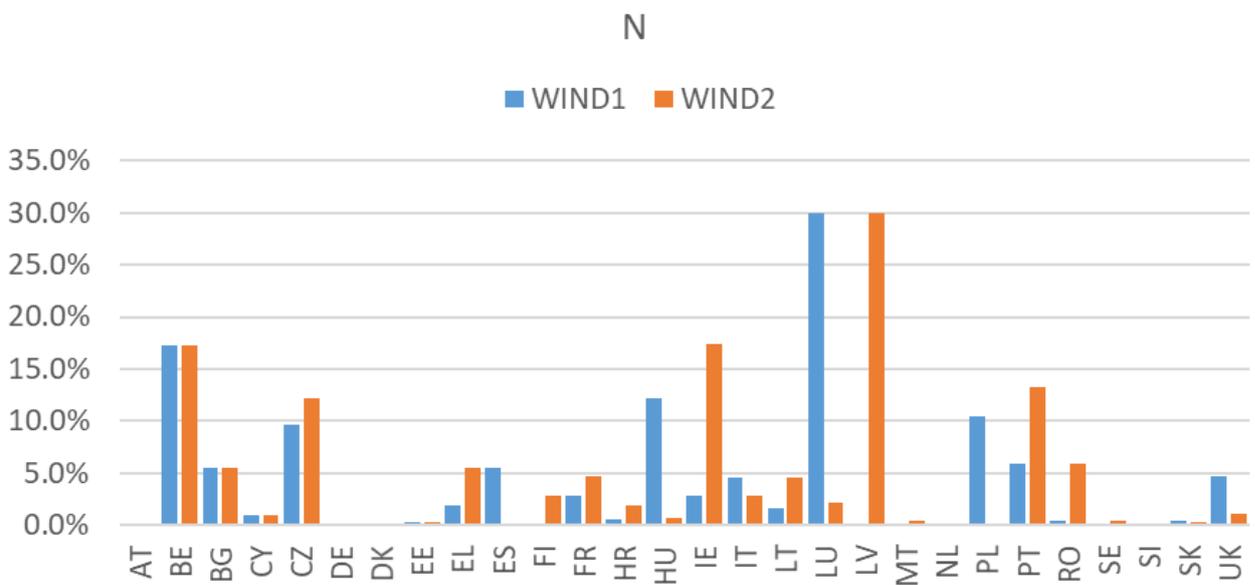


Figure 47 Hypothetical case of N load reductions under 2 "What-if-no-Directive" scenarios compared to baseline (present) scenario.

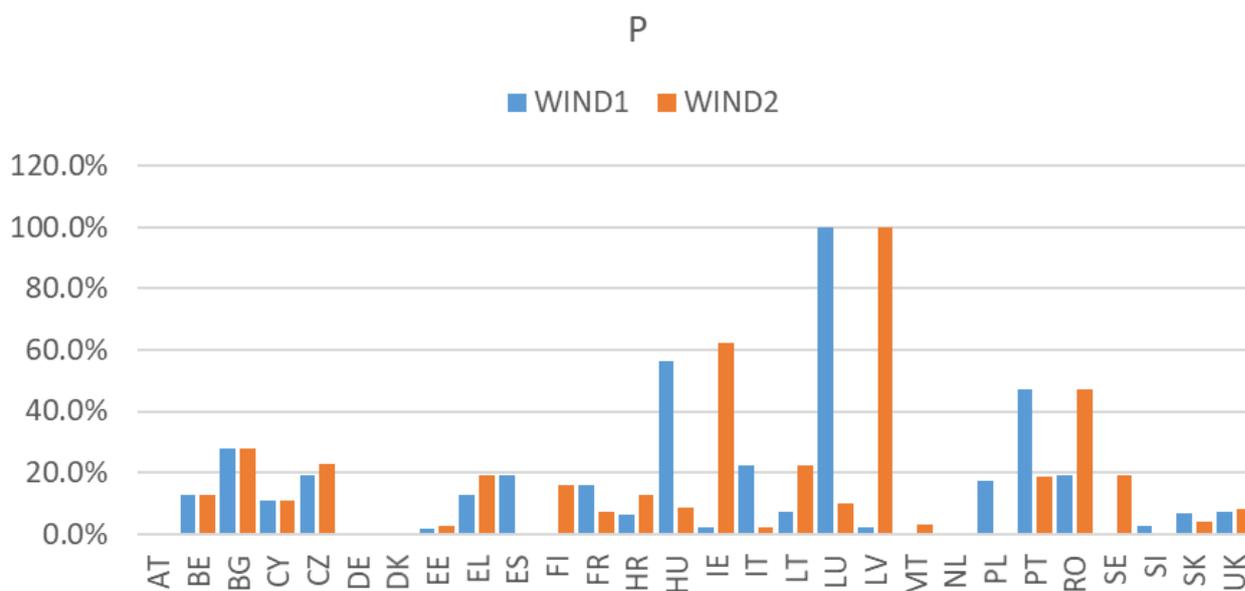


Figure 48 Hypothetical case of P emissions reductions under 2 "What-if-no-Directive" scenarios compared to baseline (present) scenario.

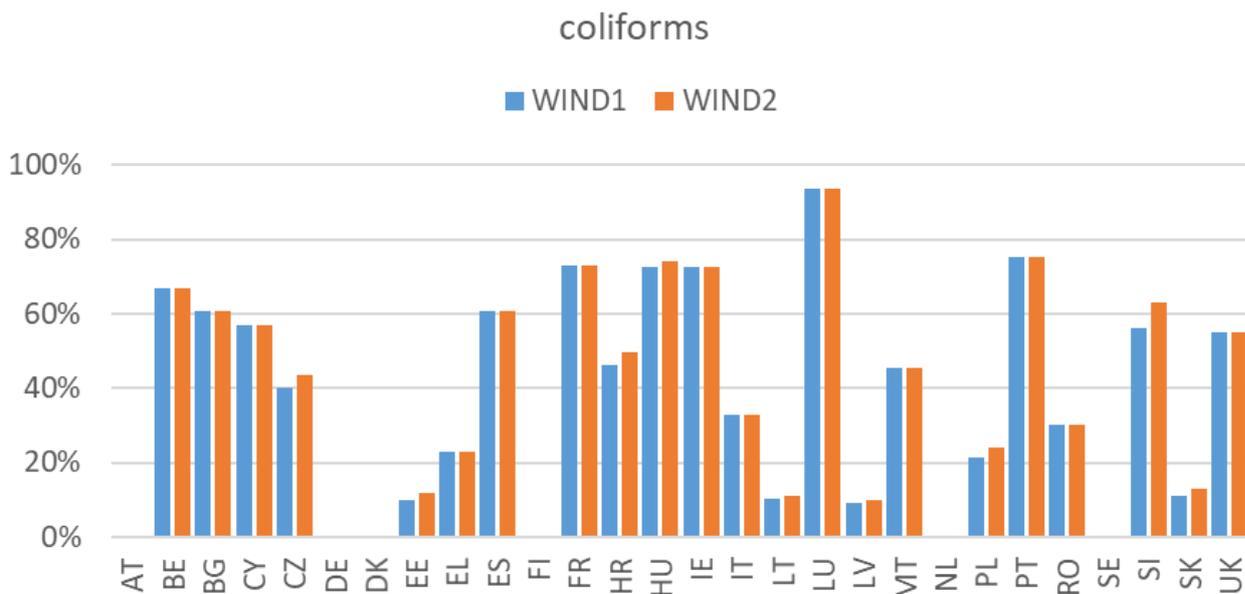


Figure 49 Percent change of river length, by country, not meeting bathing waters standards for coliforms under WIND scenario compared to baseline (present) scenario.

