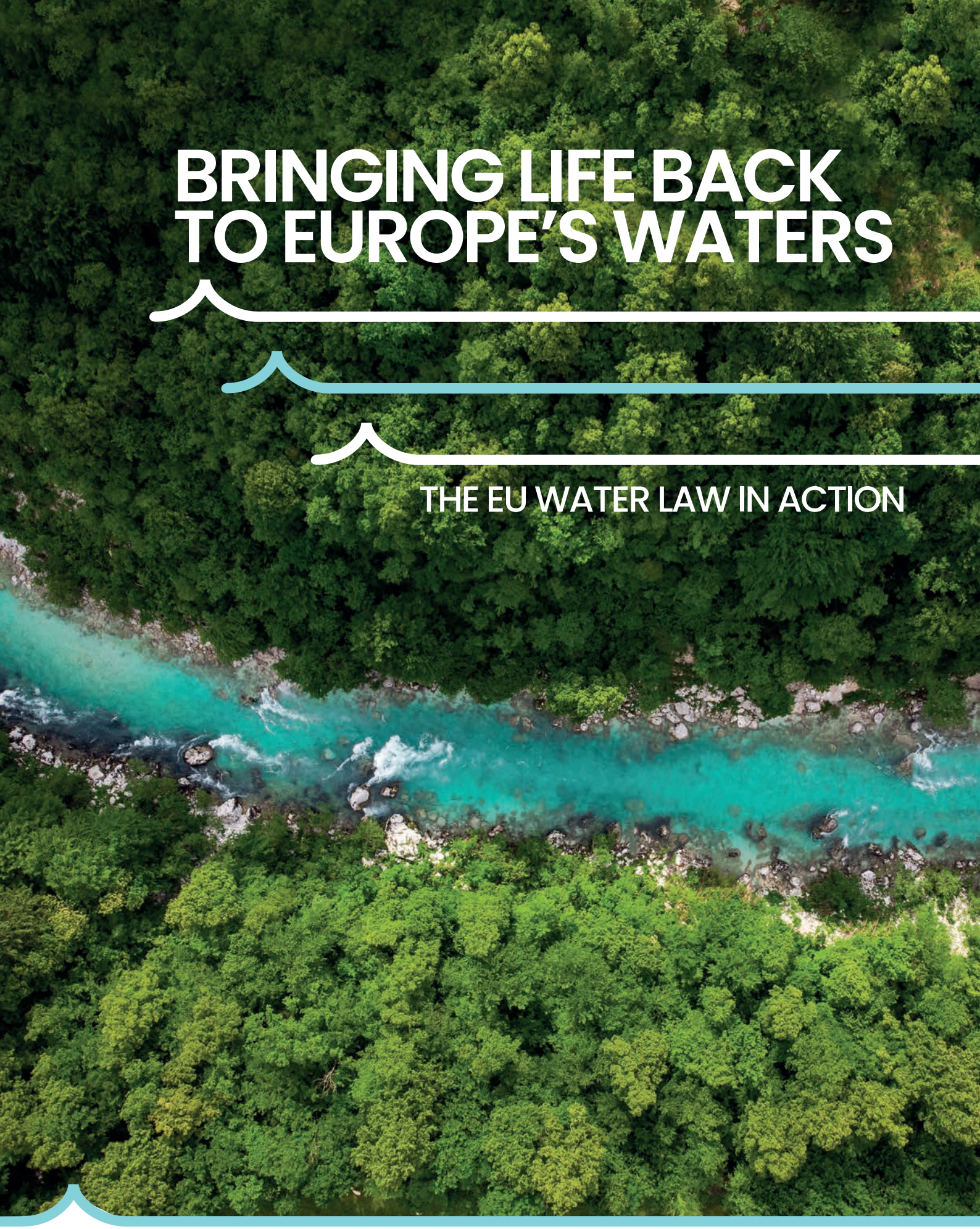


BRINGING LIFE BACK TO EUROPE'S WATERS

THE EU WATER LAW IN ACTION

WWF

EEB
European
Environmental
Bureau

ERN
EUROPEAN
RIVERS
NETWORK

EAA
European Anglers Alliance

About WWF

WWF is one of the world's largest and most experienced independent conservation organisations, with over 30 million followers and a global network active in nearly 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable and promoting the reduction of pollution and wasteful consumption. The European Policy Office contributes to the achievement of WWF's global mission by leading the WWF network to shape EU policies impacting on the European and global environment.

