Study on Existing and Future EU Water Legislation

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Abbreviations

BWD - Bathing Water Directive
CAP - Common Agricultural Policy
CIS - Common Implementation Strategy of the WFD
CoNE- Cost of Non-Europe
DWD - Drinking Water Directive
EQS - Environmental Quality Standards
GWD - Groundwater Directive
MS - Member State
NWRMs- Natural Water Retention Measures
PoM- Programmes of Measures
PS - Priority Substances
RBD - River Basin District
RBM - River Basin Management
RBMP - River Basin Management Plans
TEU - Treaty of European Union
UWWTD- Urban Waste Water Treatment Directive
Water Status - Overall status of surface and groundwater as defined by the Water Framework Directive
WEI- Water Exploitation Index
WFD - Water Framework Directive
WS&D - Water Scarcity and Drought

Executive Summary

This study concerns Existing and Future EU Water Legislation. The overall objective of this study was to carry out a combination of a backward looking (ex-post) and forward looking (ex-ante) evaluation of European water legislation. The emphasis is on the ex-post aspect, mainly because of the need to check the level of implementation of existing legislation. The ex-ante aspect aims at assessing the potential costs and benefits of further intervention at EU level using five case studies, along the lines of the approach adopted for other sectors and reported in the 'Mapping the Cost of Non-Europe, 2014 -19' report.[1]

In line with the objectives described above, this report is divided into two main parts. The first part focuses on the ex-post type impact assessment – identifying policy areas and tools as well as the main water status elements and assessing the implementation progress, effectiveness and coverage of the existing body of legislation. The findings are compared against the conclusions of the European Commission's Blueprint[2] that was carried out to review progress and realign efforts for reaching water-related targets. The second phase builds on the first and considers the costs and benefits of additional potential EU-level legislation (or other action) within the scope of the five pre-selected case studies to address any identified gaps.

Conclusions on progress to date

The Water Framework Directive (WFD) introduced a number of innovative policy instruments and stringent goals to improve the quality and management of European water bodies. By providing a framework for a range of water-related legislation, the EU has created an impressive and comprehensive body of regulation and guidance. The results of the assessment of the progress towards reaching the WFD goals and implementing its instruments which was made in the run up to the Blueprint, however, showed significant gaps. While the progress was visible and rapid in the beginning with a reduction of pollution levels as a result, further progress has been limited. Three key water-related targets are highlighted:

1. **Water quality – successful policy design available, but implementation is lagging**
   The assessment carried out in this study concludes that a successful policy design exists for reaching water quality targets. However, implementation is lagging behind as emission controls for point and diffuse sources still have to catch up with work on quality standards. The Blueprint comes to different findings, focussing on the lack of information about chemical status in river basins rather than on policy and implementation gaps. Consequently it proposes strengthening the enforcement of measures.

2. **Water quantity – limited progress and incomplete implementation**
   Our findings indicate limited progress towards established water quantity targets mainly due to incomplete implementation, typified by weak targets and tools. These issues could be tackled by promoting better policy integration, reinforcing the EU resource efficiency strategy, and

[1] EP (2014) Mapping the Cost of Non-Europe 2014-2019, July 2014 edition http://www.europarl.europa.eu/the-secretary-general/resource/static/files/files/2014-july---mapping-the-cost-of-non-europe--en-.pdf

[2] With the *Blueprint to Safeguard Europe's Water Resources* published in 2012 the EC looked into the effectiveness, gaps in implementation of the WFD and potential solutions in four general areas – land use and ecological status, chemical status and pollution, water efficiency and vulnerability of EU waters

strengthening targets and tools. The Blueprint reaches similar findings and proposes a long list of actions to overcome the problems. The majority of actions would lead to a series of further implementation guidelines for the WFD, though the effectiveness of guidelines is questionable.

3. **Space – limited progress and incomplete implementation**
   The research carried out for this study has confirmed that only limited progress has been made with regards to space related water targets. As with quantity targets, implementation remains incomplete and is hindered by weak targets and a lack of corresponding tools. These issues could be tackled by promoting better policy integration into other sectoral policies, reinforcing the EU resource efficiency strategy, and strengthening implementation tools. The Blueprint offers some similar findings but differs in that it does not consider the use of economic instruments as important and does not identify the lack of clarity of the WFD targets and missing WFD measures as an issue. The only concrete actions proposed are a guidance document on green infrastructure, enforcement of the Floods Directive and Greening the CAP. A link with the EU Strategy for a Resource Efficient Europe is not established in the Blueprint.

Remaining challenges

The reasons for the implementation gap in the WFD can be attributed to five main challenges:

- There has been a slow and incomplete implementation of the entire framework at Member State level.
- The cost-effectiveness of Programmes of Measures (PoMs) is not always clear and it can be assumed that it is difficult to attract funding for large scale restoration projects.
- There are insufficient linkages between the River Basin Management Plans (RBMPs) and other policy domains and legislation such as agriculture and flood management.
- A gap in the deployment of EU-level instruments to control emissions of pollutants.
- There is weak overall integration between water protection and energy and agricultural policy resulting in some counter-productive policy measures and instruments.

Policy recommendations for potential future EU policy actions

Our analysis identifies the following promising areas for further water policy action:

1. Strengthen EU-wide emission controls for pollutants vis-à-vis water quality standards;
2. Reduce water and energy use via water-related eco-design standards (for shower heads and water taps), while promoting water metering to improve progress on water quantity targets; and
3. Improve PoMs and EU coordination to support floodplain restoration to further space-related water targets.

These proposed actions would need to happen in combination with improving policy integration at EU and national levels in order to achieve better implementation. This study does not cover improving policy integration in detail.

We have produced approximate estimates of costs and benefits to indicate the potential scale of these actions. It should be stressed, however, that these are extrapolations based on various assumptions and should be treated with caution. It should also be noted that related estimates (for pharmaceuticals) have not been quantified.

Potential total benefits of additional EU policy measures for the period 2015-2030 could amount to:

- €248.9 billion savings from replacing old shower heads and water taps with more efficient ones, due to reduced water and energy bills under today's EU average prices. Equivalent to €2.2 billion per year;
- €43.5 billion savings if one-third of EU households install water meters due to reduced water and energy bills under today's EU average prices. Equivalent to €0.4 billion per year ; and
- €295 billion benefits from restoring 8.8 ha of floodplains across Europe – highly variable across Europe and mainly resulting from reduced flood risk management and water treatment costs and from increased income from leisure and tourism activities. Equivalent to €39.3 billion per year in 2030.

These benefits can only be achieved if the necessary investments to implement the measures are also made. Estimates for these investments are presented below:

- €16.9 billion total costs (2015-30) for the higher price of more efficient shower heads and water tap. Equivalent to €1.0 billion per year ; and
- €18.9 billion total costs (2015 -30) for installing water meters in one-third of European households. Equivalent to €0.2 billion per year;
- €362 billion investment needs for realising the restoration of 8.8 ha of floodplains which includes land purchase and infrastructure works and is highly variable across the EU. Equivalent to €24.1 billion per year.

1 Introduction and method

This chapter presents the objectives of this study, the structure of this report and a description of the methodology.

This is the Final Report of the "Study on Existing and Future EU Water Legislation". The overall objective of this study was to carry out a combination of a backward looking (ex-post) and forward looking (ex-ante) evaluation of European water legislation. The emphasis is on the ex-post aspect, mainly because of the need to check the level of implementation of existing legislation. The ex-ante aspect aims at assessing the potential costs and benefits of further intervention at EU level, along the lines of the approach adopted for other sectors and reported in the 'Mapping the Cost of Non-Europe, 2014 -19' report.[3]

In line with the objectives described above, this report is divided into two main parts. The first part focuses on delivering the ex-post type impact assessment – identifying policy areas and tools as well as the main water status elements and assessing the implementation progress, effectiveness and coverage of the existing body of legislation. The second phase builds on the first phase to consider the costs and benefits of additional potential EU-level legislation (or other action) to address any identified gaps.

This report is structured as follows:

- Chapter 1 presents the approach and methods used;
- Chapter 2 contains the Ex-post Impact Assessment of existing water-related legislation;
- Chapter 3 covers an assessment of the potential costs and benefits of additional European level interventions (cost of non-Europe); and
- Chapter 4 presents an overall conclusion summarising progress to date and potential future options.

1.1 Approach and method

This section briefly explains the approach taken in this study and the methodologies applied to carry out the assessment.

The primary source of information for this study has been an extensive literature review, covering EU documentation as well as external studies and assessments from research bodies, NGOs, etc. Annex C provides an overview of the reviewed literature. In order to supplement and help us to critically assess this literature we also carried out a relatively small number of targeted interviews with an **expert**

[3] EP (2014) Mapping the Cost of Non-Europe 2014-2019, July 2014 edition http://www.europarl.europa.eu/the-secretary-general/resource/static/files/files/2014-july---mapping-the-cost-of-non-europe--en-.pdf

group consisting of selected experts representing a variety of perspectives. 10 interviews were conducted between 18 July 2014 and 25 September 2014 with senior representatives from environmental NGOs, the water industry, the pharmaceutical industry, water authorities and water experts (see Annex B).The experts were selected in order to gain the maximum relevant (for our study) breadth and depth of knowledge from a small group. Their opinions and input has been incorporated throughout this report and is referenced via footnotes.

1.1.1 Phase I

Phase I sets out to analyse the overall body of EU policy and legislation relating to water. This analysis is intended to assess the extent to which this policy and legislation have properly identified the main challenges and considered all relevant options. The analysis also considers the level of progress achieved by the key Directives and policies.

In order to address these broad objectives the chapter is structured as follows:

1. The structure of the water-related EU law and the main pieces of legislation is described along with an identification of the main policy areas and the criteria by which the status of the water environment is judged.
2. A discussion of the availability of impact data, in particular data relating to costs and benefits.
3. An assessment of the progress, effectiveness and coverage of the existing water legislation– via a literature review of material such as impact assessments, evaluations, and other analytical reports. The progress assessment is presented under the following two categories:
    a. *Policy areas and tools*: analysing regulations and policy related to human safety and environmental protection.
    b. *Water status elements*: reviewing regulations and policy regarding water quality, quantity and morphology.
4. An assessment of the coverage of existing water legislation, with gaps identified.
5. Conclusions on the progress and coverage of the most important EU water-related regulations and policies.

1.1.2 Phase II

The model for our approach in Phase II is the 'Cost of non-Europe' report.[4] The basis of our approach is to assess the potential for additional European level action to address a number of perceived shortcomings in water related policy. Wherever possible, we have assessed the economic costs and benefits of this additional EU-level action and provided a qualitative assessment of the key issues.

The approach for Phase II is divided into the following steps:

- Step 1 – *Identify promising areas for further assessment* - based on the analysis carried out under Phase I, five cases from five topics mentioned in the ToR are selected for further research. For each of these case studies, we then apply the following steps:
- Step 2 – *Describe the problem and policy context* - describe the policy context and background, intervention logic, and state of European harmonisation, building on the empirical findings from Phase I to defend the selection of the case.

[4]EP (2014) Mapping the Cost of Non-Europe 2014-2019, July 2014 edition http://www.europarl.europa.eu/the-secretary-general/resource/static/files/files/2014-july---mapping-the-cost-of-non-europe--en-.pdf

- Step 3 – *Develop a baseline scenario*- Wherever possible and deemed relevant, the costs are expressed in monetary terms. However, we also acknowledge that “costs” is a multi-facetted expression and has relevance to a number of aspects of a problem. Furthermore, straightforward cost data are not available for all issues and Member States, while transaction costs are of greater importance for other issues such as the organisation of river basin management. Hence, this task will result in a simple base-line scenario where the current situation is clearly described and costs estimated to the furthest and most appropriate extent possible in order to identify costs incurred by citizens, society and stakeholders due to gaps and fragmentation in the policies and legislation.
- Step 4 – *Determine potential and effects of EU coordination* - the potential for improved coordination at EU level and the type and size of synergies this would yield are estimated. Based on the data from the previous task and the base-line scenario, a new scenario is developed to understand the potential benefits of additional action at EU level. The comparison between the baseline scenario and the new “added value” scenario is used to answer the following question: What are the efficiency gains, in economic terms or otherwise, from further European action to overcome the gaps, reduce fragmentation and further harmonise of the EU water policy and legislation? An MS-led approach is also considered.
- Step 5 – *Synthesise findings* - The aim is to answer the following questions (as per the ToR):
    a. What are the existing gaps that can be addressed through better application and implementation of the existing legislative framework?
    b. What are the costs in monetary terms of the infrastructure necessary to overcome these gaps?
    c. What are the costs of actions required to reduce fragmentation in, and further harmonising, EU water legislation?

2 Phase I - Ex-post Impact Assessment

This chapter provides a review of the extent to which the existing body of EU water legislation addresses water related concerns and issues in Europe. Progress and impact of the existing water legislation is also assessed.

The EU has a 40-year record of developing its water policy. The first 25 years resulted in a patchwork of legislation, covering different human uses and parts of the aquatic environment and putting in place quality standards and emission controls as well as monitoring and management requirements. Over the past 14 years the policy has been fundamentally reorganised as a result of the Water Framework Directive (WFD), which entered into force in 2000. It requires river basin planning and management and sets a very broad and ambitious long-term target for water protection – achieving 'good status'. Fourteen years later, and less than one year away from the deadline for achieving the general objective of the WFD, i.e. achieving "good" status for all water bodies, the challenge faced by the EU remains immense. To address this challenge, the European Commission has put forward its proposals for the future in the "Blueprint to Safeguard Europe's Water Resources", with a clear emphasis on better implementation of water policy.

In this phase we look into the work feeding into the Blueprint and other (non-EC) sources in order to assess the general structure and progress of the water legislation in the EU, while seeking to verify the findings from the Blueprint.

2.1 The structure of water-related EU law

This section sets the scene and defines the scope and areas of existing legislation. With regard to the scope of legislation it is useful to consider two water 'cycles' - the human cycle (small) and the hydrological cycle (large). For the areas of legislation we use a policy diagram, which places the Water Status, as defined by the WFD, in the centre with policies related to the different elements of water status - quality, quantity and morphology – around the centre.

2.1.1 Overview of water-related EU legislation

The 2000 Water Framework Directive (WFD) is arguably the most overarching piece of EU water legislation. It sets long-term and ambitious objectives for managing and improving the entire aquatic environment, and establishes requirements for integrated and transparent river basin management. More specific pieces of legislation dealing with particular aspects of water management or use have been passed both before and after the WFD. The following table shows key EU legislation in chronological order, together with key objectives. More detail on each piece of legislation is available in the Factsheets provided in Annex A.

Table1: Overview of EU water-related legislation

Year	Policy	Scope / Tools	Main objectives
Water-specific legislation			
1976	Dangerous Substances Directive 76/464/EEC repealed by WFD and PS/EQS Directives	Surface water/ Emission controls	• Eliminate pollution by dangerous substances
1976	Bathing waters, last amended by DIRECTIVE 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC (**BWD**)	Human use/ Quality standards and RBM	• To preserve, protect and improve the quality of the environment and • To protect human health by complementing WFD with regard to bathing water
1980	Drinking water quality, last amended by DIRECTIVE 98/83/EC on the quality of water intended for human consumption (**DWD**)	Human consumption/ Quality standards	• To protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean
1980	Groundwater protection last amended by DIRECTIVE 2006/118/EC on the protection of groundwater against pollution and deterioration (**GWD**)	Groundwater/ EQS and Emission controls	• To establish specific measures to prevent and control pollution of groundwater • To complement the WFD on the provisions preventing or limiting inputs of pollutants
1991	DIRECTIVE 91/271/EEC concerning urban waste water treatment (**UWWTD**)	Waste water collection and treatment/ Emission controls and identification of vulnerable areas	• To protect the environment from the adverse effects of urban waste water discharge and treatment and of biodegradable industrial waste water from the agro-food sector
1991	DIRECTIVE 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (**Nitrates Directive**)	Agricultural/ Emission controls and identification of vulnerable zones	• To reduce water pollution caused or induced by nitrates from agricultural sources • To prevent further such pollution
2000	DIRECTIVE 2000/60/EC establishing a framework for Community action in the field of water policy (**WFD**) and amended and complemented by the following: DECISION No2455/2001/EC establishing the list of priority substances in the field of water policy (**PS**) and DIRECTIVE 2008/105/EC on environmental quality standards in the field of water policy (**EQS**), further amended	All aspects of the water cycle/ RBM, economic instruments, EQS, emission controls	• To prevent further deterioration and protect and enhances the status of the aquatic ecosystems • To promote sustainable water use • To reduce / cease emissions of priority / priority hazardous substances • To mitigate the effects of floods and droughts

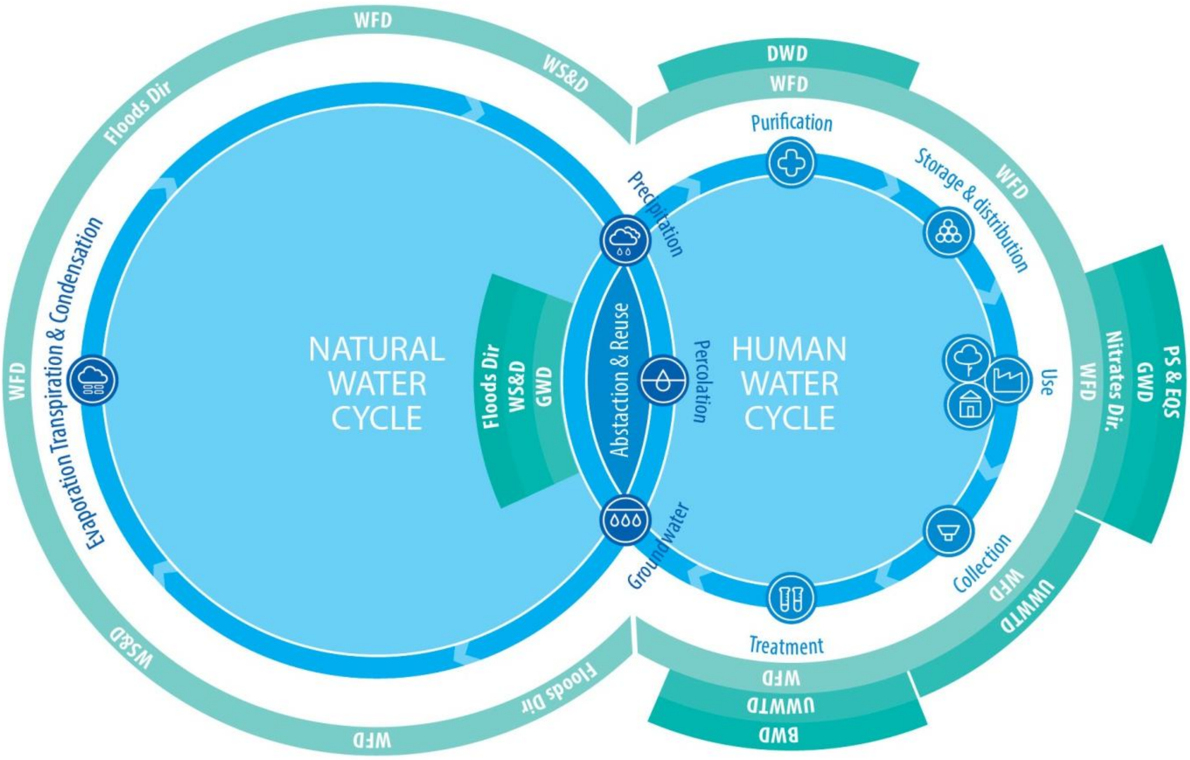
Year	Policy	Scope / Tools	Main objectives
	by DIRECTIVE 2013/39/EU as regards PS in the field of water policy		
2007	DIRECTIVE 2007/60/EC on the assessment and management of flood risks (**Floods Directive**)	All water uses/ planning	• To establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity
2007	COM [(2007) 414] Addressing the challenge of water scarcity and droughts in the European Union (**WS&D**)	All water uses	• To present policy options at EU, national and regional levels to address and mitigate the effects of water scarcity and droughts
Important non water-specific but related legislation			
1979	Directive 79/409/EEC and latest version Directive 2009/147/EC on the conservation of wild birds (**Birds Directive**)	Nature conservation	• To protect species of wild birds in the EU
1985	Directive 85/337/EEC and subsequent amendments on the assessment of the effects of certain public and private projects on the environment (**EIA Directive**)	Environmental protection	• To set requirements for mandatory Environmental Impact Assessment (EIA) for certain projects
1992	Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (**Habitats Directive**)	Nature conservation	• To ensure biodiversity through conservation of natural habitats and wild fauna and flora in the EU
2009	DIRECTIVE 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products (**Ecodesign Directive**) and its implementing regulations e.g.	All water uses	• To set ecodesign requirements for energy-using products (EuPs) • To provide for criteria and conditions for the setting of ecodesign requirements which the regulated EuPs must fulfil in order to be placed on the market • To increase energy efficiency and the security of energy supply
	REGULATION (EU) No 1015/2010 (...) implementing Directive 2009/125/EC with regard to eco-design requirements for household **washing machines**	Domestic water use	• To establish ecodesign requirements for the placing on the market of electric mains-operated household washing machines including requirements for the water consumption

Source: Authors' own analysis

2.1.2 *The water cycle- defining policy areas and tools*

In order to assess the policy areas and instruments it is useful to consider the natural and human water cycles. The former covers the hydrological cycle (precipitation, infiltration, flow and runoff and evaporation) and the related natural processes within a water system (water quality, erosion and sediment and chemical transport). The human cycle describes the anthropogenic use of water (abstraction, use and discharge) and is often called the small cycle. The following diagram summarises these two water cycles and indicates the main pieces of legislation and policies that relate to these cycles. The illustration shows that the majority of 'old' EU water legislation is concerned with the human water cycle addressing human health directly and indirectly through resource protection by combining quality standards and emission controls. The WFD broadens the scope of EU water policy to the hydrological cycle, strengthens environmental objectives and introduces new tools including river basin planning and economic instruments aiming at achieving a more efficient use of water and thus reducing water use.

Figure 1: Illustration of the water cycle



Source: Authors' own analysis

The main policy areas and related policy instruments can be classified as follows:

1. **Human safety**: setting standards for human use, i.e. BWD, DWD; supporting protection of water resources through emission controls and quality standards, i.e. WFD, UWWTD, Nitrates, GWD, PS&EQS; reducing risks from floods and droughts, i.e. WFD, Floods Directive, WS&D.

2. **Environmental protection**: setting emission controls and quality standards, i.e. WFD, UWWTD, Nitrates, GWD, PS&EQS; reduce resource use (i.e. amount of land, water, energy and material

use[5,6]), i.e. WFD requirements and instruments to protect and restore hydromorphology and increase efficiency of water use and Ecodesign.

2.1.3 The “Water Status” approach

In order to assess the overall coverage of water-related EU law, we have decided to use ‘Water Status’ as defined by the WFD. This provides a new and comprehensive approach for addressing all water issues. The “water status” is defined for surface water by its ecological and chemical status and for groundwater by the quantitative and chemical status (WFD, Art 2.17 and 2.19). The ecological status is defined as an expression of the quality, structure and ability to function of aquatic ecosystems (WFD Art 2.21) and is determined by its biological quality as supported by hydromorphological and chemical / physico-chemical quality elements (WFD, Annex V).

This system of status definitions can be simplified to the following three elements, which determine overall water status:

- **Quality(chemical and physico-chemical)**, determined by the level of anthropogenic emissions, including heat, nutrients, pesticides, industrial chemicals and micro pollutants, like pharmaceuticals which are present;
- **Quantity (Hydrology)**, the flow regime and quantity of water available, which is altered by water abstraction and consumption, water level regulation (dams, weirs) or changes to natural water retention capacities (land sealing and drainage); and
- **Space (Morphology)**, the structure of the river, its bed and riparian zone (i.e. river banks), which is changed by reducing available space (using flood plains for settlement or agriculture), altering connectivity of ground and surface waters (canals, culverts), the connectivity between the river and adjacent land (dykes and levees) and the up and down stream connectivity (dams).

These three elements are the main drivers for water status, determining whether the WFD’s objective of good ecological, good chemical and good quantitative status for the different types of waters, rivers, lakes, coastal, transitional and groundwater can be achieved.

As illustrated by figure 2 below, the majority of EU water policies address the chemical quality (DWD, UWWTD, GWD, PS&EQS, BWD, Nitrates Dir., WFD Art 11 and 16), either through EQS or emission controls. There are only a few, relatively new, policies addressing quantitative aspects (WFD Art 9 and 11, WS&D, Floods Directive). Space and structure are only addressed by the Floods Directive and the Programmes of Measures (PoMs), which require controls over activities that adversely impact hydromorphological conditions (WFD, Art 11.3i). It also requires the recovery of costs for water services, which includes changes to the morphology, for example dams and dykes, to store water and change flow levels (WFD Art 9).