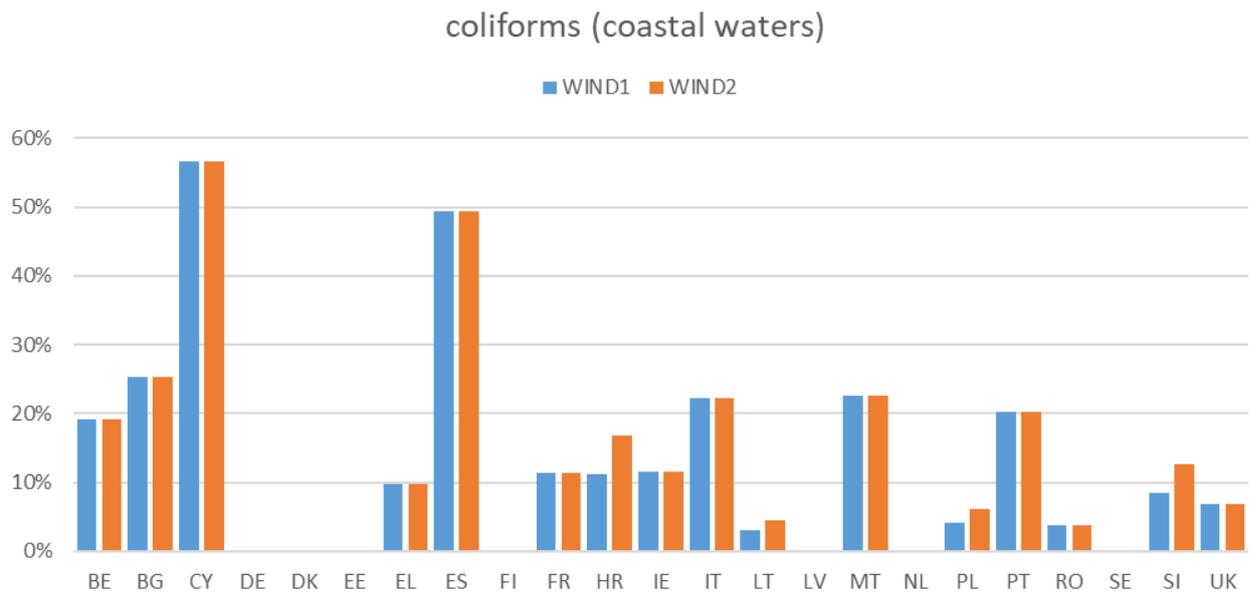


Figure 50 Percent change of coastal length, by country, not meeting bathing waters standards for coliforms under WIND scenario compared to baseline (present) scenario.

### Storm water overflows

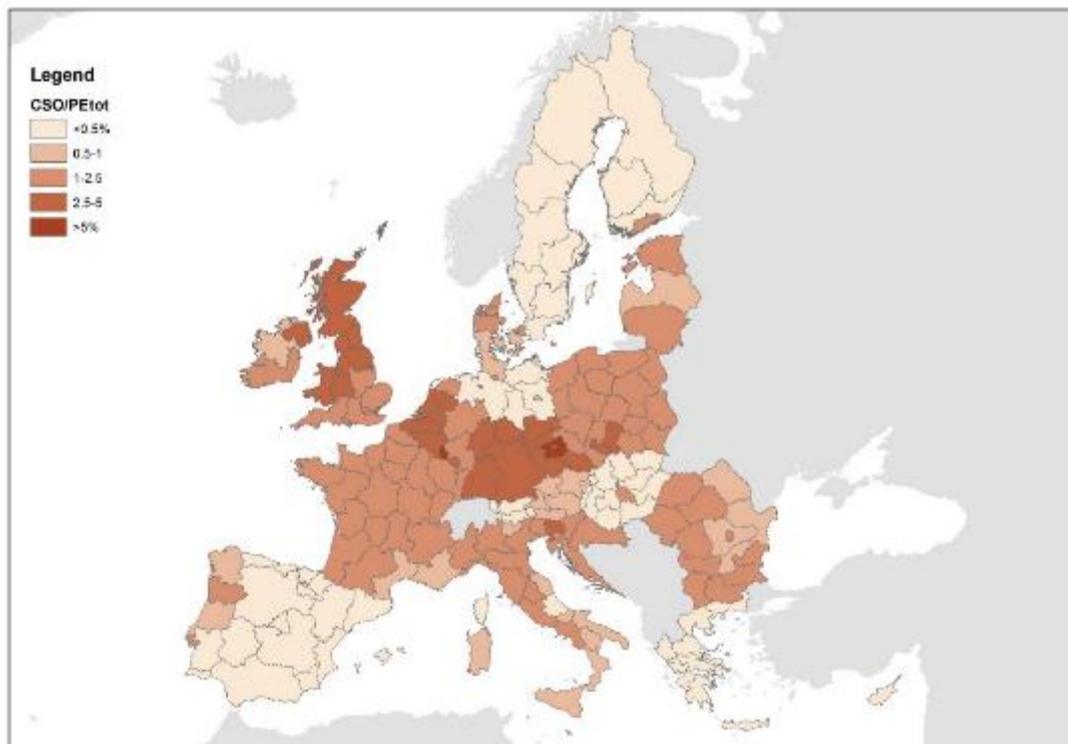


Figure 51 Potential loads to receiving water bodies. PE of CSO with assumed dilution rate of 4.

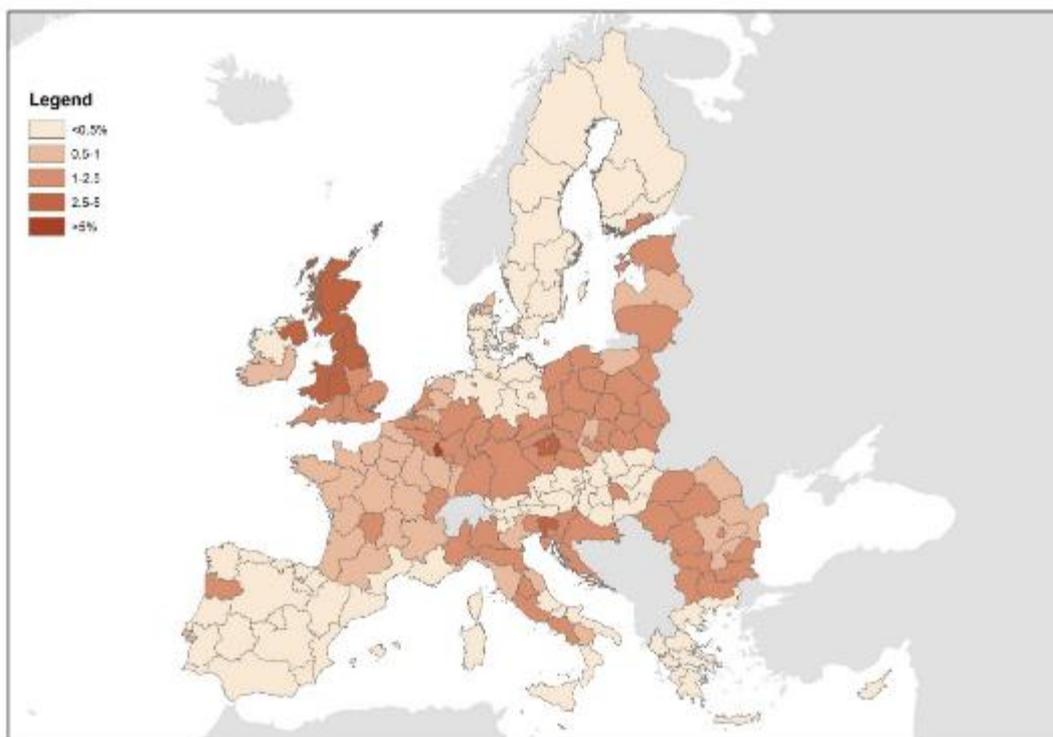


Figure 52 Potential loads to receiving water bodies. PE of CSO accounting for management measures.