About EEB

The EEB is Europe's largest network of environmental citizens' organisations. We bring together around 140 civil society organisations from more than 30 European countries. We stand for sustainable development, environmental justice & participatory democracy.

About EEA

The European Anglers Alliance (EAA) is a pan-European organisation for recreational angling. Its mission is to safeguard the fish stocks and fisheries of Europe, and to protect the interests of all those who fish with rod and line for recreational purposes. There are about 3 million affiliated members to EAA's 18 member organisations and affiliates (2014) from 17 European nations.

About ERN

The European Rivers Network (ERN) seeks to promote the sustainable management of living European rivers and water, as opposed to the exploitation, pollution and degradation that has occurred in the past. Founded in France in 1994, ERN aims to link groups, organisations and people in the fifty major rivers basins in Europe to improve communication (environment, culture, education and human rights) to protect and restore the basic equilibrium of rivers and aquatic environments. ERN implements its own projects in French and transboundary rivers in Western Europe.

Lead authors: Martina Mlinaric (WWF-EU) and Jack Rhodes
Edited by: Barney Jeffries
Communications: Sophie Bauer (WWF-EU)
Design: www.dougdawson.co.uk

Special thanks go to the following organisations and individuals for contributing to this report:
WWF-Austria, WWF-Germany, WWF-Netherlands, WWF-Poland, WWF-Romania, WWF-Spain, WWF-UK, WWF Danube-Carpathian Programme Office, Terra Cypria, Mediterranean SOS Network, The South East Rivers Trust/The Wandle Trust, Mr Józef Jeleński, European Anglers Alliance, European Environmental Bureau, European Rivers Network.

© Text 2018 WWF. All rights reserved.
Cover photo: © iStockphoto.com/merc67

This publication has been produced with the financial assistance of the European Union. The content of this publication is the sole responsibility of EEA, EEB, ERN and WWF and can under no circumstances be regarded as reflecting the position of the European Union.

CONTENTS

Executive Summary 4
Introduction 8

1. Agriculture 12
2. Hydropower 19
3. Navigation 29
4. Manmade pressures and nature-based solutions 33
5. Wastewater treatment 41
6. Cost recovery – water pricing 46

Conclusion 54
Glossary 56

EXECUTIVE SUMMARY

Healthy freshwater ecosystems are essential for nature, for society and for economies. Yet not even half the waters in the EU are considered to be healthy. The latest assessment of the European Environmental Agency indicates that only about 40 per cent of Europe's surface waters reach good ecological status and 38 per cent good chemical status.

The EU Water Framework Directive (WFD), agreed by EU governments in 2000, is a holistic piece of legislation that aims to achieve good status of Europe's freshwater bodies by 2027 at the latest. It requires the protection, enhancement and restoration of our rivers, streams, lakes, wetlands, and transitional and coastal waters, to ensure no deterioration, and to achieve good status, where the benefits of doing so exceed the cost.

To achieve these goals, efforts and resources for better implementation and enforcement of the WFD will have to be significantly stepped up. Currently, Member States show little ambition. However, where political will exists, the WFD provides an effective framework for addressing the main pressures facing freshwater ecosystems. These include:

Agriculture: A quarter of EU surface waters fail to meet WFD targets as a result of fertiliser, pesticide and sediment pollution from farms. No Member State has addressed agricultural pollution effectively, despite evidence that the benefits of doing so often exceed costs and the availability of adequate funding through various EU mechanisms. However, cases exist of basic and supplementary measures being introduced and enforced to address issues such as nitrogen pollution.

Hydropower: Europe has more than 25,000 hydropower plants, which result in loss of connectivity, altered water flow and changes in sediment transport. In order to meet WFD objectives, some Member States have introduced new pre-planning instruments to limit hydropower development, installed mitigation measures such as fish passes, and begun removing obsolete dams.

Navigation: Europe's waterways have been used for navigation throughout history, and have been shaped by locks, barrages, groynes, dredged channels and reinforced banks. However, meeting WFD requirements can spur the removal or redesign of outdated navigational infrastructure in ways that benefit navigation and the natural environment.