The PoMs, as required by the WFD, address all water status elements. Nevertheless, the mandatory (basic) measures set out by the WFD are less prescriptive with regard to hydrology and morphology (‘general binding rules’), compared to measures to control abstractions and impoundment (registers

[5]Sustainable Europe Research Institute (2009); How to measure Europe’s resource use - An analysis for Friends of the Earth Europe.
[6]EC [COM (2011) 571 final] Roadmap to a Resource Efficient Europe

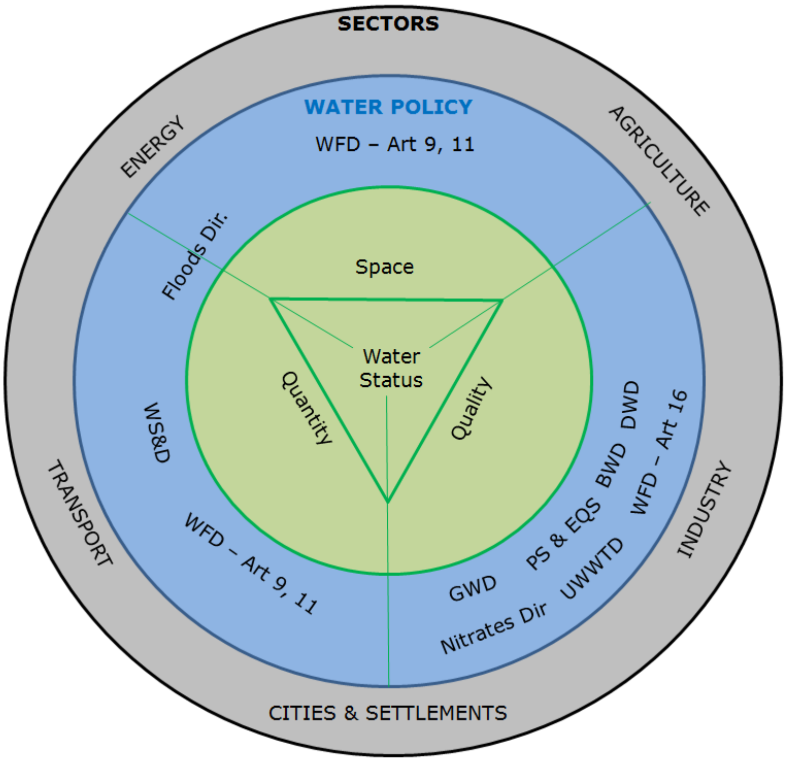
and prior authorisations) and measures against pollution (prior authorisation and prohibition) (see also chapter 3.2.1).[7]

The outer circle represents the sectors which are the main sources of pressure on water status and whose policies can conflict with water protection objectives. A detailed analysis of such conflicts is beyond the scope of this study. However this is an important issue and we have provided a brief description of arguably the most significant examples in order to illustrate this point and to highlight the importance of better policy integration[8]:

- **Agriculture**: Agricultural activities, which receive nearly 40% of the EU budget, are mentioned in 90% of RBMPs as the main cause of significant impact on water quality and quantity.[9] In their recent assessment the European Court of Auditors (ECA) concluded that while cross-compliance and the rural development fund have a positive impact on water protection, they are limited compared to the ambitious goals, and recommended modifying EU policies and better integrating these with RBMPs.[10]
- **Energy**: Energy production impacts water status in many ways. Dams for hydro-power generation and storage prevents fish migration and sediment transport, cooling towers for thermal power production consume water and cause heat pollution. Coal fired power stations emit mercury which deposits in water, and increased production of biofuels, like producing diesel from rapeseed or gasoline from maize, increase nutrient and pesticide pollution. The EU's climate and energy policy has a major impact on those developments. There is a risk that specific policies can lead to a further increase in conflicts, by focussing funding and activity on supply infrastructure or specific energy sources, i.e. renewable energy in transport. However the reverse can also be true, with certain policy choices fostering better integration, usually by increasing energy efficiency.[11]

[7] See WFD Article 11.3, list of mandatory measures – based on own assessment of this list
[8] Interviews with Peter Gammeltoft (23/7/14), Thomas Dworak (18/7/14), EEB (5/9/14) and Pierre Strosser (25/9/14) and own Blueprint assessment
[9] European Commission (2012), Impact assessment accompanying the Blueprint SWD 2012/382, page 6.
[10] European Court of Auditors (2014), Special Report (No 4/2014): "Integration of EU water policy objectives with the CAP: a partial success"
[11] IEA 2013, Energy Efficiency Market Report

Figure 2: Illustration of assessment of EU water policy structure against water status elements



Source: Stefan Scheuer Consulting 2014

Despite the complexity in describing the status of bodies of waters in accordance with the technical requirements of the WFD[12], progress has been made and water status maps have been published and are almost complete for all river basin districts.[13] Our literature review and expert interviews did not identify major issues with the status maps, although status classification of bodies of water had been challenged, for example the Cholorphyll-a concentrations set in the Elbe river basin district[14], and general weaknesses regarding the EU wide calibration of status classification methods have been identified.[15] Recent data indicate that over 50% of water bodies are failing to achieve Good Status[16] and that pressures on the hydrology and morphology (hydro-morphology) are the most significant reasons[17] behind this situation. As a result of this new assessment waters which had been classified as good a decade ago are now classified as below good. This is illustrated in the figure below, which compares the former assessment results in North-Rhine-Westphalia based on the common indicators regarding waste water discharges with a new indicator which shows the impact of morphological changes. As can

[12]CIS WFD guidance documents: N° 4 - Identification and Designation of Heavily Modified and Artificial Water Bodies; N° 5 - Transitional and Coastal Waters - Typology, Reference Conditions and Classification Systems; N° 6 - Towards a Guidance on Establishment of the Intercalibration Network and the Process on the Intercalibration Exercise; N° 10 - Rivers and Lakes - Typology, Reference Conditions and Classification Systems; N° 13 - Overall Approach to the Classification of Ecological Status and Ecological Potential; N° 14 - Guidance on the Intercalibration Process (2004-2006)

[13]EC [SWD (2012) 382 final]]SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources–part 2, page 14

[14]EEB 2010, 10 years of the Water Framework Directive: A Toothless Tiger? - A snapshot assessment of EU environmental ambitions

[15]EEB, RSPB and Pond Conservation (2006) NGO Technical Review of the Water Framework Directive Intercalibration Process

[16]EC [SWD (2012) 382 final]SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources–part 1, page 12

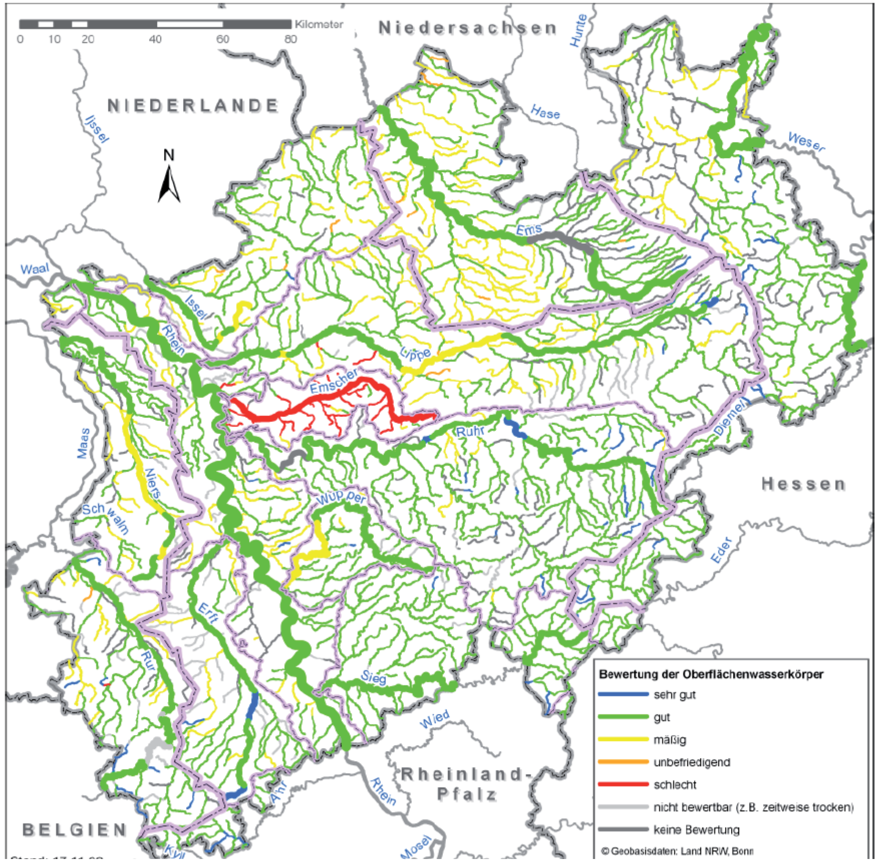
[17]EC [SWD (2012) 382 final]SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources–part 2, page 6

be seen the second diagram shows a much larger share of river in red, orange and yellow – indicating quality levels below good.

This is not surprising as the attention of water policies in the EU and Member States has been focused on improving the chemical quality (with some success), while hydrology and morphology are closely linked to quantitative resource use and allocation policies, like land, energy, material and water, which are driven by general economic developments and sector policies much more than water policies. In addition EU competencies are limited in those areas.

The Blueprint accordingly highlights the importance of better integration of water concerns into other policies as being a key factor required in order to make progress.

Figure 3: Water status assessment, North-Rhine-Westphalia, 2010



Saprobie,an indicator in use for 50 years, sensitive to urban waste water discharges.

Macrozoobenthos indicator sensitive to structural changes

[Source: Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein Westfalen "Der Zustand der Gewässer in Nordrhein Westfalen" available at http://www.umwelt.nrw.de/umwelt/pdf/monitoring.pdf]

2.2 Assessment of progress in the different areas and use of tools

This assessment relies primarily on the factsheets that have been developed during the review of existing legislation and water-related policies (see Annex A for more details and all data sources and references). It presents general progress both in terms of monitoring and reporting and attainment of objectives.

2.2.1 Policy areas where significant progress has been achieved – human health protection

- *shows that EU has made good progress concerning human health protection by setting EU quality standards*

Our initial assessment of the achievements to date and implementation progress indicates that the highest compliance rates are achieved for the DWD and the BWD – with at least over 90% compliance with the quality standards set in the respective directives. An increasing number of water bodies even achieve "excellent quality" status, defined as 99-100% compliance with the quality standards.

2.2.2 Policy areas where mixed progress has been achieved - emissions controls and quality standards

- *shows that there is mixed progress in using emission controls and quality standards affecting environmental protection but also human safety.*

Compliance with the UWWTD is high for the pre-2004 Member States (around 90%) but lower for the newer ones, especially regarding secondary and more stringent waste water treatment (compliance rates are around 40% and 14% respectively).The newer Member States are also subject to other implementation deadlines and are so far reported to be on track.With regard to pollution, a 2011JRC report[18] concluded that the total nitrogen pollution from the land to the sea had decreased by 9%, while the total phosphorus load had decreased by around 15% in 2005 compared to 1991, mainly due to a decrease in point source emissions. The high decrease observed in the North and Baltic Seas was mainly related to the implementation of advanced waste water treatment. To a large extent the improvement in the quality of EU bathing waters in recent decades is due to the implementation of UWWTD provisions.

The large majority of Member States have also achieved good progress with regard to the GWD. Almost all EU countries have reported on the establishment of threshold values in the required format either using drinking water standards or relevant international or national standards as the basis. More than half of the Member States (56 %) have also considered environmental quality objectives – international (e.g. EQS Directive) or national standards. By area, about 25 % of groundwater across Europe is classified as being in poor chemical status. Of the total number of groundwater bodies reported in the RBMPs, 6.4 % are classified as being in poor quantitative status. Nonetheless, by 2015, almost 90% of groundwater bodies are forecast to be in good chemical status and 96 % in good quantitative status.[19]

The transposition and implementation of the Floods Directive is also reported to be on track with the first flood risk management plans expected in 2015. Nonetheless, this is a relatively new directive and

[18] JRC (2011) Long term nutrient loads entering European seas
[19] EEA (2012) European waters — current status and future challenges Synthesis, page 21

so far only its transposition can be assessed. Progress towards the directive's objectives cannot currently be evaluated.

2.2.3 Policy areas where progress is lagging- diffuse and unknown pollution and resource use

- *Shows progress lagging in using emission controls to reduce diffuse pollution and in reducing resource use and lack of information on chemical quality affecting environmental protection and human safety.*

Implementation of other water policy legislation appears to have progressed at a much slower pace. There are major delays in implementation or clear divergence from intended goals and lack of achievement.

Regarding the overall objective for EU water policies as set by the WFD – 'good status', over 50% of water bodies are expected to fail to achieve the good status objective by 2015. The EAA (2012)[20] reports that almost 50% of Europe's surface waters are likely to be in a poor ecological status by 2015. The picture is more difficult to assess for chemical status as this status is not known for more than 40% of Europe's surface waters. Nevertheless, by 2015 more than 90% of Europe's groundwater is expected to be in good status in terms of both quantity and quality. Analysis of the pressures causing poor status shows that 30% - 50% of the surface water bodies are affected by diffuse pollution (principally due to agriculture). More than 40% of the river and coastal water bodies are affected by diffuse sources, whilst 20–25% of them are also subject to 'point source' pollution. Lack of ambition of relevant policies as well as hydro-morphological pressures (e.g. abstraction, land use, flow regulation and dykes) are reported as the main reasons behind this failure to achieve good ecological status.[21]

The WFD allows exemptions, delays, setting lower objectives or status deterioration, under certain conditions. The justification of criteria applied for the exemptions provided in the RBMPs has been criticised as generally lacking transparency, '*indicating a degree of arbitrariness in their application*'.[22] To date compliance with regard to the adoption and submission of RBMPs is relatively low, with only 70% of the expected reports submitted. Furthermore, not many of the submitted RBMPs contain provisions for flood risk management or water scarcity and drought (WS&D). However, the reporting deadline for flood risk management plans is not until 2015, and there are only guidelines, as opposed to binding provisions on WS&D. A further impediment is posed by the lack of synchronisation between the RBMPs reporting cycle under the WFD and the reporting cycles under the older directives – the UWWTD and the Nitrates Directive.

Improved environmental quality monitoring and an upward compliance rates are reported for the Nitrates Directive. Between 2008 and 2011 the concentration of nitrates only exceeded the threshold value in 14% of the reported groundwater bodies. This indicates a slight improvement compared to the previous reporting period. However, the designation and protection of nitrate vulnerable waters remains incomplete and eutrophication (the excessive growth of plants/algae in water caused by nitrates pollution), in particular of marine waters, is a significant problem. Another challenge is posed

[20] EEA (2012) European waters — current status and future challenges, Synthesis

[21] EC [SWD (2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources– part 1, chapter 2.5.1 and part 2, page 6.

[22] Ibid (part 1) chapter 2.5.1, page 21

by the lack of synchronisation between the reporting periods under the Nitrates directive and the RBMPs of the WFD.

The implementation of all seven areas defined in the guidelines of the WS&D Communication is reported as being limited. The EEA[23] reports that there is an imbalance in much of Europe's surface waters with water use often exceeding water availability, leading to water stress across much of Europe. Water scarcity is reported for nearly all river basin districts in the Mediterranean area.

The implementation of some more recent directives is hard to assess either due to their recent adoption or lack of reporting. For example, the EQS Directive is still being implemented – Member States have until September 2015 to transpose the directive. However, the chemical status of 40% of surface waters remains unknown, implying insufficient monitoring on MS level. Furthermore, the effects of emerging pollutants are not yet known.

2.3 Assessment of the effectiveness in addressing water status drivers

This section assesses the effectiveness of existing EU legislation in addressing the drivers of water status and highlights the conflicts with sector policies according to the approach set out in Figure 2 using information gathered for chapter 2.2 and via interviews.

2.3.1 Effectiveness of improving water quality

The EU has put in place numerous quality standards as well as emission controls, which have been effective in principle in reaching their specific targets, as can be seen from the progress in bathing and drinking water protection and to some extent in reducing pollution caused by urban waste water (see chapters 2.2.1 and 2.2.2). The main reasons for these successes are:

- Limited number of pollutants and emission sources; and
- Focus on human health effects.

However, as soon as the number of pollutants to be considered increases, or multiple emission sources are involved, progress appears limited (see chapter 2.2.3).This suggests ineffective policy design and/or policy conflicts.

In terms of policy conflicts, pollution from agricultural use of pesticides and fertilisers, run –off from transport infrastructure and air pollution is a well-studied and understood problem.[24]
With regard to ineffective policy design, there are noticeable difficulties in tackling pollution at the national level.

WFD implementation is incomplete (see chapter 2.2.3) either due to insufficient monitoring of pollutants or missing national quality standards, in cases where no EU-level standards have been set. Problems with the implementation of WFD Article 16 (combined approach for setting EQS and emission

[23] EEA (2012) European waters — current status and future challenges Synthesis, page 9
[24] EC [SEC (2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy. EEA (2012) European waters — current status and future challenges Synthesis.

controls) have been identified.[25] So far it has only led to the setting of EQS but no additional EU emission controls were directly delivered as a consequence of water protection needs. The lack of EU emission controls, as would be available through product authorisations, has been recognised by the EU legislator in 2013 by inserting a new Article 7a on Coordination, in the EQS Directive requiring the Commission to use relevant procedures under REACH, Pesticides and Biocides regulations (See Article 2.4 of Directive 2013/39/EU).

This suggests ineffective interactions between emission controls (upstream pollution control) and quality standards instruments. As a consequence, water policy at national level is often confronted with end-of-pipe emission reduction options, for example new waste water treatment standards, which are often the least cost-effective options.[26]

The issue of pharmaceutical residues has highlighted significant knowledge and regulatory gaps.[27] Such gaps are also apparent for other issues, like nano-materials, endocrine disrupting chemicals and chemical cocktail effects.[28]

2.3.2 *Effectiveness of improving quantitative aspects*

According to the EU Treaty EU measures on the quantitative management of water resources require unanimous Council decisions. The WFD is the EU's first attempt to develop policies to address quantitative water aspects indirectly, and this has been subject to constitutional challenges.[29] Regulation of this issue requires the establishment of flow regimes sufficient to support aquatic life close to undisturbed conditions (good ecological status) and the avoidance of excessive groundwater abstraction.

The instruments which are designed to reach these goals are limited to authorisation regimes for water abstraction, the promotion of efficient water use and the use of water pricing policies.

There is no strong evidence that these instruments have been successfully applied in the first round of RBMP in some Member States. For example no information has been found yet on how illegal abstractions in Spain[30] or Italy[31] have been reduced. Many Member States apply a narrow definition of water services[32], which leads to a situation where most water users, except the users of public drinking water and waste water services, are not covered by the WFD water pricing requirements. The European Court of Justice, nevertheless, ruled that this as such is not a breach of WFD requirements, as Member States are allowed to "*opt not to proceed with the cost recovery for a given water use activity, where this does not compromise the purposes and the achievement of the objectives of that directive [WFD]*".[33]

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[25] Interview Axel Singhofen (5/9/14)

[26] EurEau (2012) EurEau initial position paper on amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

[27] see EC [SEC (2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy

[28] Interview with EEB (5/9/14)

[29] Environment: Commission takes Spain to Court over urban waste water and river basin plans [European Commission - IP/11/729] http://europa.eu/rapid/press-release_IP-11-729_en.htm?locale=en

[30] WWF/Adena (2006) Illegal water us in Spain, effects and solutions

[31] Global Water Intelligence (2009) The truth behind Italy's illegal abstractionhttp://www.globalwaterintel.com/archive/10/5/general/truth-behind-italys-illegal-abstraction.html

[32] As noted in the European Commission infringement proceeding against Austria (EC - IP/12/653); Germany (EC - IP/12/536 and IP/11/1101);Belgium, Denmark, Finland and Sweden (EC - IP/11/1264); Ireland (EC - IP/11/1433)

[33] Judgment of the European Court of Justice (Second Chamber), 11 September 2014, in Case C-525/12

The economic analysis and assessment of better environmental options, as required by the WFD (Article 4.3b and Annex III),are regarded as being insufficient to understand whether cost-effective measures, such as improving water efficiency, have been considered before mitigating the impacts of water supply infrastructure and abstraction.[34]

The stringent WFD obligation to prevent the deterioration of the ecological status appears more effective and puts pressure on Member States to assess alternative water supply options including desalination and irrigation efficiency (see for example the Spanish assessment of Ebro water transfer).[35]

The EU's Ecodesign Framework is a policy instrument that addresses the environmental performance of products. This has already been addressed for dishwashers and washing machines under the EuP Directive, although the water saving effect appears to be limited (see Phase II, section 3.4.1 of this report).

The main water using sectors in the EU in terms of quantity are agriculture and energy[36], which are also subject to EU policies that are focussed historically on supporting production[37], in particular via direct payments, quotas and export support mechanisms, and energy generation and transport, in particular by setting renewable energy shares, and supporting carbon capture and interconnection projects though some of this would be counterbalanced by EU policies to increase energy efficiency and thus reduce energy demand.[38] Increased agriculture production and energy generation and transport increase the pressure on the quantitative status of the EU's water bodies.

2.3.3 Effectiveness of improving spatial aspects

It is largely up to national policies to manage the spatial aspects relevant to supporting conditions consistent with a good ecological status.

As with quantitative management of water resources, according to the EU Treaty, EU land use measures require unanimous Council decisions. Water and spatial management are closely interrelated, as water use requires space and use of space changes the hydrological cycle and thus water availability.

Lack of finance has been identified by experts[39] as a challenge for restoring floodplains and for improving hydromorphological conditions affected by existing infrastructure, such as dams and dykes. The importance of implementing the EU Floods Directive[40] and interaction with RBMPs has been stressed.

For example regarding flood risk, management can include reducing the use of floodplains and thus increasing the space for rivers, which improves the water retention capacity of the river basin, which in turn improves the hydrological regime and reduces the need for dams and water reservoirs, which

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[34]EC [SWD(2012) 382 final]]SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources – part 1

[35]Economic assessment of the Ebro Water Transfer – ES from http://ec.europa.eu/ourcoast/index.cfm?menuID=7&articleID=18

[36]CEPS (2012) Which Economic Model For A Water-Efficient Europe?

[37]See TEU objectives for the CAP: increase productivity and assure availability of supplies (Article 39.1 a and d)

[38]EU 2020 climate and energy framework and implementing policies

[39]Pieter Pollard (15/9/14) and Pierre Strosser (25/9/14)

[40]Interview with Eduard Interwies (18/7/14)

improves the sediment structure of the river. Similarly, increasing the efficiency of water use leads to reduced water demand, which reduces the need for dams and reservoirs with the same positive effect on the river structure. Therefore the Floods Directive can be regarded as one of the EU's main policy instruments to improve the availability of space for water.

Besides those parallels, the management of space for water bodies including their structure, is less developed by the WFD, which only requires general binding rules (WFD Art 11.3i).The WFD economic instruments, including cost recovery for water services, do not cover land use in general and only cover water infrastructure like dams and dykes as services for inland navigation, flood protection or energy production in a broad interpretation. As stated in chapter 2.3.2, during the first round of RBMPs a wide definition of water services was not commonly used. Further to that, the economic analysis and assessment of better environmental options, as required by the WFD (Art 4.3b and Annex III), are regarded by some as insufficient[41] to understand whether potentially cost-effective measures, like reducing land use, have been considered before mitigating the impacts of land use.

Other environmental EU policies, including the Birds, Habitats and Environmental Impact Assessment Directives establish land use planning procedures for protected areas, which are linked with the WFD (Article 6).

EU sector policies for agriculture and energy are mainly focussed on supply and production and tend to increase the use of land and water. The lack of any - or insufficient - compensation policies and measures implemented by Member States cause a conflict with reaching a good ecological status (see chapter 2.1.3 for examples).[42]

2.4 Conclusions from the Ex-post Impact Assessment

Our assessment of progress in policy areas and instruments (chapter 2.2) and of effectiveness of policies to improve the Water Status (chapter 2.3) provides a mixed picture. In addition to the overview given in the paragraphs hereafter, Table 2 below provides a detailed view of the assessment.

Progress achieved towards human health objectives

The progress that has been made in reaching human health protection objectives has mainly been achieved by using a combination of EU-level quality standards and a mix of EU and national emission controls. Progress is also reported in dealing with specific types of pollution, for example pathogens, biodegradable components and nutrients in urban waste water, causing eutrophication and posing human health risk. The instruments are similar: a combination of EU emission controls backed by quality standards.

[41] EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources– part 1

[42] Interviews with Peter Gammeltoft (23/7/14) , Thomas Dworak (18/7/14) and Pierre Strosser (25/9/14)

This approach appears to be a successful way of improving the quality elements in order to achieve the Water Status objectives.

Problems exposed regarding effective ways of addressing pollution

The implementation of the WFD exposes problems in dealing with pollution, notably:

- Diffuse pollution from agriculture, energy and transport activities;
- Weak understanding of chemical risks, due to lack of monitoring at national level and the lack of an EU risk assessment for whole groups of substances; and
- Emerging imbalance of the combined approach of setting mutually reinforcing EQS and emission controls. Emission controls, as foreseen by the WFD, have not yet come forward. While the EU has a range of emission control instruments for industrial chemicals, pesticides and biocides, they were not used over the last decade to respond specifically to water pollution concerns. Finally a range of chemical properties or products are not covered by EU risk assessments requirements or emission controls, including nano-particles, cocktail- and endocrine disrupting effects and pharmaceuticals.

Limited progress towards reducing quantitative pressures

Progress towards reducing quantitative pressures, as required to support good status for surface and groundwater, has been limited so far. This can be attributed to a lack of clarity and stringency of the target provided by the WFD as well as a lack of EU and national instruments. Some instruments are promoted by the WFD, notably economic assessments and instruments to increase water efficiency, but implementation is often narrow or incomplete. The development of EU policies in the area of quantitative water resource management is restricted due to limitations set by the EU Treaty.[43] Nevertheless, product policies have been passed which introduce minimum water efficiency requirements.

On the other hand, EU energy, agriculture and transport policies have a significant impact on water use, which is rarely considered in policy development. Overall, there remains significant untapped potential to improve water efficiency, on both the demand and supply side.

Recent European Commission initiatives to develop an EU Strategy for a resource-efficient Europe, reinforce these findings and explore the economic benefits of increasing water efficiency and saving water. For example, the Roadmap for a resource-efficient Europe[44] proposes a water abstraction target of less than 20% of available renewable water resources as well as water efficiency targets and improved measures such as water metering, water reuse, reduction of leakage from water infrastructure, etc. While the Flagship for resource efficiency[45] emphasises the importance of a water policy that prioritises water saving measures and improved water efficiency. The Communication on a circular economy[46] recommends that the Resource Efficiency Scoreboard, which is used to monitor the progress towards a resource efficient Europe, should be further developed and include indicators for water and land use.

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[43] See TEU Article 192.2b which requires unanimity in Council for measures affecting quantitative management of water resources.
[44] EC [COM(2011) 571 final] Communication (…) Roadmap to a resource efficient Europe, pp. 13-14
[45] EC[COM(2011) 21] Communication (…)A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy, p.6
[46] EC [COM(2014) 398 final/2] Communication (…)Towards a circular economy: A zero waste programme for Europe, p. 14

Limited progress regarding improved space and structure objectives

Progress with regard to improving space and structure as required to achieve a good status is limited for similar reasons as outlined above for water quantity: lack of robust targets and instruments, incomplete national implementation and conflicting EU policies leading to ineffective policy designs. This is illustrated by the unclear cost-effectiveness assessment in PoMs, which mostly address new projects requiring mitigation measures but rarely investigate better environmental alternatives to the project or revisit existing projects even though these options could be more cost-effective.