Impact of IAS in terms of BOD, nitrogen, phosphorus and coliform loads

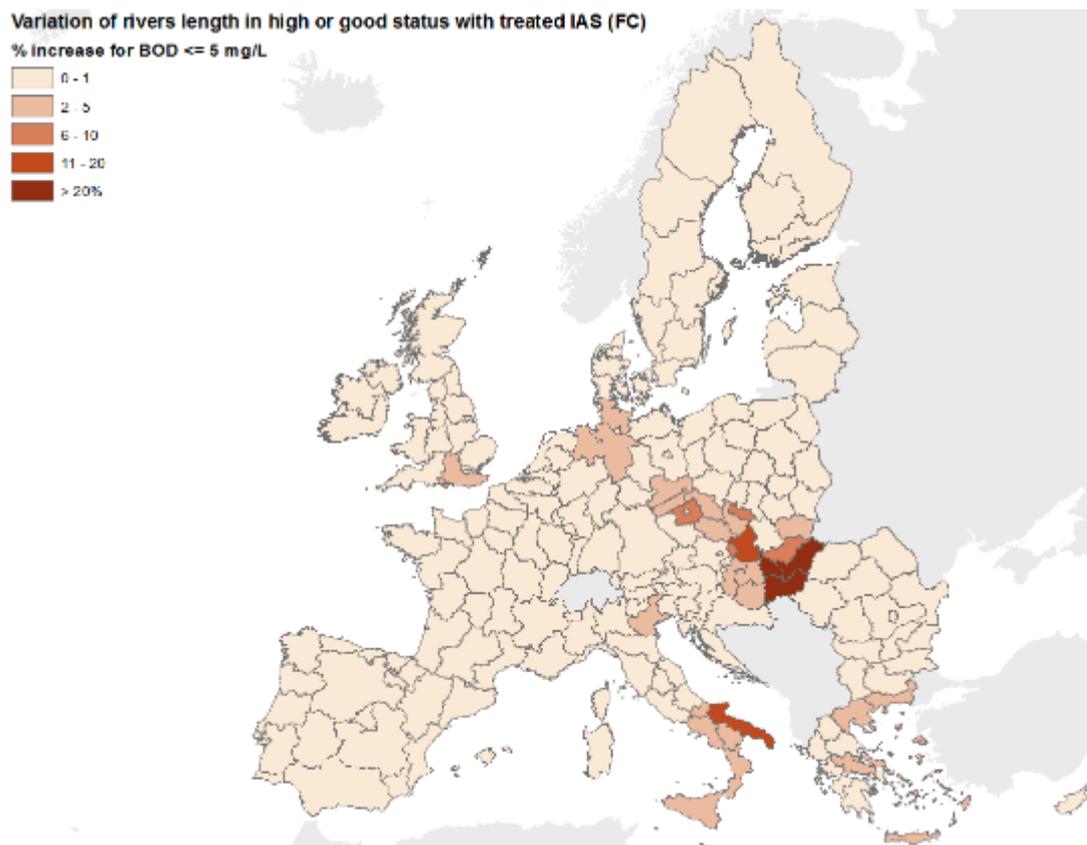


Figure 53 Percentage variation of hydrographic network in good quality under IAS (without assumptions of management measures) for BOD standards. Source: Pistocchi et al., 2019.

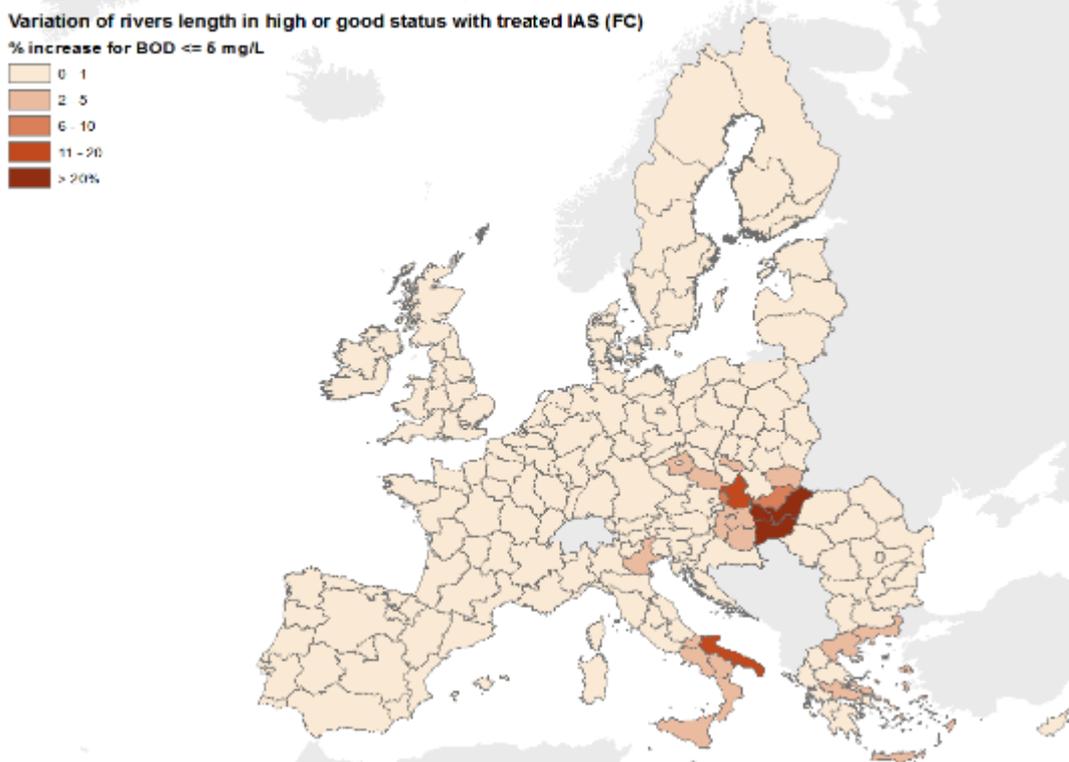


Figure 54 Percentage variation of hydrographic network in good quality under IAS (with assumptions of management measures) for BOD standards. Source: Pistocchi et al., 2019.

The impact of IAS use on receiving water bodies in terms of N is slightly smaller compared to the BOD impact with some regions increasing the length of the stream network below good status thresholds by up to more than 5%.