Flood prevention, land drainage and other changes to natural characteristics: Europe's rivers, lakes and coasts have been modified for centuries through features such as weirs, reinforced banks, dams, diversions and dredged channels. Hydromorphological pressures affect 40 per cent of Europe's surface water bodies, and 17 per cent are designated as heavily modified or artificial. Complying with the WFD is raising interest in river restoration and nature-based solutions.

Wastewater: The WFD and the associated Urban Waste Water Treatment Directive have proven effective in removing raw sewage and other wastewater from rivers, lakes and coasts across the continent. Even so, wastewater pollution continues to affect 15 per cent of EU water bodies.

The WFD also plays a major role in furthering the use of **economic instruments** in water management. It requires fairer water pricing that recovers the costs (financial, environmental and resource costs) of water services. Despite some positive results, water pricing policies have not been fully or adequately implemented and hence have had a limited impact on the freshwater environment to date.

© Tomas Hulik

AGRICULTURE

Agricultural pollution prevents a quarter of all surface waters in the EU from meeting good ecological status.

HYDROPOWER

More than 25,000 hydropower dams disrupt Europe's rivers and their natural dynamics – and more are planned.

NAVIGATION

Removing and redesigning infrastructure can support river transport while benefiting the natural environment.

NATURE-BASED SOLUTIONS

Forty per cent of Europe's surface water bodies have been modified, but restoration through nature-based solutions and dam removal is possible.

WASTEWATER TREATMENT

Despite significant improvements, wastewater pollution continues to affect 15 per cent of EU water bodies.

WATER PRICING

Pricing schemes need to cover environmental and resource costs of water services and reflect the polluter/user pays principle to drive change in the behaviour of users and polluters.

Recommendations

The European Commission is currently carrying out a fitness check of the WFD, its two 'daughter' directives (Groundwater Directive and Environmental Quality Standards Directive) and the Floods Directive. The Member States and the Commission should use this opportunity to strengthen the implementation of the EU legal framework for water protection in order to meet the ultimate 2027 deadline, and not look for ways to weaken the framework. The following recommendations outline some of the actions Member States and the Commission need to take to ensure no further deterioration occurs and that the majority of water bodies in the EU achieve good status by 2027.

- Member States should develop more effective and ambitious third-cycle river basin management plans (2021-2027) and associated programmes of measures to bring European waters to good status by 2027.
- Member States should significantly restrict their use of exemptions to exceptional cases only. To uphold the purpose and effect of the WFD, the European Commission should use enforcement measures to facilitate significant reduction in the use of exemptions.
- Member States should strictly apply the non-deterioration principle and precautionary approach. They must protect remaining free-flowing, unaltered and clean stretches of rivers for their biodiversity and ecological values and not leave them open to further hydropower development and modifications for inland navigation.
- Member States should increase the uptake of nature-based solutions and dam removal to ensure that freshwater biodiversity can spread back into degraded areas.
- Member States should apply in full the 'polluter/user pays principle' in line with the WFD, ensuring that water pricing reflects the true value of water and that all users, including agriculture, contribute to the full costs of water services in a more equitable way, The European Commission should take prompt and effective enforcement actions to ensure introduction of adequate water pricing.
- Member States should improve transparency and enable effective public participation in river basin management planning and application of exemptions (e.g. Article 4.7 WFD).
- Member States and the European Commission should ensure coherence between management and conservation of water ecosystems and relevant sectoral policies (most notably energy, agriculture, transport, flood management).
- Member States and the Commission should improve procedures and introduce effective tools for preventing, detecting and sanctioning breaches of established water and conservation laws.

INTRODUCTION

Healthy freshwater ecosystems are essential for nature, for society and for economies. They provide a source of essential fresh water, which is becoming increasingly scarce as the human population grows and the effects of climate change on water cycles take hold. Beyond this, they deliver many important services, such as flood protection, carbon sequestration, groundwater recharge, water purification, food provision and shoreline stabilisationt. They are, however, being undervalued and hence heavily degraded, with freshwater species declining at a faster rate than those in any other ecosystem.1