In addition, the WFD requirements relating to the EU Floods Directive provide a potentially powerful planning instrument if well integrated with the RBMP and the use of economic instruments.
As mentioned above, the EU Strategy for a resource-efficient Europe, does not capture land water interactions.

Policy coherence

Coherence between sector and water policies as well as between different water policies has been identified as a main issue hindering effective delivery of water policy objectives. RBMPs and PoMs in general have not yet managed to reduce those conflicts or lead to better policy integration in a systematic manner, although individual examples are provided including increased economic transparency in several countries or for example the integration of waste management into RBMPs in France.[47] Flood risk management is identified of a priority area for better integration within RBMPs. We have not studied in detail conflicts with sector policies in view of identifying potential actions at EU level, but the impact on water protection from the CAP and EU energy policies is widely recognised.[48]

Table 2 presents an overview of progress of EU water legislation based on the analysis in chapter 2 and the factsheets in Annex A. The factsheets provide information about the implementation process of the directives (regarding transposition as well as reporting on progress towards objectives). Additionally, the factsheets offer some quantitative data on related costs and benefits. Hence, Table 2 combines the Directive-specific information from the factsheets with the conclusions from the analysis in chapter 2 to provide an evaluation of implementation progress of EU water legislation.

[47] Interview with Pierre Strosser (25/9/14)
[48] Common view of experts interviewed

Table 2: Overview of the progress of EU water legislation

Area	Policy	Progress - administrative	Progress - toward objectives	Costs	Benefits	Relation to other policies	Problematic areas
All	Directive 2000/60/EC - **WFD**	Lagging: 30% of the RBMPs have not been submitted	Lagging: • Surface waters in 2015 – 50% in poor ecological status, 40% with unknown chemical status[49]; • Main pressures are on hydro-morphology[50] and from diffuse and still some point-source pollution[51]; however • Groundwater in 2015 – 90% in good status for both quantity and quality.[52]	Total costs of all WFD-related measures: €209 - €326 billion (or €8-€15 billion/year); total costs of WFD-specific measures: €40 - €230 billion (or €2 - €11 billion/year)[53,54]	If 70% of EU WBs would be in good ecological status (GES) by 2015, the expected total yearly benefits might be €1.5 - €20 billion/ year; if 100% of the EU WBs would reach GES by 2015, the expected total yearly benefits might be €2.82 - €37.3 billion/year[55,56]	Agriculture, Energy, Transport, Industry	• Insufficient use of economic assessment and instruments; Cost-effectiveness unclear • Significant and arbitrary use of exemptions to postpone reaching or setting lower objectives • Insufficient integration with other policy areas • Conflict of reporting cycles with other water legislation.

49 EEA (2012) European waters — current status and future challenges: Synthesis, p.9

50 EC [SWD(2012) 382 final] IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.17

51 EEA (2012) European waters — current status and future challenges: Synthesis, p.14

52 EEA (2012) European waters — current status and future challenges: Synthesis, p.9

53 Acteon (2012) Comparative study of pressures and measures in the major river basin management plans in the EU: Task 4 b - Costs & Benefits of WFD implementation: Final report, p.46

54 These estimations are based on RBD cost data reported by 11 Member States through WISE for the first WFD planning cycle. These costs are disaggregated to costs per inhabitant, water body and km^2. Together with statistical models for the transfer of costs to RBD where data is missing these values are used to estimate the costs of WFD relevant and WFD specific measures for all RBDs. The range represents the average values derived from the simple extrapolation and after the statistical modelling. This study is conducted for EU27.

55 Acteon (2012) Comparative study of pressures and measures in the major river basin management plans in the EU: Task 4 b - Costs & Benefits of WFD implementation: Final report, p.46

56 For the estimation of the benefits the authors use a similar approach as for the costs. However, the low number of RBD with benefit data did not allow for statistical modelling. Hence, the range represents the figures resulting from the rough multiplication of the unitary values derived from the reported RBD data and the number of inhabitants in the EU and assuming a certain proportion of the water bodies will be in good ecological status in 2015. This study is conducted for EU27.

Quality	**Emission controls and EQ**						
	Directive 98/83/EC - **DWD**	Positive: Implemented, reporting on track	Positive: Very high compliance rates in all Member States; some issues remain with compliance of remote or small suppliers	Estimated unit costs for removal of pesticides from drinking water were €0.028 /m^3 in 2006[57]	Lower health costs		Limited number of substances addressed
	Directive 2006/7/EC - **BWD**	Mixed: Implemented, reporting on track, but probably not all bathing sites identified, especially inland waters	Positive: Very high compliance rates in all Member States	Average conventional waste water treatment - operational cost is €1.9/m^3; capital investment is €474 - 593/m^3/day[58]	Lower health costs, recreational and tourism benefits	Agriculture	
	Emission controls and EQS						
	Directive 91/271/EEC - **UWWTD**	Positive: Implemented, reporting on track, new compliance deadlines for post-2004 Member States	Mixed: High compliance in “old Member States”, lower compliance in “new Member States”; decrease in nitrogen and phosphorus loads in EU seas attributed to it[59]	Average conventional waste water treatment - operational cost is €1.9/m^3; capital investment is €474 - 593/m^3/day[60]	Lower health costs, reduced treatment for drinking water		• Missing cost-effective approaches to decentralised treatment • Ageing infrastructure • Combined sewage overflows
	Directive	Positive:	Lagging:			Agriculture	• Diffuse pollution from

[57] EC [SEC(2011) 1547 final]]SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy, p.32
[58] EC [SWD(2012) 382 final] IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.25
[59] JRC (2011) Long term nutrient loads entering European seas, p.47
[60] EC [SWD(2012) 382 final]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.25

Area	Policy	Progress - administrative	Progress - toward objectives	Costs	Benefits	Relation to other policies	Problematic areas
	91/676/EEC - **Nitrates Directive**	Implemented, reporting on track	Compliance is increasing but diffuse pollution is still a major pressure for around half of the water bodies in the EU[61]				agriculture is still a major pressure for much of EU waters
	Directive 2006/118/EC - **GWD**	Positive: Implemented, reporting mostly on track	Mixed: Currently 25% of groundwater is in poor chemical status; 6.4% - in poor quantitative status; but expectation is that for both criteria around 90% of groundwater will be in good status in 2015[62]	The average overall cost of monitoring of existing PS in the EU27 is €69 million annually or €1.7 million per PS per year[63,64]		Agriculture, Industry	• Illegal abstraction in some Med countries • New pollutants, like EDC and pharmaceutical not covered
	Directives 2008/105/EC and 2013/39/EU on **EQS & PS**	Unknown: The new directive is under implementation	Lagging: 40% of surface waters are with unknown chemical status[65]; effects of emerging pollutants are not known	The average overall cost of monitoring of existing PS in the EU27 is €69 million annually or €1.7 million per PS per year[66]	Lower health costs	Industry	• Effects of emerging pollutants are unknown
	Floods and droughts						

[61] EEA (2012) European waters — current status and future challenges: Synthesis, p.14
[62] EEA (2012) European waters — current status and future challenges: Synthesis, p.21
[63] EC [SEC(2011) 1547 final]]SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy, pp.80-81
[64] This is the average value derived from a bottom-up and a top-down estimation made for the IA. The bottom-up approach was based on unit costs and found that monitoring costs for PS in the EU27 lie in the range €51-97 million, while the top-down approach was based on overall monitoring expenditure per MS and found that the range of monitoring costs is €41-94 million. €69 million is the average of the overall range i.e. €41-97 million.
[65] EEA (2012) European waters — current status and future challenges: Synthesis, p.9
[66] EC [SEC(2011) 1547 final]]SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy, pp80-81, for an explanation how the value is derived – see footnote 44

Area	Policy	Progress - administrative	Progress - toward objectives	Costs	Benefits	Relation to other policies	Problematic areas
	Directive 2007/60/EC - **Floods Directive**	Positive(so far): Implemented, first reports to be submitted in late 2015	Unknown: Flood risk management plans to be submitted in late 2015		NWRMs bring flood protection benefits of around €740 million for the period 2010-2100[67]; Avoid flood costs - economic damage from floods in EU for the period 2006-2010, are estimated at €6.4 billion/year[68]		
	COM [(2007) 414] Addressing **WS&D**	Lagging: Only some of the submitted RBMPs address WS&D issues	Lagging: Water imbalances and stress are reported in many of Europe's surface waters[69]	Total costs due to water shortages in Cyprus in the period 2010-2030 may reach €200 million (2009 prices)[70,71]			• No binding legislation in this policy area

Legend:

Human safety

Human safety and Environmental protection

Environmental protection

Source: Authors' own analysis

[67] EC [SWD(2012) 382 final] IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.23

[68] EC [SWD(2012) 382 final]]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 1, p.28

[69] EEA (2012) European waters — current status and future challenges: Synthesis, p.9

[70] Zachariadis, T. (2010) The Costs of Residential Water Scarcity in Cyprus: Impact of Climate Change and Policy Options as cited in EC [SWD(2012) 382 final]]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 1, p.28

[71] These estimates were made using three scenarios for increasing water demand in Cyprus and taking projected climate change effects into account. The whole range of the estimated scarcity costs is €72-200 million. Furthermore, this value is the estimated scarcity cost for the domestic, industry and tourism sectors as these sectors are supplied from the same freshwater sources – dams and desalination plants.

3 Phase II - The cost of non-Europe

This chapter considers the potential for a number of possible future extensions of EU water legislation. The majority of these potential extensions relate to gaps in coverage or areas of poor performance identified in the previous chapter.

The Terms of Reference for this study highlighted five policy issues where it was believed that potential existed for additional EU action and coordination. The previous chapter has confirmed that there are currently gaps or areas of poor performance. Section 3.1 shows that all of those gaps and areas concerning the water policy itself could be addressed to some extent by the five case studies suggested in the terms of reference. For each of the five cases we have described the issues as well as the European level policy options available to address them, and then made an attempt to estimate the potential costs and benefits of doing so.

3.1 Potential new EU legislation vs. gaps in coverage and areas of poor performance

This section presents the areas in which there is a coverage gap, the potential for new EU legislation and the areas which will be covered in the following case studies.

The main gaps in policy coverage and areas of poor policy performance which emerge from our high level ex-post assessment (the previous chapter) are:

1. Missing EU emission controls and gaps in chemical risk assessments and controls;
2. A need for stronger targets, and new and better use of existing tools for improving quantitative water status as part of a resource efficiency strategy; and
3. A need for new and better use of existing tools for improving space for, and structure of, water bodies as part of a resource efficiency strategy.

The five areas of potential new measures (legislative and non-legislative) cover the gaps and areas of poor performance in the following way:

1. **Programmes of Measures (PoM):** Address the majority of national implementation questions including cost-effectiveness of measures and the use of required instruments. Being part of the RBMPs implies that they would be the main vehicle to achieve better integration of different policies at national/regional level. It would therefore allow those quantity and space issues of water status to be addressed, which would be considered to respect the principles of subsidiarity and proportionality and where EU measures might not be appropriate.

2. **Waste Water Re-use:** addresses a very specific part of the quantitative issues and eventually new health aspects. This issue needs to be placed within the larger context of water efficiency and the savings hierarchy (reduce, re-use, desalinate, transfer).

3. **Eco-design and metering:** addresses a significant part of the quantitative issues and provides an important link to energy policies and energy-intensive sectors, which are major land and water users. Effectiveness will be linked to economic instruments.

4. **Economic instruments:** central to all Water Status Elements, as they have the potential to improve cost-effectiveness of PoMs and help finance restoration measures. One of the most important economic instruments is the use of water tariffs which require water metering to be effective. There are other examples of new policy tools (and better use of existing tools) which can also be considered.

5. **Pharmaceutical residues:** specific and arguably the largest outstanding gap with regard to better management of the pollution challenge. However, it does not address the significant problems with other types of pollution for which EU emission control instruments are further developed (including REACH and Pesticide and Biocide authorisations) which have not been used so far in synchronisation with setting quality standards.

From this screening it appears that the five priority areas cover most of the issues we have identified. The coverage is perhaps weakest on water quality, which is only addressed in an illustrative way by the pharmaceutical residues case, and regarding the better EU-level sector policy coordination and integration of environmental concerns into agriculture, energy and other policies.

A cross cutting and important area where there is potential for added value from EU action is the alignment of sector policy objectives in order to reduce policy conflicts and to improve environmental policy integration. Policy coherence and integration[72] remains one of the main challenges in water policy. This covers integration of (i) water concerns into different sectors and policy areas especially agriculture, chemicals, pharmaceuticals, economic and financial policy, and (ii) of different water policies, such as flood risk and river basin management. RBMPs[73] represent an important vehicle to foster such integration especially in the case of land use, quantitative management of water resources and the energy mix, where EU measures require unanimity in the Council.[74] Nevertheless, there is potential for additional EU action to reduce existing conflicts between European water legislation and major EU sector policies, including the Common Agricultural Policy (CAP) and EU energy policy.

The detailed analysis of these policy interactions and possible solutions is beyond the scope of this study. Nevertheless, the following EU policies can be highlighted as important examples which are linked with the case studies:

- Agriculture - a revised CAP with some measures aimed at dealing with water use in agriculture was adopted in 2013, though adding the WFD to the list of cross-compliance has been postponed in view of the ongoing WFD implementation. Given that progress towards reaching the WFD’s good status objectives has been slow, partly because of the significant pressures from agricultural activities and lack of financing for restoration projects, there is room for

[72]According to the majority of the expert group for this study
[73]According to the majority of the expert group for this study
[74] TEU Article 192 2.b

additional EU action to improve policy coherence and facilitate financing (see also chapter 3.2 on PoMs, building block for the costs of non-Europe on floodplain restoration).

- Energy – a new EU climate and energy policy framework for 2030 has recently been agreed upon. It sets targets for renewable energy and energy efficiency for 2030[75] and is, hence, expected to have significant repercussions for WFD implementation (see also chapter 3.4 on Eco-design and metering, building block on the cost of non-Europe on water taps and shower heads).

3.2 Case Study for Programmes of Measures

This section presents the case study for Programmes of Measures. It starts by identifying the current problems and policy context related to PoMs and RBMPs. It then describes the magnitude of the identified issues, the proposed options for improvement and the advantages of addressing the issue on a European level.

3.2.1 The problem and the policy context

The Programmes of Measures (PoMs) as required by the WFD set out all measures put in place and made operational to reach the objectives as established by the RBMPs. As discussed in chapter 2, one of the main structural challenges faced by the WFD implementation is the improvement of the hydromorphological status of bodies of water. Pressure on the hydromorphology, mainly resulting from dams, dykes and land use, is causing the majority of failures to reach good status as set by the WFD. An assessment of the basic (mandatory) and supplementary measures as required by the WFD article 11 on the PoMs correlates with this finding:

- Regarding water quality some eight categories of measures are prescribed, ranging from prohibitions, prior authorisations and controls of different types of pollutant discharges at national level and the enforcement and implementation of emission controls set at EU level.
- Quantitative aspects are addressed by general controls, prior authorisations and registers for abstractions and impoundments.
- For managing hydromorphological and spatial aspects, only one, rather vague category of measures is described: controls which may take the form of prior authorisations or controls based on general binding rules. In practice this has led to a focus on mitigating the negative impacts of new infrastructure projects with little priority given to existing infrastructure. This tendency is reinforced by the WFD Article 4 objective to prevent further deteriorations, which is not subject to the usual exemptions applied for the restoration objectives.
- Water pricing based on cost-recovery and user /polluter pays principle is a crosscutting measure, which could also support reductions of pressures on hydromorphology, but national implementation of water pricing tools has focused on public water supply and treatment services.[76]

[75] EC (2014) 2030 Framework for Climate and Energy: Outcome of the October 2014 European Council, presentation
The agreed targets for 2030 are: reduction of greenhouse gas emissions by at least 40%; increase the share of renewable energy to at least 27% of the energy consumption and raising energy efficiency by at least 27%.

[76] As noted in the European Commission infringement proceeding against Austria (EC - IP/12/653); Germany (EC - IP/12/536and536and IP/11/1101);Belgium , Denmark, Finland and Sweden (EC - IP/11/1264) Ireland (EC - IP/11/1433)

This means that in practice there are no strong specific requirements for actually restoring hydromorphology and for creating more space for rivers. Restoration programmes are a typical case of financing an upfront investment which is a major challenge given the tight budgetary policies in most Member States.

PoMs have to be seen as part of the central governance tool, the River Basin Management Plans (RBMPs), which should foster Integrated Water Resource Management (IWRM) and cross-border cooperation by taking the entire river basin as an administrative unit instead of national, regional or local borders, with reviews at six year intervals (2009, 2015, 2021 and 2027). The first comprehensive assessment of the RBMPs was carried out in the context of the reporting requirements of article 18 in the WFD, which noted that that "The strength of the planning process, and the adequacy and reliability of the RBMP depends upon good implementation of every intermediate step" (p.3).[77] Consequently, the level and quality of the design and implementation of the RBMPs and their PoMs are essential for the entire success of the WFD.

The creation and implementation of RBMPs appear to be still at an early stage. In 2012, only 75 % (n=124) of the total number of expected RBMPs were reported to the Commission. Spain, Portugal, Greece, and Belgium, in particular, were identified as laggards by not adopting or only partially adopting plans. Besides implementation problems, an assessment noted that the RBMPs struggled to provide adequate and detailed information to allow for assessments and proper monitoring, and that they made excessive use of exemptions to the guidelines set out under the WFD to justify the current levels of abstraction or management practices. For example, the 2012 assessment notes that in some cases data were missing to assess the chemical and biological status for over 50 % of the water bodies. In several cases, the RBMPs were considered to need more integration into local and regional decision-making procedures which are currently causing more organisational challenges than needed due to high transaction costs and administrative confusion in managing the river basins. The fact that RBMPs have been integrated into local and regional decision making in many Member States suggests that where it is lagging it is due to national implementation discussions rather than due to problems interpreting relevant EU regulations. Finally, the 2012 assessment noted that the RBMPs were insufficiently aligned or integrated with other important adjacent policy domains and documents such as the Flood Risk Management Plans or taking climate change and adaptation into account.

3.2.2 Potential impacts and role of EU coordination

Based on the assessment above, there are two areas where added value of EU actions could be significant[78]:

I. Dyke set back and floodplain restoration, often referred to as Natural Water Retention Measures (NRWM); and
II. Dam removal.

The potential for direct regulatory intervention from the EU is limited due to limited regulatory powers over land use and spatial planning, but financial incentives could be strengthened and policy coherence, in particular flood risk management, agriculture and investment policies, could be

[77] COM(2012) 670 final, p. 24
[78] Interview with Pierre Strosser 25/9/14

improved. A wider application of the cost-recovery principle and full implementation of WFD article 9 could also be helpful to incentivise and finance measures.

In practice this means that the EU could provide additional support and incentives for river basin authorities including:

- Management tools to better define obsolete infrastructure, which has either outlived its original purpose or reached a condition where maintenance costs outweigh benefits;
- Governance principles for successful restoration projects; and
- Prioritisation and financing tools, including use of EU structural and agriculture funds.

This would need to be accompanied by further efforts to reduce policy conflicts by better integration the economic rational of restoration projects, in particular flood plain restoration, into main EU policies.

The bottom line is that an economic rationale for dam removal, dyke set back and flood plain restoration has to be made. For dyke removal and floodplain restoration, several studies provide cost and benefit assessments, although these show very large regional variations, as the following three examples illustrate.

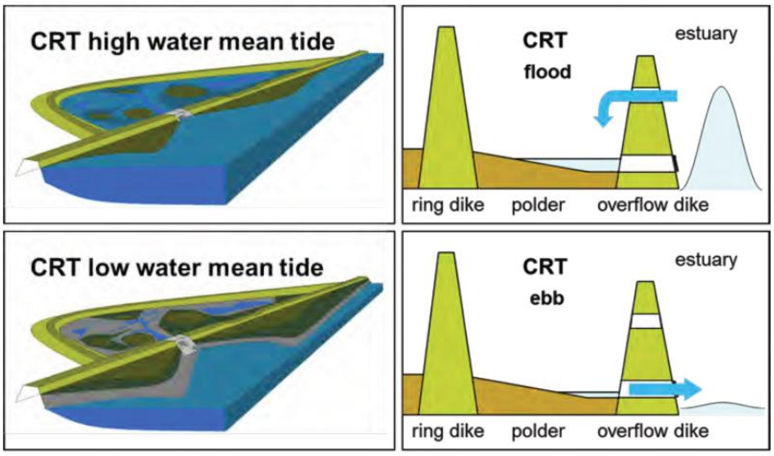
The Flemish Sigma plan to manage floods at the Scheldt estuary has been in operation since 1977 and combines increasing the height of, and strengthening the dykes, the standard procedure at the time, with the establishment of Flood Control Areas (FCA), which are low lying areas partly reconnected with the river during flood events (see illustration below). These are first steps in a NWRM. The Sigma plan was updated and expanded in 2005 to further strengthen the NWRM aspects and ecological protection focus of the plan. This was shown to be more cost-effective than the construction of a major storm surge barrier and protection of agricultural output.[79] The total investment costs for the restoration of 4.646 ha of Scheldt estuary floodplains, building of dykes and sluices, are estimated at €521 million (€112.205 /ha) and the economic benefits resulting from reduced flood damages and increased recreation and provision of other ecosystem service are estimated respectively at €740 million, and €155 million.[80] The payback period for the flood relevant aspects, which dominate the plan, are estimated to be around 14 years using a social discount rate[81] suggesting that annual benefits are around €10,000 /ha.

[79] Broekx S, et al. (2011) Designing a Long-Term Flood Risk Management Plan for the Scheldt Estuary Using a Risk Based Approach. Natural Hazards, 57 (2), 245–266, http://www.springerlink.com/content/e43138836415t02n/

[80] IEEP at al (2010) Green Infrastructure In-Depth Case Analysis Theme 4: Freshwater And Wetlands Management And Restoration

[81] Broekx S, et al. (2011) Designing a Long-Term Flood Risk Management Plan for the Scheldt Estuary Using a Risk Based Approach. Natural Hazards, 57 (2), 245–266, http://www.springerlink.com/content/e43138836415t02n/

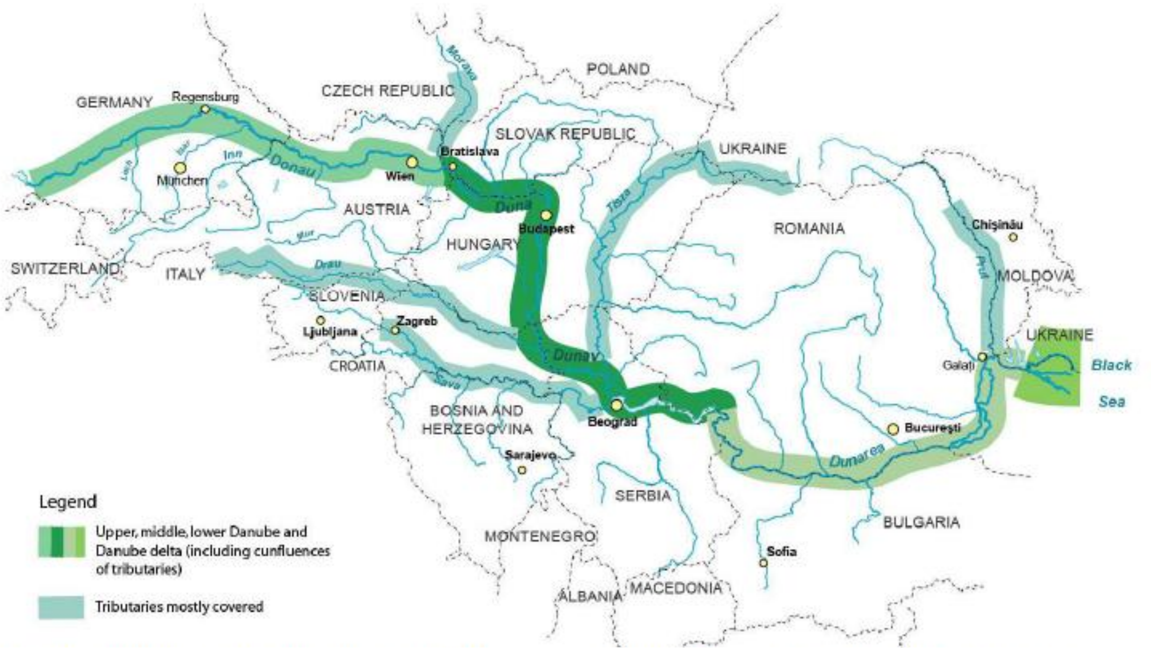
Figure 4: Functioning of a flood control area with controlled reduced tides



Source: Illustration from ECSA Bulletin 62 - Winter 2014, Estuaries in Focus – Sigma Plan Proves Efficiency

Around 1.8 million ha or 2/3 of the Danube river's floodplains are no longer active, in the sense of being connected to the river, and it is estimated that 0.8 million ha could be restored.[82] The total restoration potential, including for the Danube main tributaries, Drava, Sava and Tisza, reaches 1.4 million ha.[83] The restoration costs are estimated at an average of €5,000 /ha and the benefits at an average of €500 /ha and year for provision of ecosystem services for fisheries, forestry, animal fodder, nutrient retention and recreation, leading to a payback period of 10-20 years.[84]

Figure 5: Overview of surveyed Danube reaches and tributaries



Source: WWF (2010) Assessment of the restoration potential along the Danube and main tributaries

[82] WWF (2010) Assessment of the restoration potential along the Danube and main tributaries. Active floodplain means "Floodplain area between current flood defenses (dikes) often designed for the 100 year flood return interval; it includes usually all water bodies, but for very large rivers such as the Danube the main channel surface will be calculated separately." (WWF, 2010, p.4

[83] ibid

[84] IEEP et al (2010) Green Infrastructure In-Depth Case Analysis Theme 4: Freshwater And Wetlands Management And Restoration

France has a wetland restoration potential of around 1.5 million ha.[85] The Grenelle II Law from 2010 establishes a multiannual programme for the restoration of the ecological continuity of rivers (infrastructure works) and foresees the purchase and public management of some 20,000 ha of wetland by end of 2015. The impact assessment provided for the latter estimates the investment costs (land purchase) at between €3,000 and €7,000 per ha and management costs of €251 to €521 per ha. The annual benefits are estimated at €1,950 /ha for avoided costs of drinking water treatment, €400 / ha for fishing and hunting revenues and between €150 and €490 per ha for flood protection.
The total annual benefits add up to €2,500 and €2,850 per ha leading, with a net benefit between €1,979/ha and €2,589 /ha. This means that the investment costs would be recouped within 1-3 years.[86]

3.2.3 *Potential building blocks for illustrating the costs of non-Europe*

The definition of what *non-EU* means in this case has to be carefully developed considering the following elements:

- Better enforcement and implementation of WFD and Floods Directive by providing:
  - Management tools in order to better define obsolete infrastructure, which has outlived its original purpose and/or where maintenance costs outweigh benefits;
  - Governance principles for successful restoration projects; and
  - Prioritisation and financing tools, including for the use of EU structural and agriculture funds.
- Better integration of ecosystem service considerations in EU agriculture and cohesion policies.