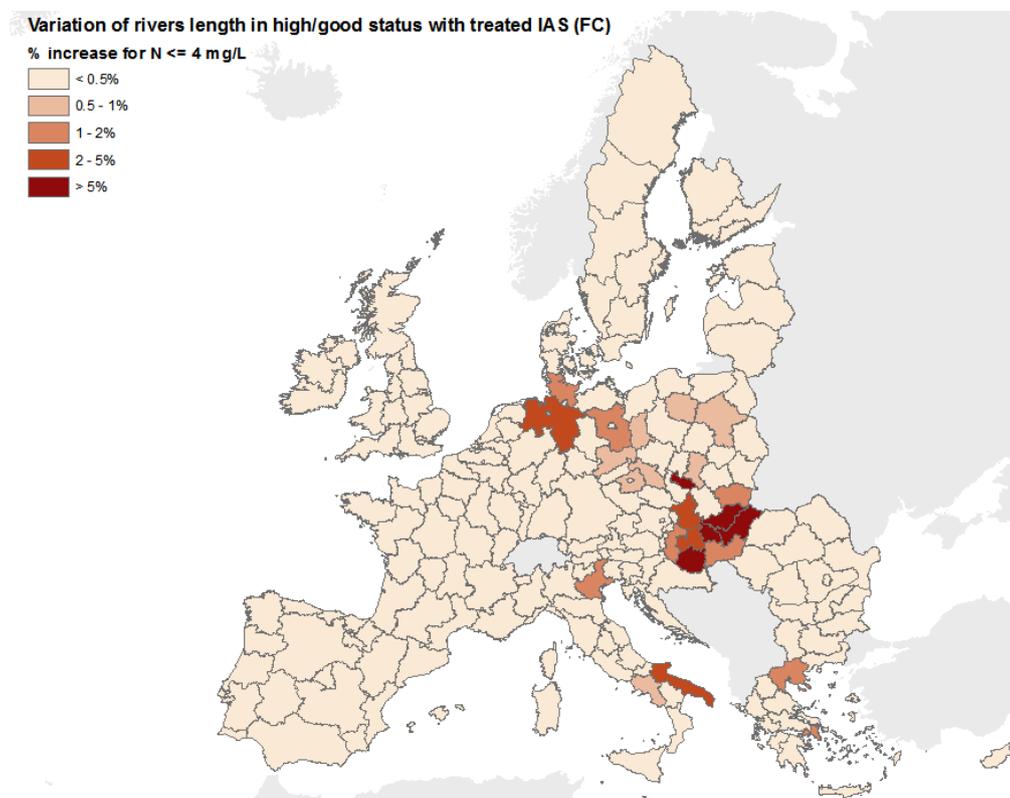


Figure 55 N: % variation of hydrographic network in good quality under IAS (without assumptions of management measures) for N standards.

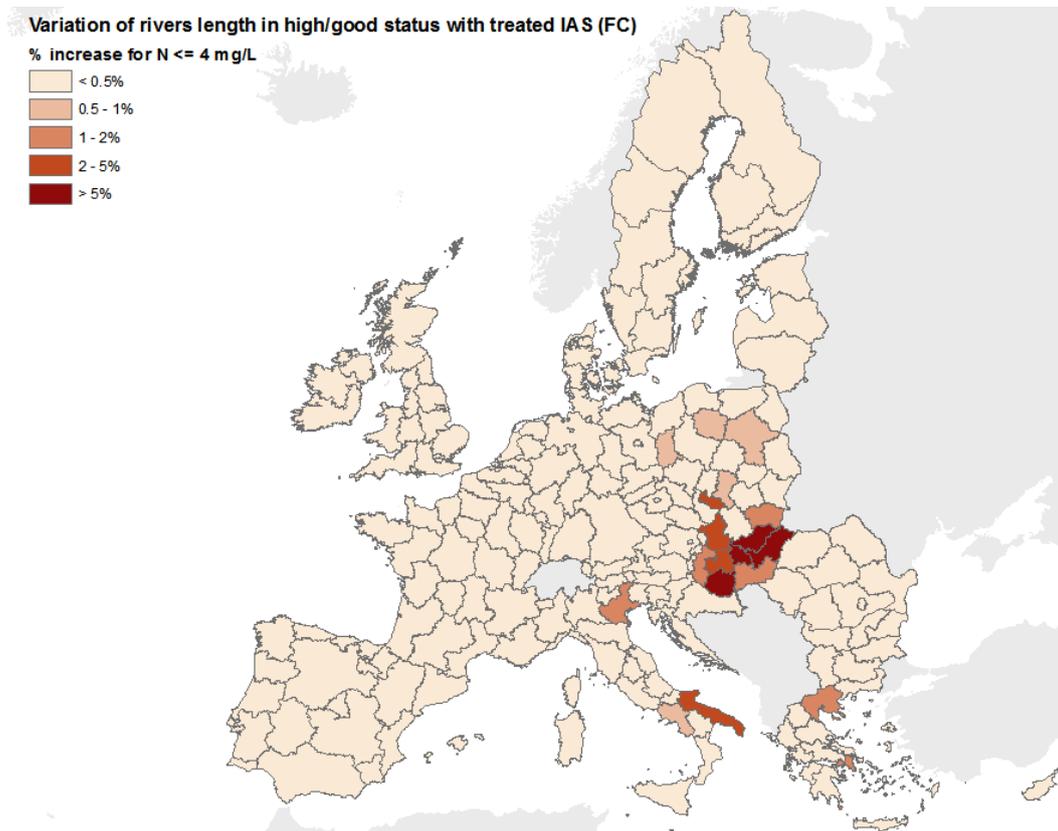


Figure 56 N: % variation of hydrographic network in good quality under IAS (with assumptions of management measures).

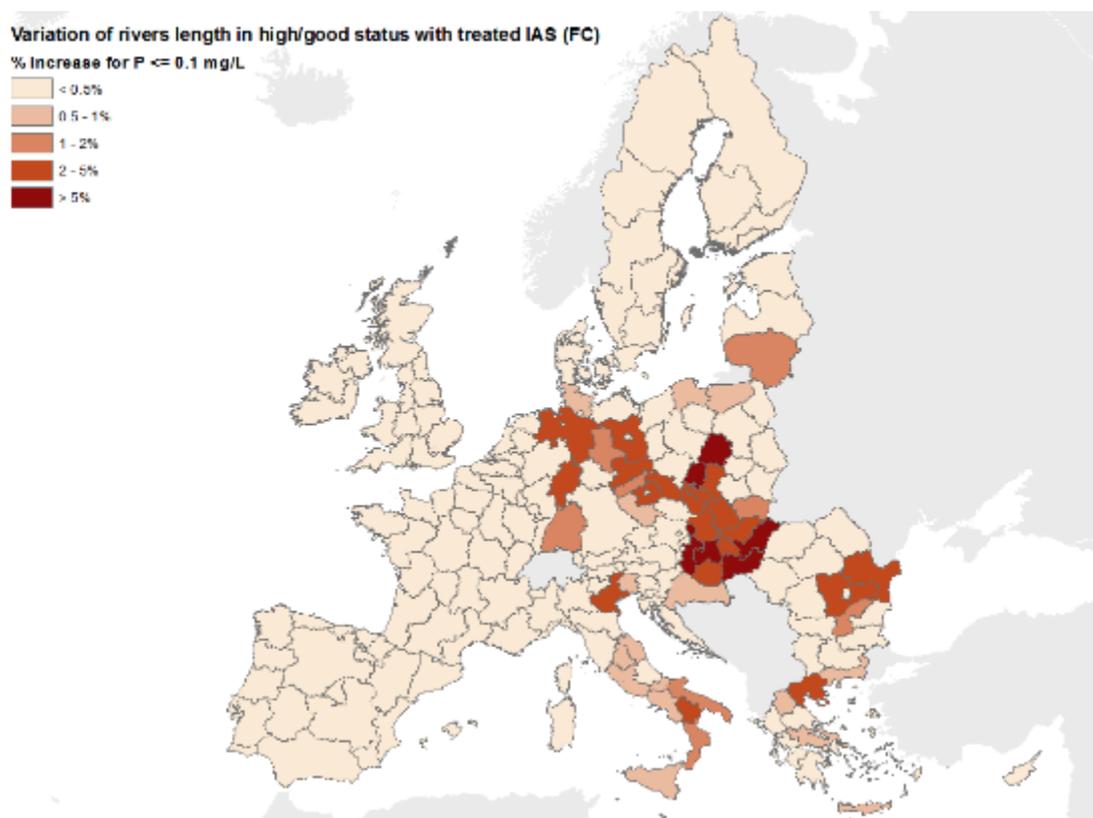


Figure 57 P: % Variation of hydrographic network in good quality under IAS

Variation of rivers length in high/good status with treated IAS (FC)