The examples from Belgium, the Danube River Basin and France discussed in the previous section show that flood plain restoration potentials are huge and deliver a broad range of positive impacts, such as flood protection, clean drinking water provision and recreation, with economic benefits estimated to be higher than the economic costs. However the upfront costs are usually high and payback periods can reach up to 20 years. The costs range from €5,000/ha to over €100,000 /ha depending on the price of land and whether major infrastructure works are required, i.e. dyke set back.

The annual benefits also vary, from €500/ha to above €10,000 /ha. The most pronounced benefits are from reduced flood damage and drinking water treatment. Other ecosystem service provisions, including food and biomass production and recreational activities, are more difficult to quantify.

The estimates of flood plain restoration potentials in France (1.5 million ha around 2% of the country's surface) and the Danube river basin (1.4 million ha also around 2% of the basin surface) could be used to extrapolate the costs and benefits. The following assumptions are made for such an extrapolation:

- The average potentials in the Danube River Basin and France of 2% of surface would be representative for the EU; and
- The average costs and benefits from the three examples in Belgium, France and the Danube river basin would be representative for the EU.

[85] IEEP et al. (2010) Green Infrastructure In-Depth Case Analysis Theme 4: Freshwater And Wetlands Management And Restoration
[86] IEEP et al. (2010) Green Infrastructure In-Depth Case Analysis Theme 4: Freshwater And Wetlands Management And Restoration and own calculations

The results for the EU are:

- ⇨ Realising a restoration potential of 8.8 million ha of floodplains;
- ⇨ Requires investments of €24.1 billion per year from 2015-2030 resulting in a total cost for this period of €361.8 billion mainly for land purchase and infrastructure works; and
- ⇨ Delivers annual benefits of €39.3 billion in 2030 or total benefits of €295.0 billion for the period 2015-2030 mainly due to reduced flood damages, public water supply costs and increased tourism and recreation activities.

3.2.4 Synthesis of findings

NWRMs such as flood restoration have large potential for achieving the WFD objectives. The estimated numbers for the associated costs and benefits presented above are based on a simple extrapolation. They indicate that the restoration potential is huge and could help to significantly close the gap to reach the WFD objectives, though further research would be required to quantify that. The actions are marked by high upfront investment costs and payback times can be over 10 years.

Costs and benefits are unevenly distributed, for example in the case of flood protection and tourism where often public investment would lead to benefits for a selected group of individuals, which can pose a feasibility challenge.

3.3 Case Study for Reuse of wastewater

This section presents the reuse of wastewater case study. It identifies the current problems and policy context pertaining to the reuse of wastewater, establishes the magnitude of the identified problems, and consequently assesses proposed avenues for improvement and the advantages of addressing the issue at the European level.

The area 'reuse of wastewater' as described in the ToR, refers to the impact of possible future harmonised rules, taking into account technological advances, on the efficient reuse of treated wastewater and greywater[87] for irrigation, industrial purposes and/or in households, for improving resource efficiency and water quality, as well as to mitigate water stress. Therefore, this area relates primarily to water quality and treatment issues, water stress levels, as well as related sectors such as eco-efficient industries and the employment this could create via the need for water technology innovation and water infrastructure.

3.3.1 The problem and the policy context

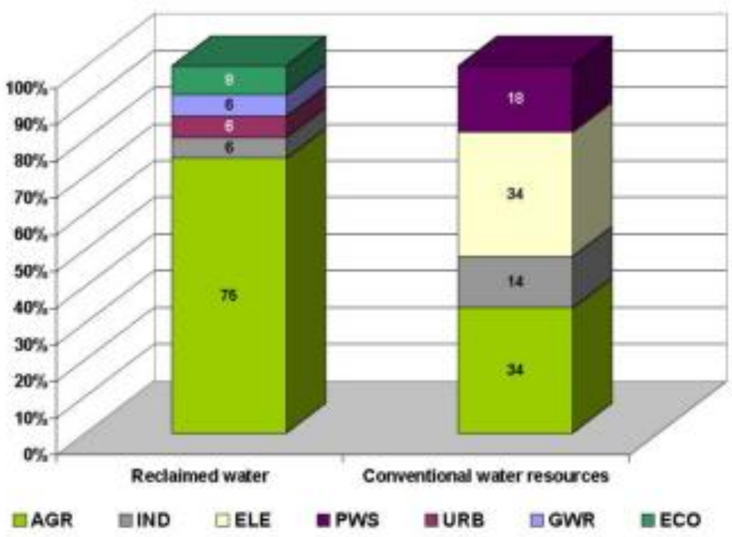
Pressure on freshwater sources is increasing around the world including in Europe. Climate change, water scarcity and population growth and human activities all exert pressure on European water resources. Almost all Mediterranean countries regularly experience an imbalance between water demand and water supply and other European regions also experience irregular periods of drought. Periods of water shortage are becoming more frequent and longer – e.g. France, Bulgaria, Malta, Belgium, and the UK have suffered successive droughts over the last twenty years.[88] One way of

[87] 'Grey' water is generally defined as water that has been used in households, excluding water from toilets, i.e. water from sinks, showers and baths.

[88] TYPSA (2013) Updated Report On Wastewater Reuse In The European Union.

reducing fresh water demand is to increase the reuse of grey and wastewater. This water can replace freshwater consumption in a number of applications such as irrigation in agriculture, industrial processes, non-potable urban applications (e.g. fire protection, toilet flushing), groundwater recharge and some recreational purposes. As can be seen in Figure 6, electricity generation, for example, currently does not make use of re-used water. Agriculture currently sources about two-thirds of its water needs from reclaimed water, yet this sector is still – together with electricity generation – the largest consumer of conventional water resources.

Figure 6: Water use and reuse of European countries by application



Legend: AGR: agricultural irrigation, GWR: groundwater recharge, IND: industrial use, ELE: electricity generation, PWS: public water supply, ECO: ecological/environmental enhancement, URB: urban and domestic uses

Source: TYPSIA (2012). Service contract for the support to the follow-up of the Communication on Water scarcity and Droughts: WASTEWATER REUSE IN THE EUROPEAN UNION

The following table (Table 3) presents a summary of water reclaim and use, by sector and Member State (MS). This overview demonstrates that in those Member States where water reuse is practiced there are country-specific standards in place. In the majority of the EU countries, water is reused in the industrial sector. Water reuse in agriculture and for municipal purposes also occurs in some of them. Most Member States have, or are considering, plans for the future implementation of water reuse.

Table 3: Water reuse by sector and MS (EU27), including relevant national regulations/guidelines

MS	Agri-culture	Munici-pal	Potable Unplanned Indirect Reuse	Ground-water recharge	Industry	Environ-ment	Future plan	Desalina-tion	Regulations/ Guidelines
AU					X				No
BE	X		X	X	X		X		Under Prep.
BG					X		X		Under prep.
CY	X	X		X	X	X	X	X	Yes
CZ									No
DK					X		X		No
EE					X		X		No
FI					X				No
FR	X	X	X	X	X		X	X	Yes
DE	X	X	X	X	X	X	X	X	Under prep.
EL	X				X		X	X	Yes

HU							X		Yes
IT	X	X		X	X		X	X	Yes
IE							X		No
LV							X		No
LT							X		No
LU					X		X		No
MT	X	X			X		X	X	Under prep.
NL		X			X	X	X	X	No
PL							X		Under prep.
PT	X	X	X	X	X	X	X	X	Yes
RO									No
SK									No
SI							X		No
ES	X	X		X	X	X	X	X	Yes
SE	X			X	X		X		No
UK		X	X	X	X	X	X	X	Under prep.

Source: TYPSA (2013) Updated Report On Wastewater Reuse In The European Union, p.7

The reuse of water is covered (directly or indirectly) by the WFD and the UWWTD and it is also part of the WS&D policy recommendations put forward by the EC:[89]

a) The UWDTD requires that "treated wastewater shall be reused whenever appropriate" under the requirement of "minimising the adverse effect on the environment" in light of the objective of its first article which is defined as the protection of the environment from the adverse effects of wastewater discharges.
b) The WFD refers, under Annex VI (v) to "emission controls" and under Annex VI (x) to "efficiency and reuse measures, inter alia, promotion of water efficient technologies in industry and water saving techniques for irrigation", as two non-exclusive list, supplementary measures.

Reclaimed water is also covered by other EU legislation with the coverage dependent upon the final use. For example, irrigation and "green agriculture" in general fall under the scope of the Common Agricultural Policy (CAP) (see textbox in section 3.5), while the quality standards for potable water are set by the DWD.

In terms of identified obstacles to water reuse, these include:

- a lack of international standards;
- scattered references to different issues of water reuse across various EU and national level regulations across multiple sectors;
- some national standards are criticised for being too stringent and hence creating barriers to an expansion in water reuse[90];
- need for synchronisation on standards related to health risks[91];
- new quality standards between water reuse and the DWD and food safety legislation in cases where recycled water is to be used directly or indirectly for consumption[92]; and
- insufficient awareness and training on this issue amongst the key stakeholders (incl. farmers and the general public).[93]

[89]TYPSA (2012). Service contract for the support to the follow-up of the Communication on Water scarcity and Droughts: WASTEWATER REUSE IN THE EUROPEAN UNION

[90]EurEau (2009) EurEau position on water reuse for irrigation as a water scarcity solution

[91]EurEau (2011) EurEau Position Paper Water re-use and other alternative resources at home: rainwater harvesting and greywater recycling for domestic purposes

[92]EurEau (2011) EurEau Position Paper Water re-use and other alternative resources at home: rainwater harvesting and greywater recycling for domestic purposes

[93]See EEA (2012) European waters — current status and future challenges Synthesis

3.3.2 *Potential and effects of EU coordination*

The use of treated wastewater should be regarded as a way of increasing water availability (by reusing already abstracted, treated and delivered water rather than using freshly abstracted, treated and delivered water) and can therefore contribute to improving the quantitative element of good ecological status for some water bodies. Hence, it is being considered as an option in the RBMPs (as part of the PoMs) to be established as part of implementing the WFD. In addition, reusing waste water helps reduce water pollution.[94] It can lead to nutrient recycling e.g. when reusing urban waste water for irrigation in agriculture, it can reduce the need for fertilisers. The cost-effectiveness of waste water reuse depends on the amount of pollutants which need to be removed, which creates incentives to reduce pollution at source. Nevertheless, in the case of waste water reuse for irrigation in agriculture, this does not reduce water consumption. Waste water, which would have been returned to the environment, is instead 'consumed' by agriculture and is thus missing downstream. On the other hand other abstractions will be replaced, leading to a net zero effect on the hydrological cycle at best if irrigation agriculture does not increase due to waste water re-use. Therefore experts recommend the establishment of a water saving hierarchy (for example similar to the waste hierarchy - reduce, re-use, desalinate, transfer) to ensure that measures which actually reduce water consumption are given high priority.[95]

In the relevant paragraphs of the WFD (Annex VI (v)) there is no explicit requirement to use a specific type of water, for a specific purpose; the only requirement concerns the achievement of quality standards defined in the directives – so wastewater and/or greywater could be used. In addition to this overarching European framework, however, there are a number of EU water-related directives already requiring specific standards for specific water uses, which are listed in the following table along with their respective reuse applications.

Table 4: EU water-related directives requiring specific standards for specific water uses, along with the different reuse applications

Wastewater reuse	Major concern	Related EU Directive							
		A	B	C*	D	E	F*	G*	H*
Agricultural irrigation	Pollution of soil, groundwater and produce with chemical/bio-hazardous substances	X	X	X	X				
	Health risk for workers and consumers								
Groundwater recharge	Health concerns if potable reuse is intended		X	X	X				
Urban applications	Health concerns regarding exposed persons								
Indirect potable reuse	Health concerns			X	X		X		
Recreational water use	Health concerns, infection risks for exposed persons					X			
Environmental enhancement	Detrimental effects on the biocenosis						X	X	
Aquaculture	Contamination of water and produce with chemical/bio-hazardous substances							X	X

Legend: A = Sewage Sludge Directive; B = Nitrate Directive; C = Groundwater Directive; D = Drinking Water Directive; E = Bathing Water Directive; F = Surface Water Directive; G = Freshwater Directive; H = Shellfish Water Directive (C, F, G, H to be repealed under WFD latest by 2013)

[94]Interview with Peter Pollard (15/9/14)

[95]Interviews with EEB (5/6/14), Ecologistas en Accion(9/9/14) in writing and Pierre Strosser(25/9/14)

Proposals for improved guidance or regulation on the reuse of wastewater

The European Commission suggested developing EU standards for water reuse – the Blueprint considered different policy options such as development of standards by the European Committee for Standardisation or the adoption of an EU regulation establishing water reuse standards.[96] EurEau suggested an EU guidance framework in order to better manage risks by describing best practice for irrigation with reclaimed water and further research and development of site-specific recommendations for the reuse of greywater and harvested rainwater for domestic purposes. In the latter case the organisation called for a detailed assessment (economic, environmental, health etc.) of the options for adapting the existing water systems to a re-use cycle and for other measures, specifically relating to urban conditions where a water system is already in place. EurEau also see potential in the reuse of sludge from wastewater treatment in agriculture as an option for soil fertilization and as such have called for an update of the Sewage Sludge Directive. The European Water Platform (WssTP) have also called for further examination of the potential to use reclaimed water for urban purposes such as park irrigation, street washing, fire-fighting etc..

There are standards regarding water reuse elsewhere in the world, for example the World Health Organisation (WHO) guidelines, California Recycled Water Regulations and Guidance and the Australian Regulations and Guidelines. The majority of these relate to quality standards for water reuse in agriculture and for non-potable use. The current legislative framework does not set binding requirements for water reuse in the EU. The Blueprint and a number of stakeholders have called for the establishment of common standards by the EC.

Some Member States have legislation in place which deals with water reuse in different sectors. The experience of different EU countries could be used for the establishment of EU standards. For example, the French regulations for irrigation with reclaimed water use the WHO Guidelines but also add restrictions for some techniques and distances between irrigation sites and residential areas and roadways. Some other Member States are already considering adopting the same guidelines. There is generally less experience with setting financial incentives for water reuse – some German regions provide subsidies for rainwater capture and reuse, while the UK and France offer tax reductions to incentivise industry to reuse water.

3.3.3 Potential building blocks for illustrating the costs of non-Europe

Increased reuse of wastewater can help reduce the costs caused by water scarcity. The EU Water Scarcity and Drought working group estimated that the overall economic impact of drought events in the last 30 years at the EU level was around €100 billion. Results show that the annual average impact has doubled between 1976-1990 and 1991-2006. It reached an average of €6.2 billion per year in the last few years, with an exceptional cost of €8.7 billion in 2003. If the EU had achieved a 20% treated wastewater reuse target for irrigation to reduce water scarcity in Europe, this could have reduced the economic impact of drought in the EU by €20 billion in the last 30 years.[97]

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[96] EC [SWD(2012) 382 final] IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 1, p.39

[97] TYPSA (2012). Service contract for the support to the follow-up of the Communication on Water scarcity and Droughts: WASTEWATER REUSE IN THE EUROPEAN UNION. Please note that these estimations only cover economic costs and do not include social and environmental costs due to a lack of data.

Increasing waste water reuse could deliver the following potential benefits:[98]

- Reduced demand for treated fresh water – with consequent energy savings (because the water does not need to be treated or pumped[99]) and reduced need for abstraction;
- Reduced cost of water supply - for consumers with a metered supply;
- Reduced drainage / public treatment costs and flows - where the water being reused is kept out of the public drainage / sewerage system; and
- Reduced pollution / nutrient recycling.

Potential additional costs involved in water reuse activities include:

- The energy and resources needed to treat the recovered water – which vary according to the required end use; and
- The need to dispose of any contaminants removed from the recovered water.

Large variation in cost-effectiveness of reused wastewater per application area

Reused wastewater exhibits large variations in cost-effectiveness depending on the sector, as well as the necessary collection and treatment technologies. Furthermore, the value of wastewater reuse may depend on water availability at a given time and place.

The economic value of treated wastewater in a sectoral application can be assessed by the corresponding conventional water price or the added value generated by the specific sector. The economic analysis (according to WFD, Article 5) should regard water as a production factor such as material, work, energy, etc. and hence be able to put a figure to the value of (reclaimed) water. For example, a report by Global Water Intelligence (GWI)[100] states that water used in certain industries generates 70 times more value than one cubic metre of water used in agriculture.

Life Cycle Cost analysis is a useful way to evaluate the conditions under which treated wastewater reuse can be cost effective and in comparing cost performances of different collection and treatment technologies and investment strategies. The cost estimates include the cost of a product over its entire lifespan, including capital costs, annual operation and maintenance costs. Total treated wastewater life cycle cost is converted into €/m^3 for comparative purposes. Treated wastewater system costs are a function of facility capacity, end-use application and water quality requirements for each reuse alternative. A range of costs estimated by Asano (1998) are presented in table 5 below.

[98]European Water Association (2007)Water Reuse in Europe http://www.ewa-online.eu/tl_files/_media/content/documents_pdf/Publications/E-WAter/documents/21_2007_07.pdf

[99] For example 5.8% of total electricity consumption in Spain is for water use - Hardy, L., Garrido, A. & Juana, L. (2012) Evaluation of Spain's Water-Energy, Nexus. International Journal of Water Resources Development. 28: 151-170

[100]Global Water Intelligence. Desalination Markets 2007. P15. www.globalwaterintel.com

Table 5: Range of life cycle costs for treated wastewater reuse, per different collection and treatment technologies

Reuse alternative	Recommended treatment process	Annual costs (€/m³)a, b
Agriculture	Activated sludge[8]	0.16-0.44
Livestock	Trickling filter	0.17-0.46
Industry and power generation	Rotating biological contactors	0.25-0.47
Urban irrigation – landscape	Activated sludge, filtration of secondary effluent	0.19-0.59
Groundwater recharge – spreading basins	Infiltration – percolation	0.07-0.17
Groundwater recharge – injection wells	Activated sludge, filtration of secondary effluent, carbon adsorption, reverse osmosis of advanced wastewater treatment effluent	0.76-2.12

Source: costs estimated by Asano (1998) where (a): Costs are estimated for facility capacities ranging from 4,000 to 40,000 m3/d. Lower cost figures within each treatment process category represent cost for a 40,000 m3/d reclamation plant while the upper cost limit is presented for a 4,000 m3/d facility, (b): Annual costs include amortized capital costs based on a facility life of20 years and a return rate of 7 %.

While some rough estimates can thus be given for the cost-effectiveness levels of water reuse per sectoral application, these have not yet been actively linked back to potential policy adjustments in terms of setting up more relevant EU or national level guidance or regulation.

3.3.4 Synthesis of findings

This case study has demonstrated potential avenues for improving standards and cost-effectiveness of wastewater reuse in Europe. In particular, increased reuse can play a role in reaching the WFD and other related objectives by reducing the negative impacts of droughts and water scarcity, increasing minimum flows and reducing abstraction. In the broader picture, this approach only addresses a very specific and small part of the quantitative issues and potential future health impacts identified during this study. Therefore, on its own, this approach may not have sufficient impact to close much of the current gap between existing water policies and successful implementation levels. We would recommended placing this approach within the larger context of the water efficiency and savings hierarchy (reduce, re-use, desalinate, transfer) in order to increase impact and better connect to other EU priorities beyond the water field.

Based on our analysis and expert interviews[101], it can be concluded that there is no clear case for regulation to promote waste water reuse at EU level while common standards for safe use and a hierarchy of water saving approaches would deliver added value. National policy and regulatory revisions should play a more important role because in many cases water reuse primarily helps solve problems in specific regions of the EU, rather than significantly contributing to sustainable water management in broader terms.

[101] Interviews with EurEau (9/914); EEB (5/9/14), Peter Pollard (15/9/14) and Pierre Strosser (25/9/14)

3.4 Case study for Eco-design and water metering

> This section presents the case study for Eco-design and water metering. EU-level eco-design and metering policy can help address a significant part of the quantitative issues identified in Phase I of this study. In addition it provides an important link to EU energy policy with significant environmental and economic impacts. Effectiveness of eco-design and water metering policies and regulations will be linked to economic instruments (discussed in Section 3.5).

3.4.1 The problem and the policy context

Various human activities impose pressures on water resources in Europe while at the same time an increasing number of EU countries face longer lasting and more frequent droughts. Water reclamation and more efficient water use are both options to safeguard water resources.[102]

In July 2009 the European Commission finalised an assessment[103] demonstrating that the introduction of mandatory requirements on water using devices under the extended Eco-design Directive could induce significant savings. If the policy scope was expanded to cover all domestic water using products, a 19.6% reduction in EU total public supply might be achieved (around 10% if only energy-related products were included without considering dishwashers and washing machines). This would correspond to a 3.2% reduction in the total annual EU abstraction.

Eco-design for water-efficient products

Following on from these 2009 findings, the European Ecodesign Directive[104] and its daughter regulations are the most relevant existing legislation regarding efficient water use. Even though this legislation primarily focuses on energy use, there is one example where the minimum requirements were extended to water use: the Washing Machines Regulations[105], where maximum water consumption is defined.[106] The effect of this regulation is therefore not only a reduction in CO_2 emissions and energy savings but also expected savings in water consumption: compared to a business-as-usual scenario, the inclusion of the maximum water consumption definition in the Ecodesign Directive for washing machines is expected to result in annual savings of 83 million m^3 (equal to saving one day of total urban water use in the EU).[107] Similarly, the Dishwasher Regulation, while not placing stringent minimum requirements with regard to water consumption, has defined Best Available Technology (BAT).

Reported problems with the implementation of the Directive and its implementing regulations include poor market surveillance for most Member States.[108] Progress with the implementation of the Washing Machines regulation is unknown as this is a relatively new piece of legislation (having been introduced in 2010).

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[102] EC [COM(2010)228 final] Second Follow-up Report to the Communication on water scarcity and droughts in the European Union COM (2007) 414 final. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0228:FIN:EN:PDF

[103] BioIS & Cranfield University(July 2009) Study on water efficiency standards

[104] DIRECTIVE (2009/125/EC) establishing a framework for the setting of ecodesign requirements for energy-related products

[105] REGULATION ((EU) No 1015/2010) implementing Directive 2009/125/EC with regard to ecodesign requirements for household washing machines

[106] EC (2010) SWD SUMMARY OF THE IMPACT ASSESSMENT Accompanying document to the Draft Commission Regulation (...) with regard to ecodesign requirements for household washing machines

[107] CSES & Oxford Research (2012) Evaluation of the Ecodesign Directive (2009/125/EC) Final Report

[108] European Council for Energy Efficient Economy (ECEEE) webpage: http://www.eceee.org/ecodesign/Horizontal-matters/eceee-pages-on-ecodesign-and-labelling-market-surveillance/MSreport

The Eco-design Directive is currently in its 2nd Working Plan for the period 2012-2014, which identified water-related products (e.g. showers and taps) as products to be considered between 2012 and 2014 for adoption of implementing measures. Water taps and shower heads were given the top ranking amongst twelve product groups in the work plan, with a potential annual energy saving of 885 PJ by 2030[109] based on reduced heat demand linked to an annual water savings potential of 3,700 million m^3 [110] (equal to saving one month and four days of total urban water use in the EU). Nevertheless, progress has been limited, with only one product group, windows, being advanced by preparatory studies. The work on taps and showerheads has barely begun. Popular opposition to the EU regulating those products in some Member States has been named as one of the reasons for the delay.[111]

In addition to the producer-driven approach of regulating maximum water consumption of relevant products, more efficient water use can be encouraged on the consumer-side via water metering. Over the past 10 years there has been a marked increase in the amount of information provided to consumers (e.g. water-efficiency labels for households' appliances, information on efficient lawn watering and gardening practices, etc.) as well as for agriculture. Many countries, NGOs, large municipalities, water companies and international organisations have dedicated home pages to water conservation and water use behaviour.