% increase for  $P \leq 0.1$  mg/L

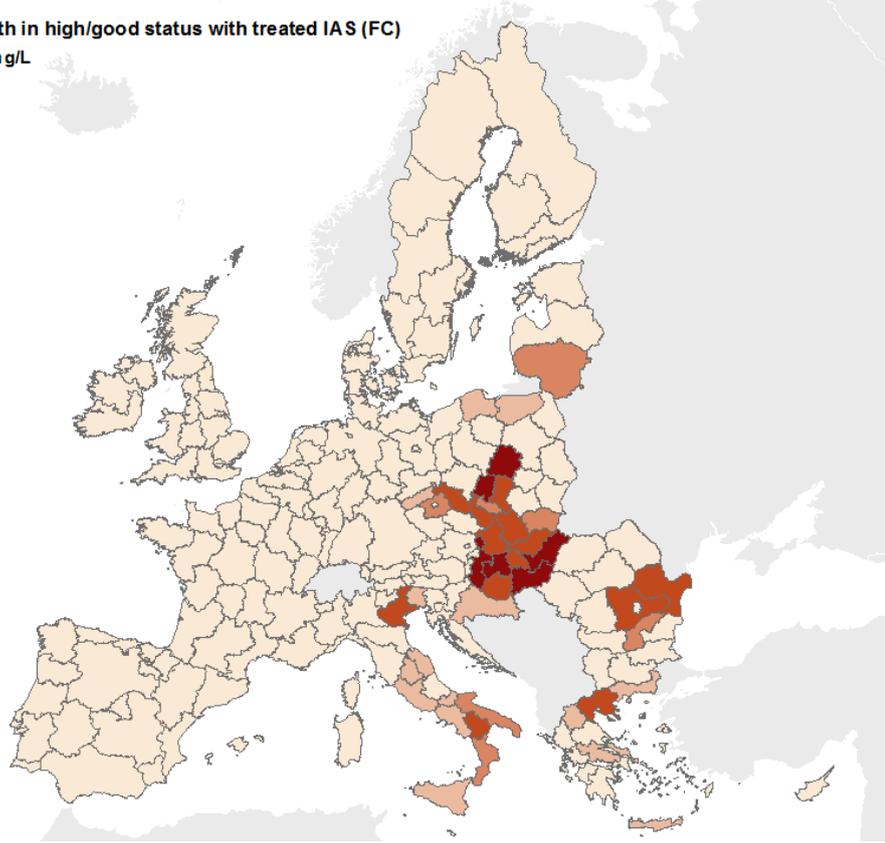
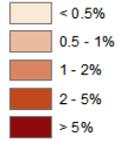


Figure 58 P: % Variation of hydrographic network in good quality under IAS with management measures in place.

Variation of river length in excellent or good status with treated IAS (FC)

% increase for  $C < 1000$  CFU /100ml

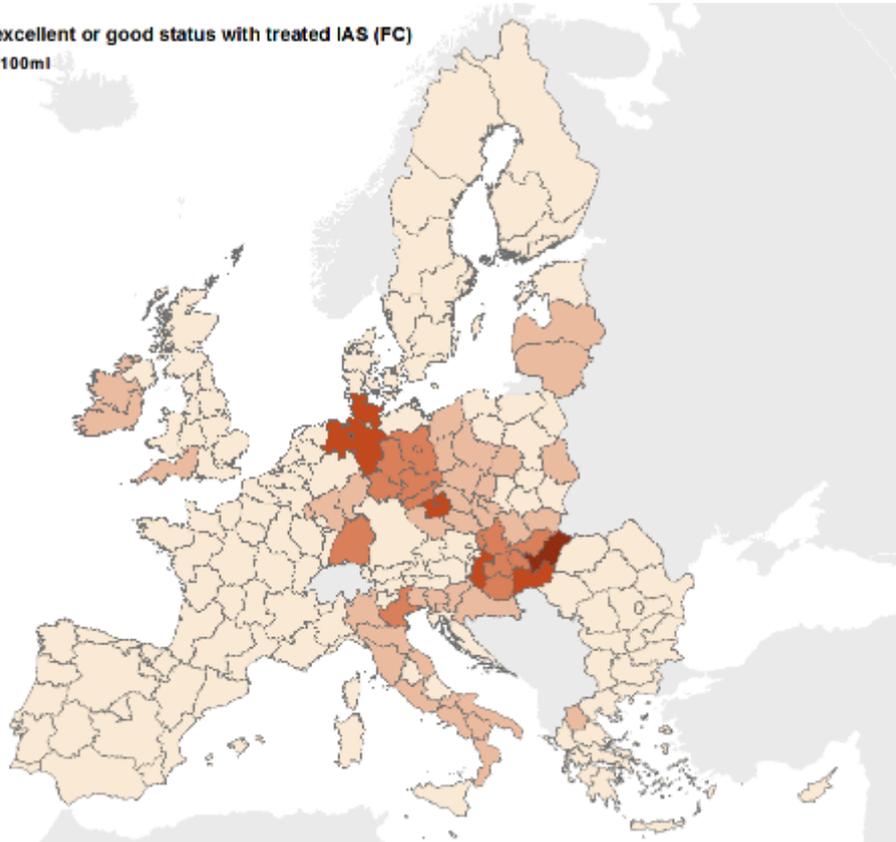
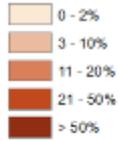
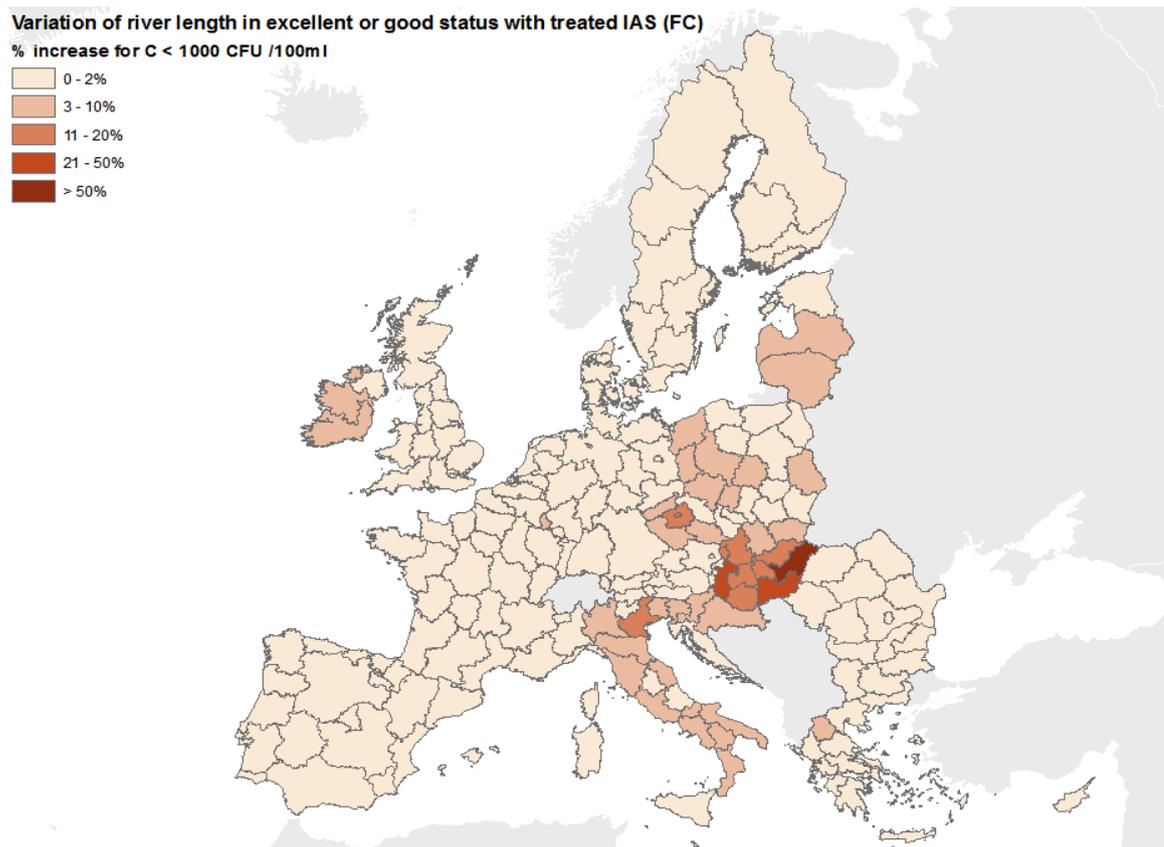