Higher water prices encourage water savings

There has been a general trend towards higher water prices in real terms throughout Europe over the past 20 years. Wide variations in water charges exist both within individual countries and between EU Member States. This is due to the wide range of factors that determine local water prices and the level of recovery costs. For example, in several countries, increased water prices decreased household water use significantly (see figure (a) below). In many central and eastern European countries, water prices were heavily subsidised until 1990. After 1990, there was a marked increase in prices in these countries during their transition to market-economies, resulting in lower water use. In Estonia, for example, water prices increased markedly after subsidies were removed, which in conjunction with water measuring and application of more advanced sanitation devices, has led to a reduction of more than 50 % in water use over the past 15 years (see figure below).[112]

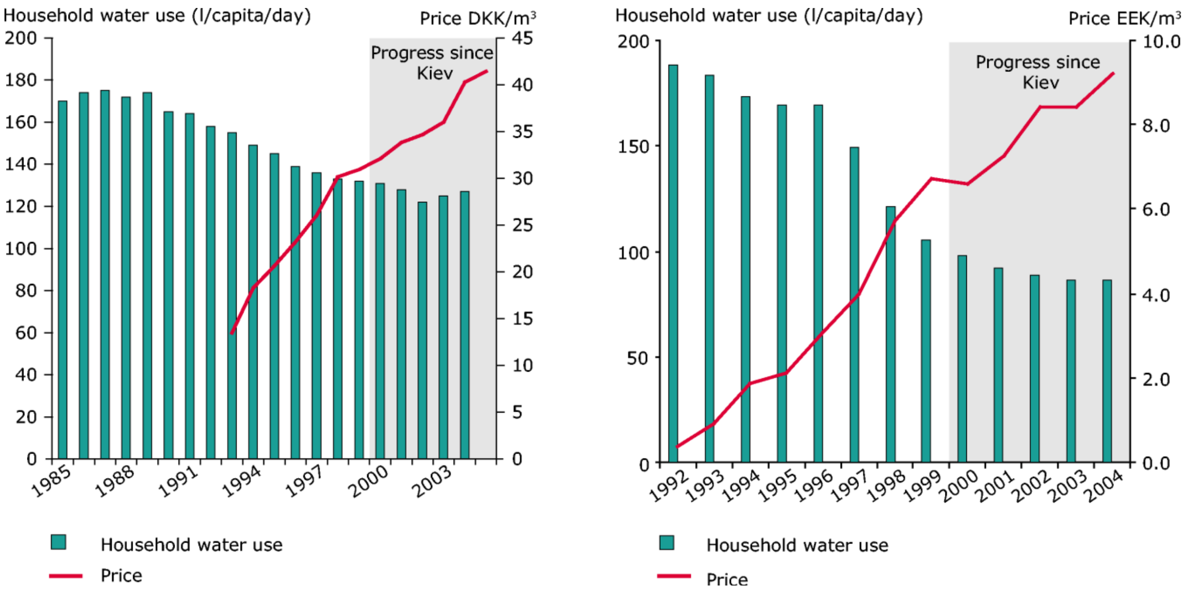
[109] VHK (2011 Final Report Task 1-4 Study on Amended Working Plan under the Ecodesign Directive (remaining energy-using products and new energy-related products)

[110] Own calculation based on VHK 2011

[111] Interview with EEB (5/9/14)

[112] EEA. Policies and measures to promote sustainable water use.http://www.eea.europa.eu/themes/water/water-resources/policies-and-measures-to-promote-sustainable-water-use

Figure 7: Effect of water price on household use in Denmark 1985-2004 and Estonia 1992-2004



Source: (a) DEPA (2004) updated by EEA and (b) Estonian Environment Information Centre (2006)

Measuring water use is a prerequisite for usage-based water pricing

Measuring water use is a prerequisite for water prices reducing consumption. Households with water meters installed generally use less water than households without meters. In Europe, household and industrial water metering continues to increase. Many North-Western European countries already meter the majority of water uses. However, in some other countries, and in particular in relation to agricultural water use, metering is still limited.

3.4.2 Potential impacts and role of EU coordination

This section provides information on existing estimates regarding the costs and benefits of eco-design and water metering and the role and impact of existing and/or further EU-level coordination.

Eco-design for water-efficient products

The dishwasher and washing machine regulations outlined above are estimated to generate combined savings due to decreased water consumption in the range of €444-544 million per year.[113] This clearly demonstrates the large potential for increased EU coordination.

Nevertheless the scope of EU Eco-design is limited to energy-related products, which allows only a few water using products to be covered, like water taps and showerheads, which are directly related to significant energy consumption. More important water using devices, like toilets or irrigation equipment, are rather weakly linked to energy consumption and it would currently be difficult to cover those via implementing measures under the Eco-Design Directive. This means that there is ample room for EU action towards setting water efficiency standards for these devices, which should result in further significant water savings. As a first step minimum performance requirements for water taps and showerheads could be established, without having to adjust the Eco-design Directive. The energy, water and consumer bill savings potentials are significant. The associated water saving potential is

[113] Calculated using the water saving reported in the two IAs report. For dishwashers - 56 to 64 million m3 and for washing machines 64 to 83 million m3 water per year saved in 2020. Both IAs use an average water price of €3.7/m3, yielding annual savings of €207-237 million for the dishwasher regulation and €237-307 million for the washing machines regulation.

estimated at 3.7 billion m^3 per year by 2030, which is about 20-30 times higher than the savings from dishwashers and washing machines and would mean a reduction of urban water consumption by around 10% for the EU as a whole. This would have a significant positive impact in improving the quantitative status of water bodies and reducing the need for water infrastructure, like dams, reservoirs and transfers, leading to morphology improvements. In addition, energy savings of 885 PJ per year may be expected due to reduced consumption of hot water, which would amount to a reduction of the EU's energy consumption by 2%. The multiple benefits of energy savings include water savings, which are estimated at 1,155 million m^3 per year by 2030[114], increased energy security (each 1% energy savings lead to 2.6% gas savings[115]) and reduced greenhouse gas emissions.

In general the main economic impact of eco-design is on the consumers, who might face higher purchase costs but lower usage-related costs. In the case of showerheads and water taps, the payback time for products, which enable 10-20% savings, is estimated to be less than 1 year.[116] The impacts of eco-design measures on industry are limited and mostly positive. A study[117]conducted a survey in order to find out whether and to what extent ecodesign impacts companies' profitability. Although not targeted specifically at the EU Ecodesign Directive, this study presents interesting results. 96% of the surveyed companies (most of which in the manufacturing sector) reported that ecodesign had either positive or neutral effects on their profitability. They also reported other benefits associated with ecodesign such as improved recognition and reputation (more than 80% of the responding companies from the EU reported this is a benefit), greater employee motivation, better customer relations and greater capacity to develop new products.

Water metering

The text box below provides cost and benefit figures from various studies that have been conducted in the UK. This research sheds light on the large water savings potential that can clearly outweigh the additional costs involved in the installation, maintenance and usage of water meters.

Box 1 Research on costs and benefits of water metering in the UK

The 2009 'Walker Report'[118] and other studies[119] from the UK considered the costs and benefits of water metering in the UK. The UK has an interesting combination of metered and non-metered supplies. Meter installation is compulsory for new housing but consumers are broadly free to choose between a billing system based on property size or metered use. Overall their results support the conclusion that faster rates of metering penetration (90% household meter penetration by 2030) could be 'significantly beneficial for customers and the environment', especially in areas where it is expensive to supply water. Metering clearly led to demand savings; these savings persisted over time.

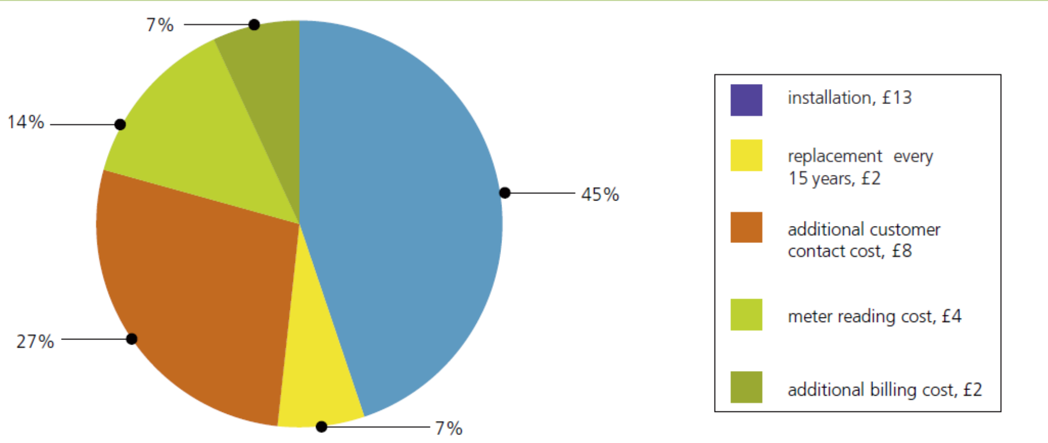
[114] Own calculation, based in World Energy Outlook 20102, water energy nexus
[115] EC (2014) accompanying Impact assessment to Communication on Energy Efficiency COM(2014)520 final
[116] VHK (2011) Final Report Task 1-4 Study on Amended Working Plan under the Ecodesign Directive (remaining energy-using products and new energy-related products)
[117] Pôle Éco-conception et Management du Cycle de Vie & Institut de développement de produits (2014) Profitability of Ecodesign: an Economic Analysis, Highlights from http://cloud.snappages.com/b0d6d10923becba07c0287d0b0af8fd47ed8a57d/Profitability%20of%20ecodesign_highlights_1.pdf
[118] The independent review of charging for household water and sewerage services: Final report', UK Department for Environment, Food and Rural Affairs, December 2009 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69459/walker-review-final-report.pdf
[119] Ofwat (2011) Exploring the costs and benefits of faster, more systematic water metering in England and Wales from http://www.ofwat.gov.uk/future/customers/metering/pap_tec201110metering.pdf.
Herrington, P (2006). 'Critical review of relevant research concerning the effects of charging and collection methods on water demand, different customer groups and debt'.05/CU/02/1. UKWIR

Water metering has demonstrated advantages in encouraging water savings, it helps identify leaks in the supply pipeline, it can help in the development of more sophisticated tariffs and, more generally, it provides more information to customers and suppliers on water usage.

Quantified benefits can be summarised as follows: average total water saving via water metering amounts to around 25 litres per person per day (22 cubic meters per household a year). On a UK level this translates into substantial water savings of around 16% of average household demand. More specifically, the studies found a reduced consumption of on average 15 litres per person per day (13 cubic meters per household a year). In addition, they noted a reduction in customer supply pipe leakages averaging ca. 10 litres per person per day (9 cubic meters per household a year).

Water metering implies additional costs to the water industry. These costs mainly include: installing the meter (financing of the installation costs), costs of replacing the meter when it wears out, costs related to meter reading, and the costs of additional customer billing and services related to water metering.
Though much variation exists in the attempts to quantify costs, on average the additional costs of water metering amount to about £30 per household per year (see figure 8 below for an illustrative cost breakdown).

Figure 8: Composition of typical effects on bills for household measured charging based on installation of a simple meter



Source: 'Walker Report' (2009)

Potential impacts of future binding water metering across all sectors and users in the European Union should be assessed in terms of their water savings potential and corresponding cost-benefit ratio.

Smart metering, where the meter has a remote data connection to the supplier and the customer can also receive live information on consumption, is expanding in electricity and gas supply across Europe and elsewhere. There are some initial trials on this occurring for water metering, for example in the UK.[120] The main benefit in water is that it should help water companies identify, and hence tackle and recue leakage. For consumers it could indicate if their consumption becomes excessive, for example due to a leak on their side of the meter, and enable them to address this issue and avoid large water bills. An Australian review[121] of the benefits of smart metering for water identified some benefits (as

[120] http://www.thameswater.co.uk/media/press-releases/17391.htm
[121] http://www.swan-forum.com/uploads/5/7/4/3/5743901/smart_metering_cost_benefit.pdf

described above, but found that there was a lack of data to carry out a detailed cost benefit analysis. It is hoped that the current trials will help address this lack of data.

3.4.3 Potential building blocks for illustrating the costs of non-Europe

As demonstrated by the Eco-design policy, the EU's internal market instruments offer significant additional potential to increase the efficiency of water using products and reduce fresh water abstractions for public water supply, which can help improve the quantitative status of many bodies of water and to reach the WFD objectives. It also provides a case for positive reinforcement of energy and water policies, which can help to reduce conflicts on those sectors.

As discussed above, the savings potential of shower heads and water taps is estimated to reach an annual 3.7 billion m^3 and 885 PJ primary energy (equivalent to 98 TWh final energy) by 2030.

What are the financial benefits?

Assuming a constant average water price in the EU of €3.7 /m^3, the savings on water bills would reach €13.6 billion per year in 2030. The energy savings, assuming today's average price of €0.2 /kWh, would result in energy bill reductions of €19.6 billion per year.

- ⇨ Annual savings of €2.2 billion for each €1.0 billion invested to replace old shower heads and water taps with more efficient ones, and
- ⇨ Total savings 2015-2030 of €248.9 billion.

What are the financial costs?

The savings potential has been calculated assuming normal replacement rates of shower heads and water taps, average product lifetime and assuming an average additional cost of €9.3 /unit for the higher performing products.

- ⇨ Annual investment costs of €1.0 billion in 2015 which reaches €3.0 billion in 2025, and
- ⇨ Total investment costs of €16.9 billion for the period 2015-2030 for replacing all old shower heads and water taps with more efficient ones.

When assessing the potential costs of Non-Europe with respect to water metering, the following rough estimations can be made. Using the water savings and cost data available for the UK as presented in Box 1 some rough estimations on the overall benefits and costs of water metering can be made.

What are the financial benefits?

Assuming a constant average water price in the EU of €3.7/m^3 and water savings of 22m^3 per household per year the estimated annual cost savings per household are €81.4. The total number of households in the EU28 reported for 2013 by Eurostat[122] is 213 839.2 thousand. The exact number of households which already have a water meter installed is not available but assuming that only one-third[123] of the total get water meters the potential in the EU28 is:

- ⇨ Annual savings of over €0.4 billion from investing €0.2 billion to install water meters, and
- ⇨ Total savings of around €43.5 billion for the period 2015-2030 if one third of EU households had water meters installed.

[122] Eurostat (2014) Number of private households by household composition, number of children and age of youngest child (1 000), last updated on 29.04.2014 and available at http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

[123] This is a rather conservative estimate. Based on most expert judgment it is likely that over 50% of households are equipped with a water meter across the EU-28.

What are the financial costs?

Assuming the additional costs of water metering are £30 or around €35.3[124] per household per year, this implies the costs of water metering add up to around 50% of the potential annual savings. Applying the assumption that only one third of the households in the EU install water meters the EU28 costs are:

- ⇨ New annual costs of €0.2 billion to install water meters in one third of EU households between 2015 and 20130, and
- ⇨ Total costs for the period 2015-2030 of €18.9 billion.

Such illustrative projections have to be treated with care due to the system interactions and feedback loops. It is therefore difficult (without extensive additional work) to present accurate estimates of the net benefits. Public water supply, collection and treatment are synonymous with high capital costs and low operational costs. Adjustment to a new system with lower water demand and throughput could lead to even higher capital and lower operational costs. In the short run water unit prices could therefore increase and nullify large parts of the savings for households. In the long run, the lower operational cost would then further reduce water bills. This is similar to the energy system where several studies have identified that different transition paths lead to similar total system costs.[125] The differences among these systems can be measured in terms of their co-benefits, which in the case of a water supply system with lower demand, would be higher levels of water protection and ecosystem services, increased water security and resilience to climate and other changes.

Finally it has to be mentioned that public and political acceptance of regulating performance of water taps and shower heads appears to be important. Complex regulatory designs to address special products and uses and complementary measures to prepare the market will be required. In the case of water metering it is assumed that the number of households in the EU will remain stable until 2030. Furthermore, payback time is assumed to be relatively short, 1 year, but this is dependent on the type and cost of the metering device.[126]

3.4.4 Synthesis of findings

Both eco-design measures with regard to water efficiency and water metering have great potential to generate savings from reduced water use, primarily for households. The associated costs of these measures are considerably lower than the potential benefits. Nevertheless, estimations for the entire EU need to be made with caution.

[124] Estimated using the average ECB exchange rate for 2013 –0.85 £/€. Annual ECB exchange rates available at http://sdw.ecb.europa.eu/quickview.do;jsessionid=41684658E2CEACB9DABC182145CD8E8F?SERIES_KEY=120.EXR.A.GBP.EUR.SP00.A

[125] E3Mlab (2014) Development and evaluation of long-term scenarios for a balanced European climate and energy policy until 2030.

[126] For example, EC [SWD(2012) 382 final](2012) IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.55 reports that the price of metering devices can vary between €35 and €350.

3.5 Case study for Economic instruments

> This section covers the case study for economic instruments. Firstly, the current problems and policy context related to the use of economic instruments are identified. Secondly, the magnitude of these issues and the potential for addressing them on an EU-level are presented.

3.5.1 The problem and the policy context

Water stress and water pollution still pose serious problems for the achievement of the Good Status objective of the WFD. At present, water pricing levels do not appear to be high enough to incentivise sustainable water use, although the use of economic instruments to reduce water use is raised in the WFD. Article 9 of the WFD asks MSs to take account of the principle of cost recovery from water services and hence to ensure appropriate water pricing schemes and contributions from all users to enable cost recovery, including the application of the polluter-pays-principle, by 2010. This aim is supported by the economic and impact analysis required under Article 5 by 2004.[127]

The EC's RBMPs report[128] and the Blueprint[129] state that the use of economic instruments is insufficient to achieve sustainable water use. The Blueprint reports that this is mainly due to subsidies in other policy areas such as bioenergy, agriculture, construction of dams etc., which may alter relative prices and thus lead to excessive consumption or pollution of the water bodies. Further impediments are posed by insufficient knowledge regarding the use of such economic instruments, lack of transparency in the calculation of costs and subsidies and lack of acceptance or historical allocation of water rights that prevents the introduction of such measures.[130] Some progress in improving the economic transparency of water management was noted for France but also for some German states, though this was not necessarily reported to the European Commission.[131]

The assessment of the submitted RBMPs shows that some of them already include modifications of the water pricing systems or measures to strengthen water metering in order to promote sustainable water use.[132] The EEA report that the current water pricing schemes ensure a generally high rate of cost recovery in the domestic sector but a lower level of cost recovery in agriculture.[133] The EEA also report that water service companies manage to cover their costs but have limited extra funds for renewal and replacements of existing infrastructure[134] while the level of leakages from the distribution systems remains a serious issue in the EU.[135]

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[127] EC (2003) Common Implementation Strategy for The Water Framework Directive (2000/60/EC) Guidance Document No 1: Economics and the Environment – The Implementation Challenge of the Water Framework Directive - guidance document on Article 5. EC (2004) Common Implementation Strategy Working Group 2B: Drafting Group ECO1 Information Sheet on Assessment of the Recovery of Costs for Water Services for the 2004 River Basin Characterisation Report (Art 9) – guidance document on Article 9

[128] EC [COM(2012) 670 final] Report (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans – pp.10-11

[129] EC [COM(2012) 673 final] A Blueprint to Safeguard Europe's Water Resources

[130] EC [SWD(2012) 382 final]]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources

[131] Interview with Pierre Strosser (25/9/14)

[132] EC [SWD(2012) 382 final]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources

[133] EEA (2013) Assessment of cost recovery through water pricing

[134] EEA (2013) Assessment of cost recovery through water pricing. EurEau (2014) Cost recovery in the WFD: WFD article 9, recovery of cost for water services.

[135] CEPS (2012) Which Economic Model For A Water-Efficient Europe?

The low level of economic instrument use (as defined in Article 9 of the WFD) has also been attributed to the lack of clear definitions or targets for the recovery of the costs, which impedes wider implementation, reporting and progress monitoring.[136] There is also some debate as to how much the "polluter pays principle" applies, for example, with regard to domestic consumers. In the case of large industrial and agricultural consumers this principle can be applied in a straightforward way –discharged water should meet the quality norms otherwise the user is fined. In the case of domestic users it is hard to link the exact user to the volume of polluted water that is discharged. Therefore, domestic users are charged by the "user pays principle".[137]

In light of these findings, the proposed policy options in the Blueprint focused on providing further guidelines on economic instruments (including some voluntary labelling of products based on water footprint and life-cycle impacts of products and water trading schemes[138]), better enforcement of existing legislation (primarily related to water quality standards) and including water efficiency conditions in the proposed Common Agricultural Policy (CAP) reform (see Box 2 below).

Box 2 The CAP and its reform[139]

The CAP has two pillars: pillar 1 relates to direct payments to farmers, while pillar 2 supports the development of rural areas through the Rural Development Programmes and the European Agricultural Fund for Rural Development (EAFRD). The proposed CAP reform included provisions for the inclusion of environmental indicators as conditions under the two pillars. In the context of the European water policy the Blueprint proposed the inclusion of conditionality regarding ecological focus areas under pillar 1, sustainable use of pesticides, reduction of illegal water abstraction and irrigation practices. In 2013 the European Council and Parliament agreed on the final reform and under the post-2013 CAP pillar 1 also includes "greening rules" for farmers (mainly larger farms). The "greening" component of the CAP requires:

- Crop diversification;
- Maintaining existing permanent grasslands;
- Having an ecological focus on at least 5% of the agricultural area.

The IA carried out before the final agreement of the reform found benefits related to water quality for all three of these conditions. However, in their final form, these conditions are not specifically targeted to the status of water bodies.

3.5.2 *Potential impacts and role of EU coordination*

The exact size of the impacts from insufficient use of economic instruments within the WFD is unknown. For instance, the costs of water scarcity and droughts have not been estimated on an EU level. Total costs due to water shortages in Cyprus in the period 2010-2030 may reach €200 million (2009 prices).[140] In turn, estimates for the economic costs of selected droughts in different regions of Europe in the period 1992-2011 range from €0.15 billion – to more than €11.6 billion.[141]

[136]EurEau (2014) Cost recovery in the WFD: WFD article 9, recovery of cost for water services
[137]EWA (2008) The polluter-pays! But, for what?
[138]Trading schemes where stakeholders agree on mutually beneficial actions to transfer abstraction rights, share benefits etc.
[139]Source: EC (2014) Agriculture and rural development webpage::http://ec.europa.eu/agriculture/index_en.htm
[140]EC [SWD(2012) 382 final]]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources
[141]Acteon (2012) Gap Analysis of the Water Scarcity and Droughts Policy in the EU, Final Report

Water pricing requires a volumetric element such as metering in order to ensure that there are incentives to reduce water consumption and use water more efficiently.[142] It has been estimated that both households and farmers who pay a flat rate for water use more water than those who pay on a volumetric basis (1/3 more for households and 10-20% more for farmers). Flat rates are still widespread in the EU and provide no incentive for sustainable water use.[143] The manufacturing industry often directly abstracts water and the low or non-existent prices they pay for abstraction do not provide an incentive for investments in water efficiency and savings.[144] There are some concerns that without the introduction of dynamic elements, like bloc tariffs in water pricing the price signal becomes weaker over time which means that the long-term impact of water prices on households water demand should not be overestimated.[145]

As incentive pricing is closely linked to water metering, which has already been discussed in section 3.4, the focus here is on economic instruments for addressing pollution and efficient water use. Water tariffs and pollution taxes targeting point-source pollution are some of the instruments considered most appropriate and most often used to address water use and quality.[146] However, as evidenced by the Dutch example (see 3 below), taxes may also be used to target more efficient water use. In Germany and Sweden, taxes also serve as incentives for investing in green infrastructure. Tax reductions and subsidies can also serve as strong incentives to improve efficiency of water use, with examples of such schemes existing in the UK and Denmark.

These policy options are only applied in some EU countries and their impacts are either unknown or are only available for the Member States they exist in. An option for EU coordination is to use one or a combination of these examples and apply them on an EU-wide level. This could take the form of either guidelines (voluntary option) or binding legislation (a new directive – e.g. on NWRMs, or amendments to existing ones – e.g. WFD).

3.5.3 Potential building blocks for illustrating the costs of non-Europe

It is important to note that the use of economic instruments is not a policy area but rather an approach to meet the water targets of the EU. Hence, making the same CoNE assessment as for the other case studies is not possible. Nevertheless, the other case studies examined in this chapter e.g. water metering, already present examples of building blocks for some economic instruments.

3.5.4 Synthesis of findings

The use of economic instruments to promote efficient water use and reduce water pollution is closely linked to other issue areas such as water metering and insufficient integration of water into other policy areas such as agriculture. Nevertheless, experience from some Member States shows that different economic instruments such as taxes or tax abatements can contribute to meeting the goals of sustainable water use and reduce pollution. A first step at the EU level could be to estimate the potential effects of these policies if applied in all Member States.

[142] EC [SWD(2012) 382 final]]IMPACT ASSESSMENT Accompanying the document (...) A Blueprint to Safeguard Europe's Water Resources
[143] EEA (2013) Assessment of cost recovery through water pricing
[144] CEPS (2012) Which Economic Model For A Water-Efficient Europe?
[145] Interview with EurEau 9(/9/14)
[146] EEA (2013) Assessment of cost recovery through water pricing

Box 3: Examples of economic instruments from selected Member States

The Netherlands - addressing efficient water use[147]

A tap water tax (2000) is charged to all users depending on quantity used, up to 300m^3 / year. Taxes are charged by water companies and paid to the state governments. Taxes equate to approximately €0.107 per m^3 (tap water), against average prices of €1.45 per m^3 (households) and €1.07 per m^3 (business). A groundwater tax (1995) is also charged to those that abstract groundwater (mainly water companies and industry). This tax equates to approximately €0.131 per m^3. Together the two taxes account for approximately 22% of the water price for industry and 16% of the water price for households, which has significantly increased since the taxes were introduced. These taxes have contributed to reduced groundwater and domestic water use since 1995, because of more efficient appliances and changing habits.

The UK - addressing efficient water use[148]

The Enhanced Capital Allowances (ECA) scheme allows businesses to write off 100% of the cost of certain water efficient technologies and products against taxable profits in the year of purchase. The objective of this scheme is to encourage businesses to invest in technologies and products that use water in a sustainable way. The UK Government provides annual lists and key information on what technologies and products are eligible under the ECA.

Denmark – addressing diffuse pollution from agriculture[149]

Denmark introduced a pesticide tax in 1996 charging manufacturers and importers but also pesticide users. However, farmers get compensated for this tax through other instruments such as land tax abatements and agricultural subsidies resulting in no, or uncertain, reductions in pesticide use. A 2012 study considered an alternative approach –a subsidy for decreased pesticide use. The results showed that farmers respond more positively to this incentive than to a tax and almost twice as many farmers would reduce their pesticide use with a subsidy than with a tax.

Germany and Sweden – promoting the restoration of natural systems[150]

One third of German cities has a so-called 'rainwater tax'. This tax is based on the permeability of the ground surface. Tax payers can receive a reduction if they provide for water retention and/or infiltration. This system is in part responsible for the amount of green roofs in the cities which have increased from 10 million m^2 in 1995 to 84 million m^2 in 1999.

In Stockholm Sweden, the tax can be reduced by 50% if there is less or slowed-down run-off of rainwater to the urban drainage system. If the building has no need for the public drainage system, one can receive a 100% reduction.

[147] Source: Ecorys (2011) The role of market-based instruments in achieving a resource efficient economy

[148] Source: Defra(2014) ECA from https://www.gov.uk/government/publications/water-efficient-enhanced-capital-allowances

[149] Sources: EPI Water (2011) Evaluating economic policy instruments for sustainable water management in Europe;
EC Science for Environment Policy (2012) More than economic incentives needed to reduce pesticide use;
The Danish Government (2013) Protect water, nature and human health: Pesticides strategy 2013-2015

[150] Sources: International Green Roofs Policies from http://livingroofsworld.com/page22.php;
ARCADIS (2012), Comparison of cost price of water/ waste water/ rain water for users in different EU Member States;
Science for environment policy (2012), Soil Sealing, in depth report, European commission

3.6 Case study for pharmaceutical residues

This section presents the case study for pharmaceutical residues in water. It covers the current problems and policy context pertaining to the disposal of pharmaceuticals, establishes the magnitude of the identified problems, and consequently assesses proposed avenues for improvement and the advantages of addressing the issue on a European level.