Figure 59 Coliforms: % Variation of hydrographic network in good quality under IAS in good quality under IAS (without management measures)



*Figure 60 Coliforms: % Variation of hydrographic network in good quality under IAS (with management measures in place).*

*Small agglomerations, scattered dwellings and non-connection*

Significant pressure or chemical substance failing	Main driver(s)	Indicators for pressure	Relevant KTM	Indicators for KTM
				Number of contaminated sites to be remediated or where preventative actions are to be taken to achieve objectives
2.6 - Diffuse - Discharges not connected to sewerage network	Urban development	Length (km)/area (km <sup>2</sup> ) of water bodies not achieving objectives because of this pressure	21 Measures to prevent or control the input of pollution from urban areas, transport and built infrastructure	Number of upgraded storm overflows required to achieve objectives
		Number of discharges not connected to sewerage network that are causing the failure of objectives		Number of sustainable drainage systems required to achieve objectives. Number of discharges required to be connected to sewerage network to achieve objectives

*Figure 61 Pressure 2.6 Diffuse - discharges not connected to sewerage network. Source: European Commission (2016).*

It is explained that under WFD as pressure type P2.6 ‘Diffuse – discharges not connected to the sewerage network’ are reported. In the WISE State of the Environment emissions source categories this is translated into NP3 – ‘Diffuse – unconnected dwellings emissions’.

The following table shows how many surface water bodies are affected by pressure 2-6 discharge non-connected to the sewerage network. This information is based on Member State reporting under the RBMPs.

	No. of surface waterbodies	% of total
All ‘significant pressures’	115 415	100
P2 - Diffuse sources	42 734	35.6
P2-6 – Discharge not connected to the sewerage network	12 341	10.7
<b>Member States reporting high amounts of surface water bodies with this pressure</b>		
HR	828	53.7
DK	2 239	25.5
RO	746	24.6
FI	838	12.3
PL	1 007	17.8

*Table 21 Surface water bodies affected by non-connected dwellings. Source: EEA [dataviewer](#) (2019), No of MS =26 (EL and LT not reported).*

*Monitoring and reporting obligations*

Art. 15	Art. 17	Art. 18
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1. Competent authorities or appropriate bodies shall monitor:

- discharges from urban waste water treatment plants to verify compliance with the requirements of Annex I.B in accordance with the control procedures laid down in Annex I.D,

- amounts and composition of sludges disposed of to surface waters.

2. Competent authorities or appropriate bodies shall monitor waters subject to discharges from urban waste water treatment plants and direct discharges as described in Article 13 in cases where it can be expected that the receiving environment will be significantly affected.

3. In the case of a discharge subject to the provisions of Article 6 and in the case of disposal of sludge to surface waters, Member States shall monitor and carry out any other relevant studies to verify that the discharge or disposal does not adversely affect the environment.

4. Information collected by competent authorities or appropriate bodies in complying with paragraphs 1, 2 and 3 shall be retained in the Member State and made available to the Commission within six months of receipt of a request.

5. Guidelines on the monitoring referred to in paragraphs 1, 2 and 3 may be formulated in accordance with the procedure laid down in Article 18.

1. Member States shall by 31 December 1993 establish a programme for the implementation of this Directive.

2. Member States shall by 30 June 1994 provide the Commission with information on the programme.

3. Member States shall, if necessary, provide the Commission by 30 June every two years with an update of the information described in paragraph 2.

4. The methods and formats to be adopted for reporting on the national programmes shall be determined in accordance with the procedure laid down in Article 18. Any amendments to these methods and formats shall be adopted in accordance with the same procedure.

5. The Commission shall every two years review and assess the information received pursuant to paragraphs 2 and 3 above and publish a report thereon.

1. The Commission shall be assisted by a Committee composed of the representatives of the Member States and chaired by the representative of the Commission.

2. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

3. (a) The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

(b) If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

If, on the expiry of a period of three months from the date of referral to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission, save where the Council has decided against the said measures by a simple

majority.

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*Table 22 Overview of monitoring and reporting obligations*

**Annex IB** and the related tables lay down how the monitoring takes place (monitoring of influent and effluent) for secondary and more stringent treatment. More stringent requirements than those in table 1 and 2 can be required to satisfy any other relevant Directives (Annex IB.4). **Table 1** lays down the reduction levels for BOD5<sup>86</sup>, COD and total suspended solids (optional). **Table 2** lays down the requirements for the reduction of phosphorus and nitrogen. **Table 3** lays down the maximum amount of samples that are allowed to fail among numerical series of samples taken per year. **Annex ID** describes the reference methods that are to be used and how the results shall be evaluated. It is laid down by how much failing samples can deviate from the indicated concentrations, and that extreme values shall – when these are due to heavy rain – not be taken into account.

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<sup>86</sup> BOD5 can be replaced by Total Organic Carbon or TOD if a relation can be established.

## Efficiency

### Annual benefits at full implementation levels

MS	Total annual benefit – central estimate (MEUR)	Annual recurring nitrogen removal benefit (MEUR)		Annual recurring bathing water quality benefit (MEUR)		Annualised one-off economic benefit of central collection (MEUR)		Annual benefit per p.e. – central estimate (EUR)
		Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate	
AT	1,469	613	1,201	124	345	280	373	71
BE	897	248	485	52	146	370	493	78
BG	255	54	105	27	74	107	143	28
CY	79	15	30	6	18	38	51	88
CZ	231	62	121	38	105	58	78	21
DE	4,745	1,483	2,912	1,170	3,248	290	386	41
DK	771	393	781	34	94	102	137	66
EE	45	25	49	0	1	6	9	28
EL	885	324	643	21	81	300	400	74
ES	4,303	1,464	2,878	544	1,349	1,016	1,355	62
FI	142	39	76	7	16	62	83	24
FR	3,852	1,275	2,497	534	1,720	720	959	52
HR	296	72	142	18	49	133	178	47
HU	544	176	341	48	134	167	222	49
IE	447	161	319	16	45	152	202	72
IT	4,608	1,582	3,128	319	885	1,415	1,887	51
LT	64	32	62	4	11	8	11	24
LU	49	18	35	10	27	4	5	68
LV	25	12	23	1	4	4	6	13
MT	41	13	26	2	4	16	21	67
NL	628	231	455	117	326	55	73	34
PL	1,331	683	1,350	53	147	183	244	33
PT	858	291	575	51	141	282	376	61
RO	730	272	522	36	101	227	302	52
SE	389	160	313	17	48	103	138	30
SI	124	25	49	18	49	46	61	73
SK	95	35	68	6	17	28	37	21
UK	2,768	932	1,820	317	814	709	945	33
<b>EU28</b>	<b>30,669</b>	<b>10,688</b>	<b>21,004</b>	<b>3,592</b>	<b>9,998</b>	<b>6,881</b>	<b>9,174</b>	<b>47</b>

Table 23 Annualised benefits per Member State – full implementation levels

*Annual costs at full implementation levels*

MS	Total annual costs (MEUR)	Annualised, one-off, investment costs (MEUR)		Annual, recurrent, operational and maintenance costs (MEUR)		Total annual cost per p.e. (EUR)
		treatment	collection	treatment	collection	
AT	1,030	326	362	145	195	50
BE	705	164	297	77	167	77
BG	200	65	92	17	26	29
CY	78	11	44	4	19	105
CZ	186	71	68	22	25	26
DE	1,940	929	388	414	209	18
DK	451	183	114	88	66	39
EE	30	15	7	5	3	19
EL	589	142	280	50	118	55
ES	3,177	742	1,456	289	690	51
FI	157	19	83	9	46	29
FR	2,899	761	1,155	347	636	40
HR	340	59	191	19	70	77
HU	513	133	253	40	88	50
IE	333	75	148	32	78	63
IT	2,900	835	1,132	353	580	39
LT	37	19	9	6	3	14
LU	19	10	3	4	2	30
LV	20	9	6	3	2	13
MT	34	6	19	2	8	67
NL	325	168	53	75	29	18
PL	802	419	192	125	66	21
PT	715	128	384	44	159	59
RO	318	144	103	39	32	25
SE	350	90	139	42	79	28
SI	103	21	52	8	22	82
SK	116	38	48	12	18	30
UK	1,405	423	530	178	273	20
<b>EU28</b>	<b>19,774</b>	<b>6,005</b>	<b>7,609</b>	<b>2,451</b>	<b>3,710</b>	<b>34</b>

*Table 24 Annualised costs per Member State – full implementation levels*

Costs and benefits increase under full implementation. Under full implementation benefits outweigh costs in all Member States apart from Slovakia and Finland. This can be due to the high level of implementation already in place in Finland before the UWWTD was adopted and the high use of IAS in Slovakia.

*Administrative burden vs administrative costs*

“Administrative costs” are costs incurred under an information obligation. There is a particular type of an information obligation called a “reporting obligation”, e.g. the

requirement for a Member State to transmit information to the European Commission as a means to demonstrate successful implementation of a legal obligation, or compliance.

“Business-as-usual costs” are costs resulting from collecting data, processing and transmitting information which would be done by an organization even in the absence of the EU legal obligation, e.g. in the process of monitoring the quality of the effluent.

Finally, “administrative burden costs” are the “marginal” part of the costs associated to monitoring, collecting, processing and transmitting of information, which is done solely because of the reporting requirement of an EU legal obligation.

To summarise: [administrative costs] = [business as usual costs] + [administrative burden costs]

*Overview of costs – benefits identified in the Evaluation*

I. Overview of costs – benefits identified in the evaluation									
		Citizens/Consumers		Businesses		Administrations		[Other...]	
		Qualitative	Quantitative / monetary	Qualitative	Quantitative / monetary	Qualitative	Quantitative / monetary	Qualitative	Quantitative / monetary
<b>Cost / Benefit</b>	<p><b>[Description:</b> e.g. = economic, social, environmental = one off/recurring</p> <p><b>= Type of cost/benefit:</b> e.g. compliance costs, regulatory charges, hassle costs, administrative costs, enforcement costs, indirect costs Changes in pollution, safety, health, employment</p>	<p>[high / medium / low / negligible / unknown Sources [KPIs stakeholders??]</p>	<p>[e.g. increase or decrease in: time taken, person days, full-time equivalents, numbers of certificates/tonnes of CO2 equivalent / employment rate / GDP / life expectancy etc or €]</p>						
	<p><b>Costs</b></p>	<p><b>Annualised investment costs – WWTP</b></p>	<p>The estimated costs have been shared by water consumers and</p>	<p>EUR 4,865 billion</p>	<p>Some of the costs have been incurred by industry with</p>				

	<p><b>EU 28 – 2014 data</b></p> <p><b>Based on cost function FEASIBLE</b></p>	<p>tax payers depending on the user charge policy in each MS.</p>		<p>own wastewater discharge Industries connected to public wastewater systems have shared part of the costs depending on the user charge policy in each MS.</p>					
Costs	<p><b>Annualised investment costs – Collection</b></p> <p><b>EU 28 – 2014 data</b></p> <p><b>Based on cost function FEASIBLE</b></p>	<p>The estimated costs have been shared by water consumers and tax payers depending on the user charge policy in each MS.</p>	<p>EUR 7,296 billion</p>						
Costs	<p><b>Annualised operational costs – WWTP</b></p> <p><b>EU 28 – 2014 data</b></p> <p><b>Based on cost function FEASIBLE</b></p>	<p>The estimated costs have been shared by water consumers and tax payers depending on the user charge policy in each MS.</p>	<p>EUR 2,008 billion</p>	<p>Some of the costs have been incurred by industry with own waste water discharge Industries connected to public waste water systems have shared part of the costs depending on the user charge</p>					

				policy in each MS.					
<b>Costs</b>	<b>Annualised operation costs – Collection</b>  <b>EU 28 – 2014 data</b>  <b>Based on cost function FEASIBLE</b>	The estimated costs have been shared by water consumers and tax payers depending on the user charge policy in each MS.	EUR 3,533 billion						
<b>Costs</b>	<b>Administrative burden</b>  <b>Per Member State – annual reporting requirements</b>					Considered to be moderate	EUR 126 000 per year for all Member States together.		
<b>Costs</b>	<b>Administrative burden</b>  <b>WWTP monitoring</b>	Not considered to be administrative burden as these are part of normal functioning costs. Would be necessary regardless of the reporting requirements to verify functioning of the WWTPs.							
<b>Costs</b>	<b>Administrative burden</b>					Considered to be	150-350 full time staff per		

	<b>Enforcement costs</b>					proportionate, variation based on specific MS	year for EU28		
<b>Benefit</b>	Nitrogen removal – monetisation based on cost function and avoided damage to water. Using €t of nitrogen removed  2014 data		EU 28 estimate  EUR 9,116 – 17,916 billion						
<b>Benefit</b>	Improvement in bathing water quality – recreation and health based on assumed WTP survey for improved water quality		EU 28 estimate EUR 3,252 - 9,057 billion						
<b>Benefit</b>	Economic savings from centralised collection		EU 28 estimate EUR 6,824 – 9,099						
<b>Benefit</b>	Recreational benefit	Covered by the improvement in bathing water quality							
<b>Benefit</b>	Contribution to tourism sector	Covered by the improvement in bathing water quality							

<b>Benefit</b>	Contribution to EU leadership on water services sector – based on assumption that 1% of the global water services sector being linked to the action of the UWWTD			Out of the top 50 companies, at least 20 water services providers are EU companies.	EUR 5-6 billion per year				
<b>Benefit</b>	Contribution to research and innovation			The UWWTD has led to increase dynamism for research and innovation. This has been supported by the funding provided by the EU research programmes (e.g. LIFE and Horizon)					

## Coherence

### Terminology

The assessment of the wording in the Directive as well as feedback from stakeholders led to the identification of a number of terms in the Directive as well as terminology used in relation to the Directive that is not completely clear.