3.6.1 The problem and the policy context

Residue compounds from pharmaceuticals in water and soil have recently been identified as an emerging environmental concern by a number of organisations including the European Environmental Agency (EEA) and the World Health Organisation (WHO). Pharmaceutical substances find their way into waters and soils through human and animal discharge, and disposal of unused pharmaceuticals into sinks and toilets. While trace levels of pharmaceuticals in water are very unlikely to have adverse effects on human health according to the WHO[151], current trajectories of increasing concentration levels could lead to potentially harmful levels of substances in surface waters, sediments, and drinking water.

The EU policy response to the emerging threat is slowly gaining traction. The main policy vehicle is the legislation on Priority Substances (PS). Under Article 16 of the Water Framework Directive (WFD, 2000/60/EU), the EU decided to set up a list of 33 priority substances that were considered a major threat to European waters (see decision 2455/2001/EC). The list became annex II under the WFD. In 2008, the list was replaced with the Priority Substance Directive (Directive on Environmental Quality Standards, 2008/105/EC) and its Annex II. The Priority Substance Directive sets out environmental quality standards (EQS) for surface waters and ranks the level of threat among the substances where priority hazardous substances are of most grave concern. EQS levels are to be met through river basin management plans. The goal of the Priority Substance Directive is to reach 'Good Chemical Status' which entails that a water body must comply with EQS set out in the Annex to the directive. EQS set the maximum allowed concentration for the substances or pollutant in questions water, sediment or biota. The level set remains below a concentration that has proven hazardous for human health and the natural environment. However, 'safe' levels are difficult, if not impossible, to establish due to lack of observed or modelled data regarding the long-term effects from exposure to different pharmaceuticals on humans.

The list of priority substances was reviewed and amended in 2011, following the revision and updating of the WFD and the Priority Substance Directive. The new proposal adds 15 new substances, designation of particularly hazardous substances, stricter EQS, new biota standards, improved monitoring and reporting, and improved monitoring and a "watch-list" mechanism for future possible priority substances to support monitoring for future amendments to the list (COM(2011) 876 final). The updated directive on priority substances, including the watch-list, was adopted on July 2, 2013.

Following the adoption of the revised Priority Substances Directive, 12 new substances were added to the watch-list and for the first time three commonly used pharmaceuticals were introduced namely two hormones (17alphaethinylestradiol and 17beta-estradiol) and a painkiller (the non-steroidal anti-

151 WHO (2012) Pharmaceuticals in drinking water http://apps.who.int/iris/bitstream/10665/44630/1/9789241502085_eng.pdf?ua=1

inflammatory drug (NSAID) Diclofenac). The introduction of these pharmaceuticals to the watch-list means that their levels and effects will be monitored to determine whether to include them on the list of priority substances or not. While the revised PS Directive is a step in the right direction, the overall lack of stronger emission controls following article 16.6 in the WFD shows that the Commission could improve on its work in this area. This is discussed at length in chapter 2.

EQS for the new substances takes effect in 2018 and the aim is reach to good chemical status by 2027. The central mechanism for implementation are the river basin management plans that ought to include the revised EQS for *existing* substances by 2015, i.e. excluding the pharmaceuticals just added to the watch-list.

Article 8c of the newly adopted revision[152] of the WFD and the Priority Substances Directive spells out specific provisions for pharmaceuticals. It requests the European Commission to develop a strategy to deal with pollution in water by pharmaceutical substances within 2 years. The strategy should consider introducing stricter norms for taking the environmental effects of pharmaceuticals into account before introducing them to the market. It is also likely to suggest action on a MS level to address the environmental harm done by pharmaceutical residue in water, taking human health into particular account.

3.6.2 *Potential impact and role of EU coordination*

Establishing the size of the problem, and the associated costs, is hampered by lack of data, in particular on an EU-28 level. (Eco)toxicological effects of pharmaceuticals are not well-understood and the monitoring of their release and concentrations in European waters and sediments is patchy at best, as most are not part of national routine monitoring programmes. Even less is known about the effects of smaller doses of pharmaceutical discharge over longer periods of time on humans or the environment. The interaction between compounds in nature is also scarcely understood.

Overall, the introduction of pharmaceuticals to the watch-list of priority substances has opened up a number of possibilities with regards to selection and monitoring of substances. For example, in preparation for the review of the WFD and the Priority Substances Directive, four ad hoc technical support studies were carried out to assess the specific impacts from each of the substances. Of the four substances assessed - Diclofenac, 17 betaestradiol, 17 alphaethinylestradiol and ibuprofene – three were added to the watch-list for future monitoring and assessments. The table below summarises the findings in the Impact Assessment (COM_SEC(2011)1547) for the three potential priority substances.

Table 6: Summary of findings from IA for the three potential priority substances

Substance	Type/Use	Concern	State-of-play in MS
17 alphaethinyl-estradiol (EE2)	Pharmaceutical; synthetic steroid hormone used mainly in oral contraceptives. No production data	Endocrine disruptive; prolonged exposure to low concentrations of EE2 has been shown to cause sex changes,	Monitoring database contains data from 3 countries, 2 showing exceedance of EQS, 1 likely exceedance;

[152] European Parliament legislative resolution of 2 July 2013 on the proposal for a directive of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy (COM(2011)0876 – C7-0026/2012 – 2011/0429(COD))

	available. Approximately 32 million women in EU use EE2-based contraception.	alterations in reproductive capacity, and ultimately population collapse in fish (Kidd et al, 2007).	literature predicts exceedances more widely.
17 betaestradiol (E2)	Steroid hormone: excreted naturally (approximately 90%) in human and livestock urine but also (<10%) as a result of pharmaceutical use (of which 90% from HRT).	Endocrine disruptive; chronic studies show effects on sexual development and fecundity in fish.	Monitoring database (2 countries) and literature show exceedance of EQS.
Diclofenac	Pharmaceutical, used as NSAID. Average consumption 0.46 g/person/year.	Toxic, directly (e.g. chronic studies show effects on gills and kidneys in fish), and via secondary poisoning, e.g. vultures in India affected by veterinary use in cattle.	Monitoring and predictions show exceedances of the EQS in water in 7 Member States.

Source: Table adopted from COM_SEC(2011)1547] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy, p.12

Two notable observations can be made from the overview table above. First, the problem appears to be sizeable. For example, 32 million women in Europe use EE2-based contraception. Diclofenac has been blamed for causing tens of millions of death in vultures in India[153] there are also numerous reports[154] of impacts of EE2 on the aquatic environment in Europe. Second, the data availability for all three substances is poor, both in terms of spread and trends in use as well as the effects on human health.

In summary, without sufficient data to monitor trends or the correct understanding of which substance does what to human health and the natural environment, selecting which substances to put on the priority list is challenging.

3.6.3 *Potential building blocks for illustrating the cost of non-Europe*

Increased EU policy coordination on pharmaceuticals could follow a number of scenarios with different cost and benefit implications. The main point of contention, which divides industries with a stake in this issue, is whether the problem should be addressed through water legislation, pharmaceutical legislation or a combination of both. The pharmaceutical industry argues for covering water pollution via pharmaceutical rather than environmental legislation to avoid dual legislation[155] and proposes a combination of upstream measures - such as use controls via hospitals - when found relevant in combination with downstream measures; while the water industry and environmental NGOs argue for

[153] EEA, 2010.Pharmaceuticals in the environment Results of an EEA workshop. EEA Technical report, No 1/2010

[154] For example: Emerging lessons from ecosystems - Ethinyl oestradiol in the aquatic environment. www.eea.europa.eu/publications/late-lessons.../late-lessons-ii-chapter-13

[155] Interview with EFPIA (25/9/14)

measures to prevent pollution at source, including product authorisations.[156] The current policy trajectory, where three substances are put on the watch-list, could lead to their integration and addition to the list of Priority Substances. This would have legal requirements for Member States to monitor their concentrations in surface waters and to test if they exceed EQS. However, this would also mean that the allowed EQS would need to be established and agreed upon.

The increased attention to pharmaceuticals requires different policy options to be considered. There are, broadly speaking, two (non-mutually exclusive) policy options: end-of-pipe solutions and/or source (preventive) solutions.

First, technical solutions could be sought to filter out the substances in water treatment plants. The UWWTD already provides a legal instrument to this end. Data on costs for different options to reduce and remove pharmaceutical substances from water are scarce. The IA for the revision of the WFD and the Priority Substances Direction mentions two estimates for upgrading Urban Waste Water Treatment Plants (UWWTPs) to be able to handle E2,: in England and Wales, €18 per capita, and in Switzerland from 5% to 25 % higher treatment costs compared to conventional treatment costs, or about €11 to €18 per capita per year.[157] In another study[158], researchers at the Swiss Federal Institute of Aquatic Science and Technology (Eawag) argued that installing new end-of-pipe treatment in wastewater plants could cost €5 and €30 annually per person. The numbers show the large uncertainty range attributed to costs for technical solutions in treatment plants, but at least indicate that there are substantial investments needed, which is compounded by another major challenge for end-of-pipe solutions which is that different compounds may require different treatment techniques. The Swiss study also argued that the new treatment technologies also involve 10% to 25% higher energy use than conventional technology, and this needs to be factored into the cost-analysis. Some pharmaceuticals may thus be removed through conventional technology currently in use for treatment of waste water, whereas others require completely new techniques yet to be developed, which implies high costs for research and development (R&D). Besides these high-tech solutions there are experiments and examples with alternative solutions. In the US, for example, the Minoa Facility has been described as an example of a low tech, low cost and high impact approach to address pharmaceuticals. It currently removes 60 % of ibuprofen and 20 to 30 % of estradiol in local waste water by filtering it through a constructed wetland containing a mix of bacteria.[159] This example shows the large differences in price, type, technology used and effectiveness of different approaches available to waste water treatment managers which makes the calculations of a global cost for implementing end-of-pipe solutions inherently difficult to make without very large uncertainty ranges. Therefore, all cost-calculations in this area should be carefully understood as rough approximations of introducing one technology based on scarce data instead of a robust input to a cost-benefit analysis.

A complement, and even substitute, to end-of-pipe solutions are those options where the problem can be addressed at source. For example by preventing users from disposing of unused pharmaceuticals in sinks and toilets, substituting harmful drugs with less harmful drugs and challenging producers to devise

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[156] Interviews with EEB (5/9/14) and EurEau (9/9/14)

[157] EC [COM_SEC(2011)1547]SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy,p.49

[158] Adriano Joss (2008), quoted in “Something in the water” . Chemistry World. Royal Society of Chemistry. (can be accessed at http://www.rsc.org/chemistryworld/Issues/2008/September/SomethingInTheWater.asp)

[159] Adams, J. (2013) In a tiny NY village, bacteria do a big job on drugs in wastewater. ENSIA. (), more information can be found via: http://www.esf.edu/trinity/

new drugs with less harmful effects on human health or nature (sometimes called “green” chemistry). Other user side solutions include take-back (of unwanted medicine) schemes which could have a substantial impact given that some studies claim that 80 % of pharmaceuticals entering the waste water streams comes from private households.[160] Directive 2004/27/EC (Art. 127b), requires all Member States to ensure that there are appropriate take-back systems in place for consumers to return human medicine that is unused or expired. Data on the functioning of take-back schemes are highly fragmented but indicate that the quality and the success of the schemes vary substantially. For example, an EEA survey of all EU 28 states and neighbouring countries, found that states collect between 10 million and 100 million tonnes per capita.[161] While estimates are difficult to make, the study estimates that some 50 % of unused packages are not returned in a safe way. Older studies also point towards large discrepancies between EU countries. In 2006, the then Swedish state-run pharmacy chain Apoteket reported that 73 % of unused pharmaceuticals are returned to be correctly disposed. However this high figure could be compared with Germany, where one study[162] reported that only 14 % of the unused pharmaceuticals were returned appropriately.

Besides having costumers return their unused pharmaceuticals, producer-side measures to enhance drugs’ environmental and health performance, could be addressed in the Market Authorisation (MA) processes for new medicines and their associated compulsory Environmental Risk Assessments (ERA). ERA was introduced on a large scale in 2005. For veterinary products it is mandatory and taken into the risk-benefit analysis in the authorisation process. For human medicinal use however, a negative ERA advice is not considered enough for denying market access. A related problem is that many of the drugs introduced before ERAs became commonplace, so called “legacy drugs”, have unknown and possibly negative effects on the environment.[163]

Table 7 below describes the different policy options and assesses the associated costs.

160 Tuerk J, B.Sayder, A. Boergers, H. Vitz, TK. Kiffmeyer, S.Kabasci, (2010) Efficiency, costs and benefits of AOPs for removal of pharmaceuticals from the water cycle. Water Science & Technology—WST Vol 61 No 4 pp 985–993 © IWA Publishing 2010 doi:10.2166/wst.2010.004

161 EEA, 2010.Pharmaceuticals in the environment. Results of an EEA workshop. EEA Technical report, No 1/2010

162 KNAPPE, 2008.State-of-art review of policy instruments to limit the discharge of pharmaceutical products into European waters. Deliverable D3.1 from the KNAPPE project (Knowledge and Need Assessment on Pharmaceutical Products in environmental Waters)

163 BIO Intelligence Service (2013), Study on the environmental risks of medicinal products, Final Report prepared for Executive Agency for Health and Consumers

Table 7: Policy options and costs to address pharmaceutical residues

Policy measure	Cost	Benefits	Assessment of EU level costs
1. "Down-stream" end-of-pipe measures, e.g. fitting existing water treatment plants with additional treatment methods to address pharmaceuticals, in particular in hospitals.	Few estimations but to remove E2 through water treatment estimated in England and Wales to €18 per capita, and in Switzerland from 5 to 25 % compared to conventional treatment costs translated into about €11 to €18 per capita per year.[164] Some studies indicate a range from €5 to €30 per capita per year.	Installing new filters for pharmaceuticals could create co-benefits by filtering out other harmful substances and thus improve overall water quality.	Highly expensive option. Costs likely to be passed on to consumers and will differ widely across the EU depending on status of local water treatment facilities. Very rough estimations for the EU 28 equal to €9.1 billion for 1 substance and €27.3 billion for all 3 substances (could be less in case the treatment is similar for different substances).[165]
2. "Up-stream" preventive measures, e.g. awareness raising among hospitals and general public to foster substitution and safe disposal of unused drugs	Campaign and education costs for national and EU-level information drives.	Highly cost-effective and yields synergies if combined with other measures since it lowers the pressure, on for example, end of pipe measures.	Behavioural change is always cumbersome to instigate and it would be difficult to attribute policy implementation to impacts however should be a far more cost-effective measure than, for example, end-of-pipe measures.
3. Product Design and production measures, e.g. introducing environmental requirements into market authorization procedures	Added R&D costs for drug-companies to ensure environmental qualities. Drug-discovery process could amount to $ 802 million[166] (approx. €630 million) however difficult to estimate how much would be spent on environmental considerations.	Removing the harmful effects of drugs in water or stop residues from reaching water bodies makes above measures redundant. Innovation and developing new markets.	Very difficult to estimate. The costs of drug development and testing are high but to extract the costs of amending the environmental standards for market authorization is not possible with current data availability.
4. Monitoring, e.g. adding common monitoring procedures and measure on an EU level	The Commission calculates monitoring costs range of € 1 – 2.4 million annually equalling 22 – 52 % of current estimated costs for EU 27 monitoring.[167]	Better and more comprehensive monitoring will be essential to assess policy impacts on an EU level.	Would be important to include for all the options above in order to measure success. Hence a cost of € 1 – 2.4 million times the number of substances should be added to all the options above.

Source: Authors' own analysis

164 EC [COM_SEC(2011)1547] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy,p.49
165 Based on England and Wales costs €18/capita and assuming 507.4 million inhabitants in EU28.
166 Dickson, M and J.P. Gagnon, 2009.The cost of new drug discovery and development. Discovery Medicine, June 09, 2009
167 EC [COM_SEC(2011)1547]_EN , SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy, p.46

3.6.4 *Synthesis of findings*

To sum up, there is very little information on the costs imposed by the current level of pharmaceutical concentrations in European waters. First, there is very little information on overall concentration levels of different drugs in water on a European level. Second, most cost-estimates are very approximate with large uncertainty ranges for end-of-pipe solutions only calculated for a few places in a few countries, mainly involving installation of high-tech waste water treatment in existing facilities. These are likely to be very high estimates for public spending compared to other policy alternatives such as information campaigns or take-back schemes. Hence, a first step towards improving the European response to the emerging problem of pharmaceuticals would be to improve the monitoring and oversight on a European level, both on the level of concentrations of pharmaceuticals in surface water as well as the risks to human health associated with exposure. The current legislative step to put the three pharmaceuticals – 17 alphaethinyl-estradiol (EE2), 17 betaestradiol (E2) and Diclofenac – on the watch-list is clearly a step in the right direction.

As this overview has shown, current legislation and instruments at the disposal of the EU are quite diverse and thus provide a range of possible policy interventions to apply for future purposes. Should the health effects of pharmaceuticals become more visible and our knowledge increase on how the causal pathways from compound to organism works, then the functional and political pressures on policy action would increase and lead to the possible activation of policy instruments.

It seems clear that interventions at source-level, i.e. prevention, offer a more cost-efficient approach than improved wastewater treatment in reducing the concentration of pharmaceuticals in water. One point for further action and research could be on how to improve the performance of take-back schemes across the EU by consumer education, spread of best-practices, and possibly more stringent regulation.

It could be useful to think of a “building blocks” approach towards the pharmaceutical residue problem. First, upgrading and extending monitoring will be necessary in all policy scenarios in order to assess the impact of measures. Second, information campaigns among doctors, pharmacies and the general public to promote safe disposal of unused drugs and find substitute drugs could reduce the amount of pharmaceuticals in water. Third and finally, both end-of-pipe measures and increasing the environmental requirements are likely to create substantial costs which in turn are likely to be passed on to consumers and public authorities. However, it is plausible to assume that the costs for end-of-pipe solutions outweigh the costs for product-design and use measures, which also deliver benefits from lead innovation and developing new markets.

3.7 Summary of case study results

Additional EU-level policies could be pursued in all five of the case study areas; however, the potential benefits and costs differ per case. The following examples are used to illustrate the size of costs of non-Europe in water protection:

- **Flood plain restoration**: This is marked by long-term economic benefits mainly due to reduced flood damage and water supply costs worth between €500 to €10,000 annually per ha of restored floodplain. This compares favourably with the (albeit) high investments costs of €5,000 to €100,000 per ha. The variability of the numbers is large and depends on the specific local situation. Depending on the available restoration potential in the EU the long-term annual economic benefits of a full realisation of the potential could reach some €39 billion. EU action in this area could include better integration of ecosystem service consideration in EU agriculture and cohesion policies and additional support and incentives for river basin authorities including:

- Management tools in order to better define obsolete infrastructure, which has outlived its original purpose and/or where maintenance costs outweigh benefits;
- Governance principle for successful restoration projects; and
- Prioritisation and financing tools, including use of EU structural and agriculture funds.

- **EU Eco-design measures for water taps and showerheads and mandatory water metering**: marked by payback of usually well below a year and leading to substantial annual savings on water and energy bills of €2.2 billion by 2030 for eco-design measures on water taps and showerheads and €66.4 per household for water metering, with today's water and energy prices. Those savings are likely to overlap and will be lower in the short term because of the high transition costs of public water supply, collection and treatment systems, (where water charges have been based on historic demands and need to support a sector which has high capital costs but relatively low operating costs).

- **Combination of upstream measures to reduce pharmaceutical residues**: The down-stream costs of removing pharmaceutical residues from urban waste water streams are significant. Estimates from two countries for upgrading treatment systems suggest that total annual costs for the EU could be as high as €9 billion, which is likely to be recovered from increasing water bills. In order to avoid those costs it appears worthwhile to investigate the costs and benefits of upstream measures such as introducing environmental aspects in the EU authorisation system for pharmaceuticals and EU wide campaigns to foster substitution and safe disposal of unused drugs.

Comparing our findings with the Blueprint it appears that our ex-post assessments are rather similar but the ex-ante assessment shows significant differences. The political choice made in the Blueprint was to focus on quantitative aspects and the use of EU-level guidance documents. The current relevance of this focus has been questioned by several of the experts we interviewed.

Based on our findings we recommend focussing EU water protection actions on the following areas (Table 8).

Table 8: Recommended focus for EU water protection actions

Area	Example analysed / baseline	Indication of monetised benefits
1. Strengthening EU wide emission controls for pollutants vis-a-vis environmental quality standards;	Pharmaceutical residues: costs of end of pipe removal. The baseline scenario is that growing pressure to reduce levels of a growing number of micro-pollutants will sooner or later necessitate new treatment levels, which could be avoided by upstream measures,	€9 billion annually for avoidance or postponement of new treatment levels across Europe. Investment costs for upstream measures are not known or quantifiable

Area	Example analysed / baseline	Indication of monetised benefits
	including product and service designs	
2. Reduce water and energy use	Water taps and shower heads performance and water metering requirements complemented by development pathways for public water systems. The baseline scenario is that water and energy prices remain constant at today's levels	€2.2 billion annually due to reduced water and energy bills €1.0 billion annual investment costs
3. EU coordination to support and incentivise floodplain restoration,	Providing better governance, CBA and financing tools for projects, which are well coordinated with flood risk and agriculture policies. The baseline scenario is that 8.8 million ha of floodplain area are available in the EU for restoration	€39 billion annually mainly due to reduced flood damages, public water supply costs and increased tourism and recreation activities. €361.8 billion total investment costs mainly for land purchase and infrastructure works.

Source: Authors' own analysis

Given the high variability in the quality of national implementation including slow and wrong application of EU water protection laws, the identified actions should be accompanied and be supported by better implementation and policy integration activities. It is also important to point out that the estimates of costs and benefits in these options are based on a number of assumptions and extrapolations and as such they should be treated as indicative.

4 Conclusions

This chapter provides a summary of the main report findings. First, the chapter offers a comparison of the study findings with the Blueprint findings. Second, the chapter wraps up the analysis with concluding remarks and indications on lessons learned for potential future policy recommendations.

4.1 Comparison with the Blueprint findings[168] and actions

This section presents a comparison of our assessment with the Blueprint findings and actions. We can identify differences and similarities regarding the three main Water Status elements (for more details see **Erreur ! Source du renvoi introuvable.Erreur ! Source du**

4.1.1 Quality – different findings, different solutions

A successful policy design is available, but this requires emission controls to catch up with work on quality standards and that gaps in assessing and addressing risk of certain pollutant groups are closed. The Blueprint comes to different findings, focussing on the lack of information about chemical status in river basins and less on policy and implementation gaps. Consequently it proposes strengthening the enforcement of measures. The Blueprint only recognises that there could be a more fundamental regulatory interaction issue and proposes a report regarding the risk of pharmaceuticals. With regard to diffuse pollution it proposes CAP conditionality for pesticide uses.

4.1.2 Quantity – similar findings, similar direction of solutions

Limited progress and incomplete implementation, typified by weak targets and tools. Those issues could be tackled by better policy integration, reinforcement of EU resource efficiency strategy and strengthening targets and tools.

The Blueprint reaches similar findings and proposes a long list of actions to overcome the problems. The majority of actions would lead to a series of further implementation guidelines for the WFD. The effectiveness of guidelines has not yet been established.[169] At the screening phase for the IA for the Blueprint a wide range of legislative options, including amendments to the WFD, have been looked at[170], but these options were dropped early on due to political concerns.[171] Only one proposal for regulatory action emerged, related to maximising the reuse of waste water. The Blueprint also makes several proposals to establish conditionality for the CAP and funding priorities.

4.1.3 Space – slightly different findings, few solutions

[168]With the *Blueprint to Safeguard Europe's Water Resources* published in 2012 the EC looked into the effectiveness, gaps of implementation of the WFD and potential solutions in four general areas – land use and ecological status, chemical status and pollution, water efficiency and vulnerability of EU waters

[169]Interviews with EEB (5/9/14), Ecologistasen Accion (9/9/14) in writing and Pierre Strosser (25/9/14)

[170]IEEP et al. (2012) Service Contract To Support The Impact Assessment Of The Blueprint To Safeguard Europe's Waters Assessment Of Policy Options For The Blueprint, Final Report

[171] As reported by several of the interviewees.

Limited progress and incomplete implementation, reflecting weak targets and tools. These issues could be tackled by better policy integration, reinforcement of EU resource efficiency strategy and strengthened tools.

The Blueprint offers some similar findings but differs in that it does not consider the use of economic instruments as important and does not identify the lack of clarity of the WFD targets and missing WFD measures as an issue. The only concrete actions proposed are a guidance document on green infrastructure, enforcement of the Floods Directive and Greening the CAP. A link with the EU Strategy for a Resource Efficient Europe has not been established.

4.2 Conclusions on progress to date and remaining challenges

This section summarises the findings of the report as a whole – covering progress to date and key remaining challenges.

The WFD introduced a number of innovative policy instruments and stringent goals to improve the quality and management of European waters, and by providing a framework for a range of water-related legislation, the EU has created an impressive and comprehensive body of regulation and guidance. The results of the assessment of the progress towards reaching the WFD goals and implementing its instruments which was made in the run up to the Blueprint, however, showed significant gaps. While the progress was visible and rapid in the beginning with the reduction of pollution levels falling as a result, further progress has been limited. This is notwithstanding that several tools are available to control emissions. Regarding the quantitative aspects of water, new tools have come in place yet progress is difficult to assess. Finally, the spatial aspects of problems pertaining to the implementation of the WFD have been difficult to address in particular when dealing with infrastructure and land use.

The reasons for the implementation gap in the WFD can be attributed to five main challenges:

- First, there has been a slow and incomplete implementation of the entire framework at MS level. The speed of progress, stringency and level of detail in the RBMPs for example, differ widely between catchment areas and competent authorities which creates large disparities in the institutional framework for implementing the FWD in European countries.
- Second, the cost-effectiveness of Programmes of Measures (PoMs) is not always clear and it can be assumed that it is difficult to attract funding for large scale restoration project. Data on these issues are however, scattered and this is an issue that would benefit from further urgent research.
- Third, there are insufficient linkages between the RBMPs and other policy domains and legislation such as agriculture and flood management. For instance, the current design of the CAP remains geared towards intensive agriculture which in some places is a large source of water contamination and loss of floodplain functions.
- Fourth, a gap in the deployment of EU-level instruments to control emissions of pollutants.
- Fifth, there is weak overall integration between water protection and energy and agricultural policy resulting in sometimes counter-productive policy measures and instruments.