The table below includes only terms in the Directive that were identified by stakeholders as unclear. Terms in relation to the Directive that are not completely clear are discussed below the table.

Term/obligation	Lack of definition
Normal climatic conditions	<p>In Art. 10 the UWWTD requires that treatment plants are “designed, operated and maintained to ensure sufficient performance under all normal local climatic conditions”.</p> <p>Although the word “local” makes it clear that there is room for adjustment according to Member States’ needs, there might be room for doubts as to what constitutes normal climatic conditions.</p>
Storm water overflows (SWOs)	<p>Annex IA requires that collecting systems are designed to limit pollution of receiving waters due to storm water overflows.</p> <p>Corresponding footnote 1 requires Member States to take measures to deal with SWOs and lists some examples. One measure could be specification of what an <u>acceptable</u> number of overflows per year is.</p> <p>It is unclear whether this refers to combined sewer overflows or also to separate sewer overflows, and whether urban run-off needs to be considered. It is also unclear what “acceptable” means here and how it should be determined.</p> <p>There is evidence that Member States take very different measures to deal with SWOs. It is unclear whether this is the most efficient approach to deal with an issue that can have negative impact on transboundary waters and even impact on health (see <a href="#">storm water overflows</a>).</p> <p>There is also evidence that Member States have struggled with implementing this provision given that it was an issue raised in Court cases.</p>
Unusual situations	<p>These are mentioned in Art. 4(4) “The load expressed in p.e. shall be calculated on the basis of the maximum average weekly load entering the treatment plant during the year, excluding unusual situations such as those due to heavy rain”.</p>

Footnote 1 Annex I: “Given that it is not possible in practice to construct collecting systems and treatment plants in a way such that all waste water can be treated during situations such as unusually heavy rainfall, Member States shall decide on measures to limit pollution from storm water overflows.”

A general definition beyond the specific example of unusually heavy rainfall is missing.

## Term/obligation

## Clarity of some definitions

Industrial waste water

Requirements in the regulations/authorizations for industrial waste water discharges into urban waste water systems are vaguely defined under article 11 and Annex IC. The same applies to direct discharges under Art. 13 from biodegradable industrial waste water (Annex III)

Sludge

Sludge is defined in Art. 2(10) as "residual sludge, whether treated or untreated, from urban waste water treatment plants". This definition is not clear when seen in relation to the Sewage Sludge Directive.

However, there is no evidence that this hindered the reuse of sludge.

Appropriate treatment

Art. 2(9) explains that “‘appropriate treatment’ means treatment of urban waste water by any process and/or disposal system which after discharge allows the receiving waters to meet the relevant quality objectives and the relevant provisions of this and other Community Directives”. Under Art. 7 it is required that in those agglomerations below 2 000 p.e. equipped with a collecting system that discharge into freshwater or estuaries, that the collected waste water is subject to “appropriate treatment”. It also applies to agglomerations below 10 000 p.e. discharging into coastal waters.

It is unclear what kind of treatment level is referred to, however, it provides sufficient space to adapt treatment levels to needs and to new legislation, where necessary (for instance to meet the quality objectives of the Water Framework Directive or the Marine Strategy Framework Directive which were adopted later than the UWWTD).

Agglomerations

The term “agglomeration” does not necessarily refer to a city or municipality, but according to Art. 2(4) refers to “an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point”.

It is unclear what “**sufficiently concentrated**” means (no description or threshold fixed), and what methodology should

be used to delineate agglomerations.

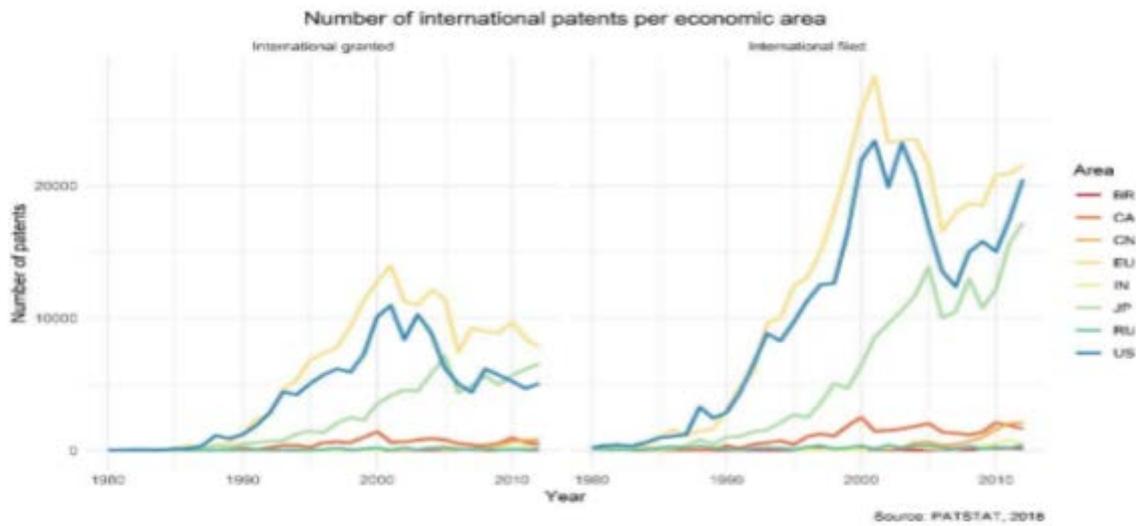
Individual or other appropriate systems	This term is used in Art. 3, see also <a href="#">IAS</a> , and may cover a wide range of systems from storage tanks to individual treatment plant. The conditions set for using IAS in Article 3(1) are not entirely clear as they leave it up to the discretion of Member States to decide on the use of IAS.
Cold climate and high mountain region	Art. 4(2) of the Directive provides that a treatment less stringent than secondary may be applied to discharges to “ <i>high mountain regions (over 1500 m above sea level) [...] due to low temperatures</i> ” (provided that such discharges do not adversely affect the environment). There have been discussions as to whether the reference to “high mountain region” is clear and appropriate, as low temperatures also occur at normal altitudes e.g. in Sweden and Finland. Since those countries were not EU Member States at the time of the adoption of the Directive, some criticisms have been heard that Art. 4(2) does not account for the diversity of geographic, climatic and meteorological conditions all over the Union.

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*Table 25 Unclear terminology.*

## Relevance

### Number of international patents per economic area



Source: own elaboration, based on PATSTAT

Figure 62 Number of internationally held water technology related patents for major economic regions, PATSTAT (1980-2012). Left shows granted patents, right shows filed patents. Source: [Blue2](#), (2018) Part A2.

## ANNEX 5: REFERENCES

### *Main EU water legislation*

**Urban Waste Water Treatment Directive (UWWTD):** Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, OJ L 135, 30/05/1991

**Water Framework Directive (WFD):** 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 (OJ L 327, 22.12.2000, p. 1).

**Groundwater Directive (GWD):** Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration, OJ L 372, 27/12/2006.

**Drinking Water Directive (DWD):** Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption, OJ L 330, 5.12.1998, p. 32.

**Environmental Quality Standards Directive (EQSD):** Directive 2008/105/EC of the European Parliament and of the Council on environmental quality standards in the field of water policy as amended by the Priority Standards Directive 2013/39/EU, OJ L 348, 24/12/2008.

**Nitrates Directive (ND):** Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources, OJ L 375, 31/12/1991

**Industrial Emissions Directive (IED):** Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17/12/2010

**Bathing Water Directive (BWD):** Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality, OJ L 64, 4/3/2006

**Marine Strategy Framework Directive (MSFD):** Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), OJ L 164, 25/6/2008.

### *Case law*

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