4.3 Policy recommendations

This section summarises the proposed recommendations for potential future actions, based on the findings of this study (the recommendations are discussed in more detail in section 3.7).

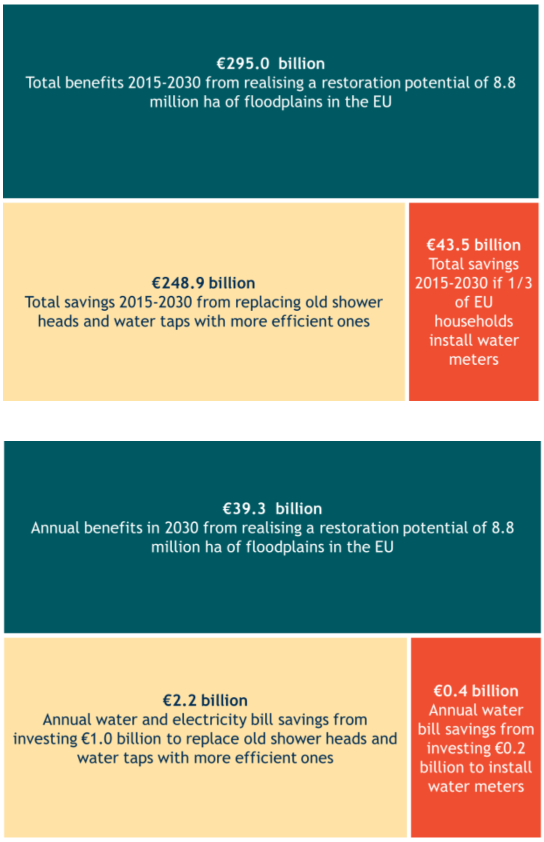
Based on the overall analysis, the study identifies four promising areas for further water policy action: PoMs, Eco-design, water metering and up-stream pollution controls, next to improving policy integration at EU and national levels in order to achieve better implementation.

- Strengthen EU-wide emission controls for pollutants vis-à-vis water quality standards;
- Reduce water and energy use via water-related eco-design standards (for shower heads and water taps), while promoting water metering to improve progress on water quantity targets; and
- Improve PoMs and EU coordination to support floodplain restoration to further space-related water targets.

These proposed actions would need to happen in combination with improving policy integration at EU and national levels in order to achieve better implementation. This final aspect has not been covered in detail by our work.

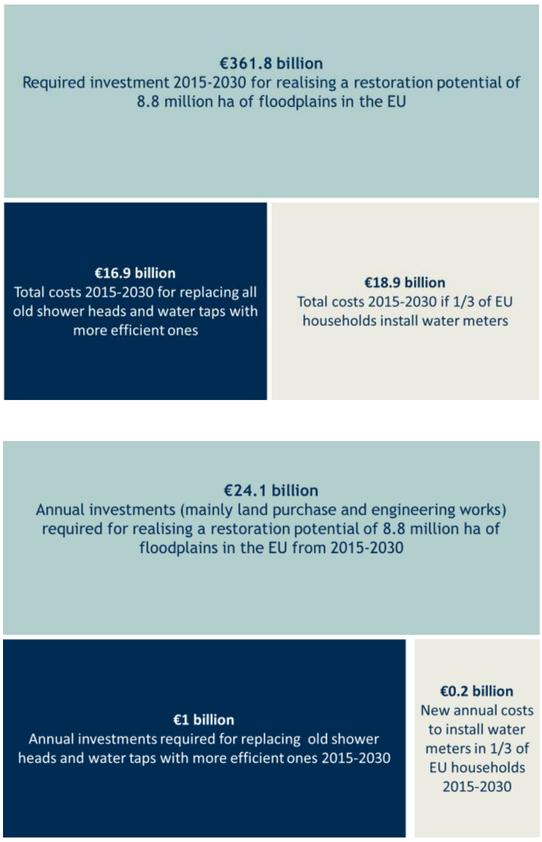
We have prepared high level estimates of costs and benefits (presented in the following figures) to indicate the potential scale of these actions but should stress that these are extrapolations based on various assumptions and should be treated with caution. The selected examples have different payback times and, therefore, represent very different investment cases. The payback times of water saving measures are short, while flood plain restoration is a long-term investment whose return will depend on the supporting policy framework, local prices and legislation (e.g. regarding land purchase) and further investigation of more detailed cost and benefit aspects. Generally, information about costs has been more readily available than data about benefits. Nevertheless, the costs of the proposed actions may decrease in the future e.g. the price of more efficient shower heads and water taps is likely to fall as production volumes increase.

Figure 9: Potential benefits from EU policy measures for 2015-2030 and annually



Source: Authors' own analysis

Figure 10: Potential investment needs of EU policy measures for 2015-2030 and annually



Source: Authors' own analysis

Table 9: Overview of ex-post assessment and Blueprint to Safeguard Europe's Water Resources

Water status	Blueprint findings and proposed actions					This report's analysis		
	Findings	***Actions - ongoing***		**Actions delivered**	***Actions failed***	**Progress**	**Effectiveness**	**Main issues identified**
Overall	Water status not good enough, but no need for major legislative work	*Better national implementation and increased policy integration*				Limited progress in reaching Good Status and moving toward sustainable water management	Weak evidence about cost-effectiveness of EU and national policies	Incomplete EU policies, weak national implementation and river basin governance remains a big challenge
Quality	Insufficient information and monitoring regarding WFD	Enforcement			Cross-compliance CAP, postponed	Progress to protect human health	Effective use of quality standards and emission controls	National implementation deficits
	Good progress with pre WFD Directives					Mixed progress in reducing environmental pollution	EQS without accompanying emission controls ineffective	Lack of EU emission controls and product requirements
	Gap in addressing risks from pharmaceuticals			Report on pharmaceuticals		Diffuse pollution remains a problem	Weak policy integration	Contradicting agriculture, energy and transport policies
						Lack of knowledge about chemical risks	Gaps for chemical cocktails, endocrine disrupting effects, or pharmaceutical residues	Gaps in EU level assessment of chemical risks
						Effective policy design - good targets, but missing instruments		
Quantity	Over-abstraction: 2nd most important pressure on Status	WFD enforcement	Monitoring support and inspections		Cross-compliance CAP, postponed	Limited progress in increasing water efficiency	Ineffective overall EU policy design due to Treaty limitations	Contradicting agriculture, energy and transport policies

	Illegal abstractions, narrow and weak economic assessments	Ecodesign, Labelling and Procurement	Funding priorities				Limited progress of economic assessments and instruments	Mixed effectiveness of water pricing, lack of EU instruments	Reinforcement of EU resource efficiency strategy
	Some progress in WS&D policies, but high untapped potentials	4 Guidance (trading, leakage, e-flows, targets)	Waste water re-use regulation				Little progress in supporting Good Status	Ineffective EU target design	Strengthen WFD specific targets and tools
							Ineffective EU policy design - Weak targets, weak tools		
Space	Main pressure on the Water Status originates from dams and dykes serving energy, agriculture, transport and flood protection	2 Guidance (Green Infrastructure)		Greening CAP Pillar I: Crop diversification; Maintaining existing permanent grasslands; at least 5% ecological focus area			Limited progress in increasing space and improving structure	Ineffective overall EU policy design due to Treaty limitations	Contradicting agriculture, energy and transport policies
	Focus so far mainly on new infrastructure developments, little on existing	WDF/Floods enforcement					Limited progress of economic assessments and instruments	Missing cost-effective national PoMs	Reinforcement of EU resource efficiency strategy required
							Little progress in supporting Good Status	Ineffective EU target design	Strengthen WFD specific targets and tools
							Ineffective EU policy design - Weak targets, no tools		

Source: Authors' own analysis

Annex A – Water policies factsheets

The following factsheets present key information about the most relevant EU water policy documents.

Table 10: Water Framework Directive (WFD) factsheet[172]

Document name	Water Framework Directive (2000/60/EC) - WFD
Level of implementation	EU (Priority substances, Groundwater) and MS (RBMPs and PoMs)
Year of entry into force	2000
Type of policy	Command & control & governance
Area of focus	Umbrella Directive – multiple aspects of whole river basins
Main policy tool	River Basin Management Plans (RBMPs); Programmes of Measures (PoM)
Context	The WFD addresses the increased pressure on EU's water resources from the *"continuous growth in demand for sufficient quantities of good quality water for all purposes"*
Objectives	General objectives: • To prevent further deterioration and protect and restore the ecological and chemical status of the aquatic environment and ecosystems • To promote sustainable water use • To ensure the reduction and prevention of further groundwater pollution • To mitigate the effects of floods and droughts Intermediate goals: • 2000-2012 – transposition; analysis of pressures and impacts on river basin districts (RBDs); establishment of monitoring programmes, RBMPs and accompanying PoM to address the identified pressures • By 2015 - To achieve "good status" as defined in Annex V of the directive(good chemical and ecological status for surface waters and good quantitative and chemical status of groundwaters) for all water bodies
Costs[173]	• **administrative burdens**(e.g. the reporting cycles of the UWWTD and Nitrates Directive are not synchronised with the WFD) • **investment costs** (e.g. installation of metering in all irrigated EU land, on the basis of French experience, could cost around €243 million, full scale implementation of metering for the whole EU would cost €3080 million); (different green infrastructure project costs vary between €50 000 and €4 billion)
Benefits	• Consolidation of EU water laws

[172]Information in factsheet based on: EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources;
EC [COM(2012) 670 final]]REPORT FROM THE COMMISSION (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans;
EC [SEC(2009)415]]SWD accompanying the Report from the Commission (...) on programmes for monitoring of water status;
EC [COM(2007) 128 final]]COMMUNICATION (...) Towards sustainable water management in the European Union - First stage in the implementation of the Water Framework Directive 2000/60/EC
EEA (2012) European waters — current status and future challenges Synthesis
[173]EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources, part 1 (p.56) and part 2 (pp.21-22)

Document name	Water Framework Directive (2000/60/EC) - WFD
	• Flexibility on national level as to how the objectives of the directive are achieved • Improved water quality • Preserved aquatic biodiversity • Avoided costs *(e.g. in France the economic benefits of natural water storage in terms of the replacement costs of building grey infrastructure like dams ranges from € 37/ha/year to € 617/ha/year)*[174]
Impacts – Economic[175]	• Internalise externality costs • Reduce costs of flood damages*(e.g. economic damage from floods in EU are estimated at €6400 million/year for the period 2006-2010, while the total additional damage from climate change scenarios ranges €7700 – 15000 million/year)* • Reduce costs of water shortages and droughts*(e.g. scarcity costs for households, industry and tourism in Cyprus imply that the present value of total costs due to water shortages in the period 2010-2030 may reach €200 million (2009 prices))* • Reduce costs of water treatment *(e.g. for conventional waste water treatment the operational cost is on the average €1.9/m3 and the capital investment is €474 – 593/m3 per day)* • Create a level-playing field within the EU • Increase productivity of commercial fisheries and aquaculture • Foster research and innovation
Impacts – Social	• Access to safe drinking water and sanitation • Access to safe bathing water • Recreational value of preserved aquatic biodiversity • Improved safety regarding floods, water scarcity and droughts
Impacts – Environmental	• Improved water quality • Safeguarding of aquatic biodiversity • Mitigation of climate change effects
Data availability	The impact assessment (IA) accompanying the Blueprint[176] is the most recent IA available and it contains estimates of different costs and benefits related to specific measures in the following areas: • Measures for controlling diffuse pollution, protecting ecosystems and promoting natural water retention (e.g. green infrastructure projects, Natural Water Retention Measures (NWRMs) etc.) • Measures improving water availability (e.g. desalination, water transfers etc.) • Water efficiency measures (e.g. water savings in buildings, household appliances etc.).

[174] Ibid. part 2, p.23

[175] Ibid. part 1, p.28 and part 2, p. 25

[176] EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

Document name	Water Framework Directive (2000/60/EC) - WFD
	Information on implementation progress is available from the EC periodical reports and accompanying SWD.[177]
Implementation progress	The 1st 6-year management cycle is in progress – 23 Member States have submitted complete RBMPs. The EC has received 124 RBMPs out of the expected 174 (approx. 70%).The Court has ruled against Belgium, Greece and Portugal for not having adopted and reported the plans. A judgment on Spain is pending.[178] However the 2015 target for "good status" will not be reached for a significant number of water bodies. The EAA (2012)[179]reports that almost 50% of Europe's surface water is likely to be in poor ecological status by 2015. The picture is more difficult to assess for chemical status as more than 40% of Europe's surface waters have unknown chemical status. Nevertheless, by 2015 more than 90% of Europe's groundwater is expected to be in good status in terms of both quantity and quality. Analysis of the pressures causing poor status shows that 30% - 50% of the surface water bodies are affected by diffuse pollution (principally due to agriculture). More than 40% of the river and coastal water bodies are affected by diffuse sources, whilst 20–25% of them are also subject to 'point source' pollution. Lack of ambition, extensive use of exemptions in an arbitrary way (e.g. extending the deadline for reaching good status or setting lower environmental objectives without justification or explaining the conditions used i.e. technical feasibility, proportionality, affordability) and hydromorphological pressures (abstractions, land use, flow regulation and dykes) are reported as the main reasons for failing good ecological status.[180] Other existing issues related to the implementation of the WFD have been identified in the Commission report on RBMPs (2012)[181]and grouped under the following categories: • Insufficient use of economic instruments to address market failures*(e.g. 49% of RBMPs include modification of the water pricing system to foster a more efficient use of water, 40% of the RBMPs include measures to enhance water metering which is a precondition for incentive water pricing)* • Lack of policy integration in support to specific measures • Ineffective water governance to tackle coordination problems • Knowledge gaps
Monitoring system / techniques	At MS level • surface waters: surveillance, operational and investigative monitoring for chemical and ecological status;

177 EC [COM(2012) 670 final] REPORT FROM THE COMMISSION (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans;
EC [SEC(2009)415] SWD accompanying the Report from the Commission (...) on programmes for monitoring of water status;
EC [COM(2007) 128 final]]COMMUNICATION (...) Towards sustainable water management in the European Union - First stage in the implementation of the Water Framework Directive 2000/60/EC

178 Ibid.

179 EEA (2012) European waters — current status and future challenges Synthesis

180 EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources– part 1, chapter 2.5.1 and part 2, page 6.

181 EC [COM(2012) 670 final] REPORT FROM THE COMMISSION (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans

Document name	Water Framework Directive (2000/60/EC) - WFD
	• groundwater: ground level, chemical and operational monitoring for quantitative and chemical status • additional monitoring in protected areas • the number of monitoring stations installed varies per MS At EU level – Member States submit RBMPs in 6-yearly cycles to EC for review
Relevance for CoNE case study?	No revision of the directive is expected before 2019. Relevant for all 5 issues.
Reference	DIRECTIVE (2000/60/EC) establishing a framework for Community action in the field of water policy DIRECTIVE 2013/39/EU amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

Table 11: Urban Waste Water Treatment Directive (UWWTD) factsheet[182]

Document name	DIRECTIVE (91/271/EEC) concerning urban waste water treatment - UWWTD
Level of implementation	EU (setting standards) and MS (implementation)
Year of entry into force	1991
Type of policy	Command & control
Area of focus	Waste water
Main policy tool	Minimum requirements for collection and treatment of waste water. National programmes for implementation and periodical reports to the EC.
Context	It addresses the pollution related to waste water discharge from urban areas and certain industry sectors
Objectives	To protect the environment from the adverse effects of urban waste water discharge and treatment and of biodegradable industrial waste water from the agro-food sector
Costs[183]	• administrative burdens*(e.g. the administrative burden that the reporting cycles of the UWWTD are not synchronised with the WFD)* • investment costs especially those related to sewage systems and treatment facilities*(e.g. for conventional waste water treatment the operational cost is on average €1.9/m3 and the capital investment is €474 – 593/m3 per day)*
Benefits	• Improved water quality • Improved public health
Impacts – Economic	• Investment in infrastructure • Foster research and innovation • Improve productivity of commercial fisheries and aquaculture
Impacts – Social	• Job creation • Access to sanitation • Access to safe bathing water • Improved public health • Recreational value of preserved aquatic biodiversity
Impacts – Environmental	• Improved water quality • Safeguarding of aquatic biodiversity
Data availability	The IA accompanying the Blueprint[184] is the most recent IA available and it contains estimations of different costs and benefits related to specific measures such as waste water treatment and waste water reuse. Information on implementation progress is available in the EC periodical reports, the most recent being from 2013.[185]
Implementation progress	With regard to *collecting systems, secondary and more stringent treatment* there

[182]Information in factsheet based on:EC [COM(2013) 574 final] Seventh Report on the Implementation of the Urban Waste Water Treatment Directive (91/271/EEC);
EC [SWD(2012) 393 final] SWD The Fitness Check of EU Freshwater Policy;
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources
[183]EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources
[184]Ibid.
[185]EC [COM(2013) 574 final] Seventh Report on the Implementation of the Urban Waste Water Treatment Directive (91/271/EEC)

Document name	DIRECTIVE (91/271/EEC) concerning urban waste water treatment - UWWTD
	are overall high compliance rates by 2010. <table><tr><th>Compliance rates regarding</th><th>EU15</th><th>EU12</th></tr><tr><td>Collecting systems</td><td>97%</td><td>72%</td></tr><tr><td>secondary treatment</td><td>88%</td><td>39%</td></tr><tr><td>more stringent treatment</td><td>90%</td><td>14%</td></tr></table>Generally the Member States which joined after 2004 (EU12)[186] are trailing behind but they are also subject to different compliance deadlines. There is also lower level of compliance with these standards in big cities in the majority of Member States.[187] With regard to pollution a recent JRC report (2011)[188] concluded that the total nitrogen export from the land to the sea had decreased by 9%, while the total phosphorus load had decreased by around 15% for 2005 compared to 1991 mainly due to a decrease in point source emissions. Moreover the high decrease observed in the North and in the Baltic Sea was mainly related to the implementation of advanced waste water treatment. The improvement in the quality of EU bathing waters in the last decades is also to a large extent due the implementation of the UWWTD.
Monitoring system / techniques	Monitoring and waste water treatment on MS level
Relevance for CoNE case study?	This directive is relevant particularly with respect to issue of waste water re-use (issue 2).
Reference	Council Directive (91/271/EC) concerning urban waste water treatment

[186]Croatia has not been included in the last available report
[187]EC [COM(2013) 574 final] Seventh Report on the Implementation of the Urban Waste Water Treatment Directive (91/271/EEC)
[188]JRC (2011) Long term nutrient loads entering European seas

Table 12: Ecodesign directive factsheet[189]

Document name	DIRECTIVE (2009/125/EC) establishing a framework for the setting of ecodesign requirements for energy-related products
Level of implementation	EU (setting standards) and MS (surveillance)
Year of entry into force	2009
Type of policy	Command & control
Area of focus	Energy-using products (EuPs) excluding transport
Main policy tool	Working plans set out by the EC indicating the list of EuP groups with priority for the adoption of implementing measures and following directives and regulation regarding a particular group of products
Context	Energy-related products account for a large proportion of the consumption of natural resources in the EU
Objectives	• To set ecodesign requirements for energy-related products with the aim of ensuring the free movement of such products within the internal market. • To provide for criteria and conditions for the setting of ecodesign requirements which the regulated EuPs must fulfill in order to be placed on the market • To increase energy efficiency and the security of energy supply
Costs	• Administrative burdens • Investment costs *(e.g. costs for renovation of buildings range €200-2000 to replace toilet flushes or toilet equipment, €800-3500 to install water efficient cooling system etc.)*
Benefits	• Improved environmental quality • Increased resource efficiency • Uniform rules for the products within the internal market
Impacts – Economic	• Level-playing field and free movement of goods within the internal market • Investment in research and innovation
Impacts – Social	• Energy savings • Improved health
Impacts – Environmental	• Improved environmental quality • Increased energy efficiency • Increased water use efficiency *(e.g. between 56 to 64 million m^3 of water per year are expected to be saved in 2020 thanks to the dishwasher ecodesign regulation and between 64 to 83 million m3 per year from the washing*

[189] Information in factsheet based on: EC [SWD(2012) 434 final] SWD Establishment of the Working Plan 2012-2014 under the Ecodesign Directive;
EC [COM(2008) 660 final] COMMUNICATION (...) Establishment of the working plan for 2009-2011 under the Ecodesign Directive;
EC [SEC(2010) 1357 final] SWD SUMMARY OF THE IMPACT ASSESSMENT Accompanying document to the Draft Commission Regulation (...) with regard to ecodesign requirements for household dishwashers;
EC (2010) SWD SUMMARY OF THE IMPACT ASSESSMENT Accompanying document to the Draft Commission Regulation (...) with regard to ecodesign requirements for household washing machines;
EC (2010) REGULATION(EU) No 1016/2010 (...) implementing Directive 2009/125/EC with regard to ecodesign requirements for household dishwashers;
EC (2010) REGULATION (EU) No 1015/2010 (...) implementing Directive 2009/125/EC with regard to ecodesign requirements for household washing machines;
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

Document name	DIRECTIVE (2009/125/EC) establishing a framework for the setting of ecodesign requirements for energy-related products
	machines regulation, which amounts to twice the total domestic water use in the EU in one day) • Mitigation of climate change effects
Data availability	The IA accompanying the Blueprint presents some estimates of investment costs and economic and water savings for renovation of buildings and certain water using products.
Implementation progress	Currently the 2nd Working Plan for the period 2012-2014 is in place. Ecodesign regulations for domestic dishwashers and washing machines have been adopted in 2010. For dishwashers no stringent minimum requirements with regard to water consumption are set but they are nonetheless defined for the Best Available Technology (BAT). While for washing machines minimum requirements for water consumption are set in the Regulation. Ecodesign regulations for water -related products such as showers and taps etc. and water-using products such as irrigation equipment etc. have not been adopted yet but are under consideration. Market surveillance problems in Member States – the general level of surveillance activities undertaken by a number of EU countries has been considered low. Significant activity is reported in 5 Member States, moderate to low activity in most, and no activity reported for 2010 in 6.[190] Meanwhile, the EU-funded "Involvement of Civil Society in Market Surveillance of Ecodesign and Energy Labelling" (MARKETWATCH)[191] project aims to increase the involvement of civil society in market surveillance activities related to Ecodesign and Energy Labelling, with the ultimate goal to increase the level of compliance in the EU.[192]
Monitoring system / techniques	Monitoring on MS level: National authorities in Member States are in charge of monitoring the compliance with the ecodesign and labelling requirements for products covered by the Ecodesign Directive
Relevance for CoNE case study?	This framework directive and its daughter directives for the different product groups are relevant for the ecodesign and water metering issue (issue 3).
Reference	DIRECTIVE (2009/125/EC) establishing a framework for the setting of ecodesign requirements for energy-related products

[190] European Council for Energy Efficient Economy (ECEEE) webpage: http://www.eceee.org/ecodesign/Horizontal-matters/eceee-pages-on-ecodesign-and-labelling-market-surveillance/MSreport

[191] Involvement of Civil Society in Market Surveillance of Ecodesign and Energy Labelling" (MARKETWATCH) (2014) homepage: http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=2644

[192] The project includes a number of specific activities and operations that civil society organisations will conduct towards this objective, including large campaigns of verification of the proper implementation by manufacturers and retailers of some of the Ecodesign and Energy Labelling requirements through physical and on-line shop visits. – ibid.

Table 13: Environmental quality standards (EQS) directive factsheet[193]

Document name	DIRECTIVE (2008/105/EC) on environmental quality standards in the field of water policy *and following amendment by* DIRECTIVE 2013/39/EU as regards priority substances in the field of water policy
Level of implementation	EU(setting standards) and MS (implementation)
Year of entry into force	2009
Type of policy	Command & control
Area of focus	Surface waters
Main policy tool	Member States publish regular inventories of the emissions which are included in their RBMPs
Context	It addresses the chemical pollution of surface waters
Objectives	To set environmental quality standards (EQS)for priority substances and certain other pollutants with the aim of achieving good surface water chemical status
Costs and benefits	• Administrative burdens • Surveillance costs*(e.g. the 2011 IA has estimated that the overall cost of current monitoring of existing PS in the EU27 is on average €69 million per year)*
Benefits	• Improved water quality • Improved public health • Improved aquatic biodiversity
Impacts – Economic	• Uniform rules for industry in EU • Reduced cost of treatment for drinking and industrial process water*(e.g. estimated unit costs for removal of pesticides from drinking water were reported to be €0.028 /m^3 in the 2006 IA)* • Reduced cost of dredging*(e.g. management costs are heavily dependent on the sediment quality and vary from €1 - 45 /m3)* • Potential for more productive commercial fisheries and aquaculture • Fostering research and innovation
Impacts – Social	• Reduced exposure to hazardous chemicals for humans both in case of occupational and recreational purposes • Improved quality of fish and shellfish in commercial fisheries and for recreational fishing • Improved amenity value of water bodies • Cleaner drinking water for livestock and reduced accumulation of hazardous chemicals in animal products • Reduced potential for accumulation of hazardous chemicals by crops
Impacts – Environmental	• Improved chemical status of water bodies • Improved aquatic biodiversity
Data availability	Description of associated costs for the new proposed PS is available in the accompanying IA

[193] Information in factsheet based on: EC [SEC(2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy;
EC [SWD(2012) 393 final] SWD The Fitness Check of EU Freshwater Policy
EEA (2012) European waters — current status and future challenges Synthesis

Document name	DIRECTIVE (2008/105/EC) on environmental quality standards in the field of water policy *and following amendment by* DIRECTIVE 2013/39/EU as regards priority substances in the field of water policy
Implementation progress	Still under implementation However, the chemical status of 40% of surface waters remains unknown, implying insufficient monitoring by Member States. Furthermore, effects of emerging pollutants are not yet known.
Monitoring system / techniques	Monitoring of the chemical status of water bodies at MS level
Relevance for CoNE case study?	This directive is relevant for the pharmaceutical residues issue (issue 5)
Reference	DIRECTIVE (2008/105/EC) on environmental quality standards in the field of water policy DIRECTIVE 2013/39/EU amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

Table 14: List of priority substances (PS) factsheet[194]

Document name	DECISION No 2455/2001/EC establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC
Level of implementation	EU
Year of entry into force	2001
Type of policy	Command & control
Area of focus	Surface waters
Main policy tool	RBMPs
Context	It addresses chemical pollution of surface water bodies
Objectives	To list the priority hazardous substances related to the WFD 2000/60/EC
Costs and benefits	• Costs: administrative burdens; investment costs • Benefits: improved water quality; improved public health; improved aquatic biodiversity
Impacts – Economic	• Uniform rules for industry in EU • Reduced cost of treatment for drinking and industrial process water • Potential for more productive commercial fisheries and aquaculture • Fostering research and innovation
Impacts – Social	• Reduced exposure to hazardous chemicals for humans both in case of occupational and recreational purposes • Improved quality of fish and shellfish in commercial fisheries and for recreational fishing • Improved amenity value of water bodies • Cleaner drinking water for livestock and reduced accumulation of hazardous chemicals in animal products • Reduced potential for accumulation of hazardous chemicals by crops
Impacts – Environmental	• Improved chemical status of water bodies • Improved aquatic biodiversity
Data availability	Quantitative estimate of surveillance cost of PS is available in 2011 IA
Implementation progress	Added as an Annex to the WFD 2000/60/EC
Monitoring system / techniques	Monitoring of the chemical status of water bodies on MS-level
Relevance for CoNE case study?	This list is of relevance to the pharmaceutical residues issue (issue 5)
Reference	DECISION No 2455/2001/EC establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC

[194] Information in factsheet based on: EC [SEC(2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy

Table 15: Floods Directive factsheet[195]

Document name	DIRECTIVE 2007/60/EC on the assessment and management of flood risks
Level of implementation	EU (providing guidelines) and MS (implementation)
Year of entry into force	2007
Type of policy	Command & control
Area of focus	Flood risks within river basins and coastal areas
Main policy tool	Flood risk management plans submitted to the EC
Context	Floods pose various threats to human lives, cultural heritage and the economy. The probability of flood events and related human and economic vulnerability have been increasing due to climate change and human activity.
Objectives	To establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity.
Costs	• Administrative burdens • Investment costs (*e.g. investment costs for NWRMs differ per measure and can range from €48/ha for buffer strips to around €783000 /ha for urban infiltration measures, while the annual O&M costs range from €2/ha for re-meandering measures to around €73000 /ha for the urban infiltration ones)*[196]
Benefits	• Lives saved; • Improved human health (less injuries or diseases); • Improved environmental quality • Improved resilience; • Economic benefits *(e.g. some estimations suggest that NWRMs bring flood protection benefits of around €740 million for the period 2010-2100)*
Impacts – Economic	• Reduce costs of flood damages *(e.g. economic damage from floods in EU are estimated at €6400 million/year for the period 2006-2010, while the total additional damage from climate change scenarios ranges €7700 – 15000 million/year)* • Reduce disruptive effects to the properties market, tourism and other business activities in affected area • Foster research and innovation
Impacts – Social	• Improved physical and psychological health of humans • Reduced number of casualties and injuries • Protected cultural heritage
Impacts – Environmental	• Improved water quality • adaptation to climate change effects • Safeguarding of biodiversity

[195] Information in factsheet based on: EC [SEC(2006) 66] SWD Annex to the Proposal for a DIRECTIVE(...)on the assessment and management of floods - Impact Assessment;
EC (2014) Implementation of the Floods Directive http://ec.europa.eu/environment/water/flood_risk/timetable.htm;
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

[196] A list of different NWRMs and their associated investment and O&M costs can be found in EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources, part 2, p.22

Document name	DIRECTIVE 2007/60/EC on the assessment and management of flood risks
Data availability	Quantification of flood costs and damages for the Rhine region and the UK in the accompanying IA. Estimates of investment and other costs of NWRMs are available in the IA accompanying the Blueprint.
Implementation progress	So far all Member States are on track with the transposition of the directive and the preliminary flood risk assessments. Member States are expected to submit flood risk management plans by December 2015.
Monitoring system / techniques	Monitoring on MS-level
Relevance for CoNE case study?	This directive is related to PoM issue (issue 1)
Reference	DIRECTIVE 2007/60/EC on the assessment and management of flood risks

Table 16: Water scarcity and droughts (WS&D) policy factsheet[197]

Document name	COM [(2007) 414] Addressing the challenge of water scarcity and droughts in the European Union *and the latest review* COM [(2012) 672)] Report on the Review of the European Water Scarcity and Droughts Policy
Level of implementation	EU (guidelines) and MS (adoption & implementation)
Year of entry into force	Various depending on related binding legislation
Type of policy	Guidelines for action
Area of focus	General
Main policy tool	Guidelines and proposed policy options in 7 areas: • Putting the right price tag on water • Allocating water and water-related funding more efficiently • Improving drought risk management • Considering additional water supply infrastructures • Fostering water efficient technologies and practices • Fostering the emergence of a water-saving culture in Europe • Improve knowledge and data collection. Member States are to include WS&D considerations in their RBMPs
Context	Water scarcity and droughts pose threats to human health and economic activity while the number of droughts in the EU has increased over the past 30 years
Objectives	To present policy options at EU, national and regional levels to address and mitigate the effects of water scarcity and droughts
Costs and benefits	• Costs: when policy action is taken - administrative burdens on MS-level; investment costson MS-level • Benefits: improved human health; improved quantitative status of water bodies; efficient use of resources
Impacts – Economic	• Reduce costs associated with water scarcity and drought effects *(e.g. scarcity costs for households, industry and tourism in Cyprus imply that the present value of total costs due to water shortages in the period 2010-2030 may reach €200 million (2009 prices))* • Internalise externality cost • Develop tourism sector and other business activities related to water bodies • Foster research and innovation related to sustainable water use
Impacts – Social	• Improved physical and psychological health of humans • Access to drinking and bathing water • Amenity value of bathing water sources • Recreational value of preserved biodiversity
Impacts – Environmental	• Improved quantitative status of water bodies • Mitigation of climate change effects • Safeguarding of biodiversity

[197] Information in factsheet based on: EC [SEC(2007) 993] SWD IMPACT ASSESSMENT Accompanying document to the COMMUNICATION (...) Addressing the challenge of water scarcity and droughts in the European Union;
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

Document name	COM [(2007) 414] Addressing the challenge of water scarcity and droughts in the European Union *and the latest review* COM [(2012) 672)] Report on the Review of the European Water Scarcity and Droughts Policy
	• Resource efficiency
Data availability	Economic costs of droughts; investment costs for some water-saving measures in accompanying IA as well as in IA accompanying the Blueprint
Implementation progress	Limited implementation related to all 7 areas. Meanwhile the EAA[198] reports that there is an imbalance in much of Europe's surface waters with water use often exceeding water availability and this leads to water stress across much of Europe. Water scarcity is reported for nearly all river basin districts in the Mediterranean area.
Monitoring system / techniques	Specific monitoring depending on policy option on MS-level
Relevance for CoNE case study?	This policy is related to issue 1 – PoM, issue 2 – reuse of waste water, issue 3 – ecodesign and water metering as well as issue 4 – economic instruments
Reference	COM [(2007) 414] Addressing the challenge of water scarcity and droughts in the European Union COM [(2012) 672)] Report on the Review of the European Water Scarcity and Droughts Policy

[198] EEA (2012) European waters — current status and future challenges Synthesis

Table 17: Drinking Water Directive (DWD) factsheet[199]

Document name	DIRECTIVE (98/83/EC) on the quality of water intended for human consumption
Level of implementation	EU (for minimum standards), MS (for implementation and monitoring)
Year of entry into force	1998
Type of policy	Command & control
Area of focus	Water intended for human consumption with certain exceptions
Main policy tool	MS Reports on the quality of the water intended for human consumption every 3 years
Context	Clean drinking water is vital for human health
Objectives	To protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean
Costs	• Administrative burdens; • Investment costs*(e.g. For treatment)* • Surveillance costs*(e.g. the 2011 PS IA has estimated that the overall cost of current monitoring of existing PS in the EU27 is on average €69 million per year)*
Benefits	• Improved human health • Improved water quality
Impacts – Economic	• Create level-playing field in the EU • Healthier and more productive population
Impacts – Social	• Improved human health • Reduced exposure to contaminants in water • Access to safe drinking water • Recreational value of preserved biodiversity
Impacts – Environmental	• Improved chemical status of water • Safeguarding of biodiversity
Data availability	No quantification of treatment costs found so far, costs of surveillance for PS is available in the PS IA.[200] Information on implementation is available in the periodical EC reports, the last being from 2014.
Implementation progress	Overall high compliance levels and hence high quality of water for human consumption. The compliance rates related to microbiological and chemical parameters for large suppliers are higher than 90% in most Member States, some achieving 99-100% compliance (only 3 Member States did not achieve such compliance for the chemical parameters). Compliance rates for small suppliers are lower with 6 Member States exhibiting compliance rates for these parameters below 90%.So far three 3-year derogations have been granted. Some issues which need to be addressed are: • Improve the water supply in remote areas and from small water suppliers • Achieve more cost-effective monitoring and parameter analysis • Consider new scientific information regarding chemicals and

[199]Information in factsheet based on: EC [COM(2014) 363 final] Synthesis Report on the Quality of Drinking Water in the EU examining the Member States' reports for the period 2008-2010 under Directive 98/83/EC

[200]EC [SEC(2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy

Document name	DIRECTIVE (98/83/EC) on the quality of water intended for human consumption
	contaminants • Improve consumer access to environmental information • Update derogation mechanisms and implementation timescales
Monitoring system / techniques	Monitoring stations on MS-level
Relevance for CoNE case study?	This directive is related to issue 1 – programmes of measures and issue 5 – pharmaceutical residue
Reference	DIRECTIVE (98/83/EC) on the quality of water intended for human consumption

Table 18: Bathing Water Directive (BWD) factsheet[201]

Document name	DIRECTIVE 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC
Level of implementation	EU (for minimum standards), MS (for implementation and monitoring)
Year of entry into force	2006
Type of policy	Command & control
Area of focus	Bathing water
Main policy tool	Yearly national and EU reports on the quality of bathing water
Context	The quality of bathing water needs to be monitored and protected
Objectives	To preserve, protect and improve the quality of the environment and to protect human health by complementing Directive 2000/60/EC with regard to bathing water
Costs	• Administrative burdens; • Investment costs *(e.g. for conventional waste water treatment the operational cost is on average €1.9/m3 and the capital investment is €474 – 593/m3 per day)* • Surveillance costs *(e.g. the 2011 PS IA has estimated that the overall cost of current monitoring of existing PS in the EU27 is on average €69 million per year)*
Benefits	• Improved human health • Improved water quality
Impacts – Economic	• Develop tourism sector and other business activities related to bathing water bodies
Impacts – Social	• Improved health of humans • Access to safe bathing water • Amenity value of bathing water sources • Recreational value of preserved biodiversity
Impacts – Environmental	• Improved chemical status of water bodies • Safeguarding of biodiversity
Data availability	Costs of surveillance for PS are available in the PS IA, costs for waste water treatment are available in the Blueprint IA.[202] Information on implementation is available in the periodical EC reports, the last being from 2014.
Implementation progress	In 2013: 94.7 % of all bathing waters in EU met the minimum water quality standards set by the BWD; 82.6 % of the bathing waters achieved “excellent quality” (or complying with the most strict 'guide' values)
Monitoring system / techniques	Monitoring of parameters on MS-level
Relevance for CoNE case	This directive is relevant for issue 1 - programmes of measures and issue 5 –

[201] Information in factsheet based on: EEA (2014) European bathing water quality in 2013

[202] EC [SEC(2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

Document name	DIRECTIVE 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC
study?	pharmaceutical residues
Reference	DIRECTIVE 2006/7/EC concerning the management of bathing water quality and repealing Directive 76/160/EEC

Table 19: Groundwater Directive (GWD) factsheet[203]

Document name	DIRECTIVE (2006/118/EC) on the protection of groundwater against pollution and deterioration
Level of implementation	EU (for guidance); MS (for implementation and monitoring)
Year of entry into force	2007
Type of policy	Command & control
Area of focus	Groundwater
Main policy tool	RBMPs - assessments of the status is published in the MS' RBMPs, which are reviewed by the EC
Context	The quality and quantity of groundwater in the EU needs to be protected from deterioration and chemical pollution
Objectives	• To establish specific measures to prevent and control pollution of groundwater • To complement the WFD on the provisions preventing or limiting inputs of pollutants
Costs	• Administrative burdens • Investment costs • Surveillance costs *(e.g. the 2011 PS IA has estimated that the overall cost of current monitoring of existing PS in the EU27 is on average €69 million per year)*
Benefits	• Improved water quality and quantity • Improved human health
Impacts – Economic	• Create a level-playing field within the EU • Reduce costs of water scarcity and shortages
Impacts – Social	• Access to safe drinking water • Reduced exposure to hazardous chemicals for humans and animals • Reduced probability of chemical absorption by crops
Impacts – Environmental	• Improved chemical status of groundwater • Improved quantitative status of groundwater
Data availability	No detailed quantification of costs found so far – costs of surveillance for PS are available in the PS IA.[204] Information on implementation is available in the 2010 EC report and SWD.
Implementation progress	26 Member States have reported on the establishment of threshold values in the required format. Drinking water standards were most frequently reported as basis of threshold values, either laid down in the EU DWD or respective international or national standards. More than half of the Member States (56 %) also considered environmental quality objectives – international (e.g. EQS Directive) or national standards. By area, about 25 % of groundwater across Europe is in poor chemical status. From the total number of groundwater bodies reported in the RBMPs 6.4 % are classified as being in poor quantitative status. Poor groundwater status is distributed

[203]Information in factsheet based on: EC [SEC(2010) 166 final] SWD accompanying the Report from the Commission in accordance with Article 3.7 of the Groundwater Directive 2006/118/EC on the establishment of groundwater threshold values
EEA (2012) European waters — current status and future challenges Synthesis
[204]EC [SEC(2011) 1547 final] SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy

Document name	DIRECTIVE (2006/118/EC) on the protection of groundwater against pollution and deterioration
	throughout several countries, namely Belgium, Cyprus, the Czech Republic, Denmark, Italy, Malta, and the United Kingdom. Nonetheless, by 2015, almost 90% of groundwater bodies is forecasted to be in good chemical status and 96 % - in good quantitative status.
Monitoring system / techniques	The status of groundwater bodies is monitored on MS-level
Relevance for CoNE case study?	This directive is relevant for issue 1 – PoM, issue 5 – pharmaceutical residues
Reference	DIRECTIVE (2006/118/EC) on the protection of groundwater against pollution and deterioration

Table 20: Nitrates Directive factsheet[205]

Document name	DIRECTIVE (91 /676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources
Level of implementation	EU for standards, MS for implementation and monitoring
Year of entry into force	1991
Type of policy	Command & control
Area of focus	General
Main policy tool	4-yearly reports by Member States and a synthesis report by the EC
Context	The nitrate content of water bodies has been increasing and the main cause of pollution from diffuse sources in the EU surface and ground waters is nitrates from agricultural sources
Objectives	• To reduce water pollution caused or induced by nitrates from agricultural sources • To prevent further such pollution
Costs	• Administrative burdens*(e.g. the administrative burden that the reporting cycles of the Nitrates Directive is not synchronised with the WFD)* • Investment costs
Benefits	• Improved environmental quality • Preserved biodiversity
Impacts – Economic	• Reduce cost of water treatment • Create level-playing field
Impacts – Social	• Access to safe drinking water • Increase amenity value of water bodies • Recreational value of preserved biodiversity
Impacts – Environmental	• Improved chemical status of water bodies • Mitigation of climate change effects • Safeguarding of biodiversity
Data availability	No quantification of costs found so far. Information on implementation is available in the periodical EC reports, the last being from 2013[34].
Implementation progress	The pressure from agriculture has decreased, although not uniformly, in the period 2008–2011 compared to 2004–2007 regarding the numbers of cattle, pigs and sheep and remained stable regarding poultry. At the same time, the consumption of chemical fertilizers has decreased, continuing its long-term trend. Monitoring of water quality has improved, with an increase in the total number of monitoring stations for groundwater and surface water. Of all reported groundwater stations, 14.4% exceeded the threshold of 50 mg/l nitrates and 5.9% were between 40 and 50 mg/l nitrates, indicating a slight improvement compared to the previous reporting period. Nevertheless, further decrease of pollution is needed. Another challenge is posed

[205]Information in factsheet based on: EC [COM(2013) 683 final] REPORT (...) on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2008–2011;
EC [SWD(2012) 382 final] SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources

Document name	DIRECTIVE (91 /676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources
	by the lack of synchronisationbetween the reporting periods under the Nitrates directive and the RBMPs of the WFD.
Monitoring system / techniques	Monitoring stations on MS-level
Relevance for CoNE case study?	This directive is relevant for issue 1 – programmes of measures
Reference	DIRECTIVE (91 /676/EEC) concerning the protection of waters against pollution caused by nitrates from agricultural sources

Annex B – Stakeholders interviewed

- **European Environmental Bureau,** Pieter de Pous (Policy Director) and Stephane Arditi (Senior Policy Officer: Waste & Products)
- **EurEau,** Carl-Emil Larsen (President) and Bruno Tisserand (Chair of Commission on Wastewater)
- **Ecologistas en Acción,** Santiago Martin Barajas et al. in writing
- **Scottish Environment Protection Agency,** Peter Pollard
- **European Federation of Pharmaceutical Industries and Associations,** Dr Bengt Mattson, Co-Chair PIE taskforce
- **Peter Gammeltoft,** Former Head of Unit Water in DG Environment of the European Commission
- **Eduard Interwies,** consultant involved in Blueprint
- **Thomas Dworak,** consultant involved in Blueprint
- **Axel Singhofen,** Advisor of the Greens / European Free Alliance in the European Parliament
- **Pierre Strosser,** Acteon

The European Chemical Industry Council (CEFIC)) and the European Association of Metals (EUROMETAUX), were invited for interviews, but were not available for interviews during the study time frame.

Annex C - Bibliography

Author	Year	ref. code	Title
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Acteon	2012		Gap Analysis of the Water Scarcity and Droughts Policy in the EU, Final Report
Arcadis	2012	Project number 11589 | February 2012	The role of water pricing and water allocation in agriculture in delivering sustainable water use in Europe – FINAL REPORT European Commission
Arcadis	2012		Comparison of cost price of water/ waste water/ rain water for users in different EU Member States;
Bio Inteligence Service	2013		Study on the environmental risks of medicinal products, FINAL REPORT, prepared for Executive Agency for Health and Consumers
Bio Inteligence Service	2012		Water saving potential in agriculture in Europe: findings from the existing studies and application to case studies - Final Report
Bio Inteligence Service& Cranfield University	2009		Study on water efficiency standards, Final Report
Bixio, D. et al.	2006		Wastewater reuse in Europe
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Danish Government	2013		Protect water, nature and human health: Pesticides strategy 2013-2015
DEFRA	2014		Water efficient enhanced capital allowances from https://www.gov.uk/government/publications/water-efficient-enhanced-capital-allowances
DEFRA - Walker, A.	2009		The Independent Review of Charging for Household Water and Sewerage Services, Final report from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69459/walker-review-final-report.pdf

Author	Year	ref. code	Title
De Stefano	2010		*Facing the water framework directive challenges: A baseline of stakeholder participation in the European Union*. Journal of Environmental Management. Volume 91, Issue 6, June 2010, Pages 1332–1340
Dickson, M and J.P. Gagnon	2009		The cost of new drug discovery and development. Discovery Medicine, June 09, 2009
E3Mlab	2014		Development and evaluation of long-term scenarios for a balanced European climate and energy policy until 2030
Ecologic	2007		EU Water saving potential (Part 1 –Report)
EC	2014		Agriculture and rural development webpage: http://ec.europa.eu/agriculture/index_en.htm
EC	2014		Economic assessment of the Ebro Water Transfer – ES webpage: http://ec.europa.eu/ourcoast/index.cfm?menuID=7&articleID=18
EC	2014		Background document to the Public Consultation on Policy Options to optimise Water Reuse in the EU
EC	2014	COM(2014) 363 final	Synthesis Report on the Quality of Drinking Water in the EU examining the Member States' reports for the period 2008-2010 under Directive 98/83/EC
EC	2014		Implementation of the Floods Directive, homepage http://ec.europa.eu/environment/water/flood_risk/timetable.htm
EC	2014	COM(2014) 398 final/2	Communication (…)Towards a circular economy: A zero waste programme for Europe
EC	2014		2030 Framework for Climate and Energy: Outcome of the October 2014 European Council, presentation, available at: http://ec.europa.eu/clima/policies/2030/docs/2030_euco_conclusions_en.pdf
EC	2013	COM(2013) 249 final	COMMUNICATION (...) Green Infrastructure (GI) — Enhancing Europe’s Natural Capital
EC	2013	SWD(2013) 155 final	SWD Technical information on Green Infrastructure (GI) Accompanying the document COMMUNICATION (...) Green Infrastructure (GI) — Enhancing Europe’s Natural Capital
EC	2013	COM(2013) 574 final	(...) Seventh Report on the Implementation of the Urban Waste Water Treatment Directive (91/271/EEC)
EC	2013	COM(2013) 683 final	REPORT (...) on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2008–2011
EC	2013		Resource and Economic Efficiency of Water Distribution Networks in the EU, Final Report
EC	2012	SWD(2012) 382 final	SWD IMPACT ASSESSMENT Accompanying the document COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources
EC	2012	COM(2012) 673 final	COMMUNICATION (...) A Blueprint to Safeguard Europe's Water Resources
EC	2012	SWD(2012) 393 final	SWD The Fitness Check of EU Freshwater Policy

Author	Year	ref. code	Title
EC	2012	COM(2012) 670 final	REPORT FROM THE COMMISSION (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans
EC	2012	SWD(2012) 379 final	SWD European Overview (1&2) Accompanying the document REPORT (...) on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans
EC	2012	COM(2012) 672 final	COMMUNICATION (...) Report on the Review of the European Water Scarcity and Droughts Policy
EC	2012	SWD(2012) 434 final	SWD Establishment of the Working Plan 2012-2014 under the Ecodesign Directive
EC	2012	COM(2012) 765 final	REPORT (...) Review of Directive 2009/125/EC (...) establishing a framework for the setting of ecodesign requirements for energy-related products (recast)
EC	2011	SEC(2011) 1547 final	SWD IMPACT ASSESSMENT (...) as regards priority substances in the field of water policy
EC	2011		EC (DG Environment) Technical Support for the Impact Assessment of the Review of Priority Substances under Directive 2000/60/EC Substance assessment: Diclofenac
EC	2011		EC (DG Environment) Technical Support for the Impact Assessment of the Review of Priority Substances under Directive 2000/60/EC Substance assessment: 17 beta estradiol
EC	2011		EC (DG Environment) Technical Support for the Impact Assessment of the Review of Priority Substances under Directive 2000/60/EC Substance assessment: 17 alpha ethinylestradiol
EC	2011		EC (DG Environment) Technical Support for the Impact Assessment of the Review of Priority Substances under Directive 2000/60/EC Substance assessment: Ibuprofen
EC	2011	SEC(2011) 338 final	SWD Accompanying document to the Third Follow up Report to the Communication on Water Scarcity and Droughts in the European Union COM (2007) 414 final
EC	2011	COM(2011) 571 final	Roadmap to a Resource Efficient Europe
EC	2011	COM(2011) 21	Communication (…)A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy
EC	2010	SEC(2010) 1357 final	SWD SUMMARY OF THE IMPACT ASSESSMENT Accompanying document to the Draft Commission Regulation (...) with regard to ecodesign requirements for household dishwashers
EC	2010		SWD SUMMARY OF THE IMPACT ASSESSMENT Accompanying document to the Draft Commission Regulation (...) with regard to ecodesign requirements for household washing machines
EC	2010	SEC(2010) 166 final	SWD accompanying the Report from the Commission in accordance with Article 3.7 of the Groundwater Directive 2006/118/EC on the establishment of groundwater threshold values
EC	2010	COM(2010)228 final	REPORT (...) Second Follow-up Report to the Communication on water scarcity and droughts in the European Union COM (2007) 414 final

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EC	2009	COM(2009) 156 final	REPORT FROM THE COMMISSION (...) in accordance with article 18.3 of the Water Framework Directive 2000/60/EC on programmes for monitoring of water status
EC	2009	SEC(2009)415	SWD accompanying the Report from the Commission (...) on programmes for monitoring of water status
EC	2008	COM(2008) 660 final	COMMUNICATION (...) Establishment of the working plan for 2009-2011 under the Ecodesign Directive
EC	2007	COM(2007) 128 final	COMMUNICATION (...) Towards sustainable water management in the European Union - First stage in the implementation of the Water Framework Directive 2000/60/EC
EC	2007	SEC(2007) 362	SWD Accompanying (...) the COMMUNICATION (...) 'Towards Sustainable Water Management in the European Union' First stage in the implementation of the Water Framework Directive 2000/60/EC
EC	2007	COM(2007) 414 final	COMMUNICATION (...) Addressing the challenge of water scarcity and droughts in the European Union
EC	2007	SEC(2007) 993	SWD IMPACT ASSESSMENT Accompanying document to the COMMUNICATION (...) Addressing the challenge of water scarcity and droughts in the European Union
EC	2006	SEC(2006) 66	SWD Annex to the Proposal for a DIRECTIVE(...)on the assessment and management of floods - Impact Assessment
EC	2005	CIS Guidance document 14	Guidance on the intercalibration process 2004 - 2006
EC - OIE & Ecologic	2005		Evaluation of the impact of floods and associated protection policies, Final Report
EC	2004	COM(2004)472 final	COMMUNICATION (...) Flood risk management: Flood prevention, protection and mitigation
EC	2004	CIS info sheet	Common Implementation Strategy Working Group 2B: Drafting Group ECO1 Information Sheet on Assessment of the Recovery of Costs for Water Services for the 2004 River Basin Characterisation Report (Art 9)
EC	2003	CIS Guidance document 13	Overall approach to the classification of ecological status and ecological potential
EC	2003	CIS Guidance document 10	River and lakes – Typology, reference conditions and classification systems
EC	2003	CIS Guidance document 6	Towards a guidance on establishment of the intercalibration network and the processon the intercalibration exercise

Author	Year	ref. code	Title
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