The situation in the EU is dire. Freshwater ecosystems face numerous pressures: pollution from agriculture and industry, over-abstraction of aquifers and rivers, and changes to the natural and physical conditions of rivers and other freshwater bodies due to hydropower, navigation, agriculture and flood management. As a result, not even half of all European waters are considered to be healthy. The latest assessment of the European Environmental Agency (EEA) indicates that only about 40 per cent of Europe's surface waters reach good ecological status and 38 per cent good chemical status; ground waters are generally faring better, with 74 per cent in good chemical status and 89 per cent in good quantitative status, but problems in some basins are still severe.i

The EU Water Framework Directive (WFD), which was agreed by EU governments in 2000, is a holistic piece of legislation that aims to achieve good status of Europe's freshwater bodies by 2027 at the latest. It requires the protection, enhancement and restoration of our rivers, streams, lakes, wetlands, and transitional and coastal waters, to ensure no deterioration, and to achieve good status, where the benefits of doing so exceed the cost. Although complex and not always easy to understand, the WFD revolves around the key idea that we must conserve our freshwater ecosystems if we are to secure a sufficient supply of good quality water for humans and nature in the future.

With its ambitious and innovative approach to water management the WFD aims for a shift from fragmented policies to a holistic approach, integrating all parts of the wider environmental system. One significant innovation is the introduction of river basin districts. The WFD calls for a single system of water management within the natural geographical and hydrological unit of a river's catchment area, rather than according to administrative or political boundaries. Each district should have a river basin management plan (RBMP), developed and delivered through cooperation with multiple stakeholders, sometimes across national borders. RBMPs are required to be updated every six years; districts in the EU are currently on their second planning cycle.

1. Populations of freshwater species fell by 81 per cent between 1970 and 2012, compared to 38 per cent and 36 per cent for terrestrial and marine specie respectively. *See WWF. 2016. Living Planet Report 2016. Risk and resilience in a new era. WWF International, Gland, Switzerland.*

Good status

The WFD aims to achieve "good status" for all ground and surface waters in the EU. Surface waters are assessed on their ecological status and chemical status, while groundwater bodies are assessed on their quantitative status and chemical status.

Ecological status is assessed according to a number of quality elements, including:

- Biological quality (e.g. fish, invertebrates, aquatic plants)
- Hydromorphological quality (e.g. riverbank structure, connectivity, riverbed structure, flow)
- Physicochemical quality (e.g. temperature, pH, oxygenation, nutrient concentrations).

For a water body to achieve good ecological status, these quality elements should show only a slight change from natural conditions as a result of human activity. It should be able to provide all the expected benefits to humans, and support all but the most sensitive wildlife. The directive also specifies a five-point scale for surface water quality: high (undisturbed or almost undisturbed natural conditions), good, moderate, poor or bad ecological status. If water bodies have undergone significant hydromorphological changes or were created artificially, the WFD allows Member States under certain conditions to designate such surface water bodies as heavily modified or artificial with the environmental objective being "good potential" rather than status.

Chemical status is based on concentrations of specific chemical pollutants. Water bodies cannot achieve good ecological status if any of these concentrations is exceeded.

The WFD represents an effective, flexible and modern piece of EU law embedding principles of integrated river basin management into the legal framework governing water management in the EU Member States as well as neighbouring countries. The WFD also has an impact on water management globally, serving as a reference tool for global work on water management and a template for water protection legislation.

For the ultimate 2027 goal to be achieved, however, efforts and resources for better implementation and enforcement of the WFD will have to be significantly stepped up. Currently, Member States show little ambition in implementing the WFD. This is evident in ineffective RBMPs, programmes of measures that are poorly delivered,[ii] insufficient funding allocated to implement control measures, and excessive use (and misuse) of various types of exemptions provided within the WFD.

The European Commission is currently carrying out a fitness check of the WFD, its two 'daughter' directives (Groundwater Directive and Environmental Quality Standards Directive) and the Floods Directive, as well as evaluating other pieces of water legislation such as the Urban Waste Water Treatment Directive. The goal is to assess the performance of the EU water legislation, and more specifically its effectiveness, efficiency, coherence, relevance and added value.

This report sets out to demonstrate how the WFD is being used to address the main water pressures in the EU. These include diffuse and point source pollution from agriculture, households and industry, and changes to the water flow and physical characteristics (hydromorphology) of rivers as a result of hydropower, navigation, flood management and other drivers. Case studies show how various Member States are addressing, or beginning to address, these pressures, as well introducing economic measures such as pricing schemes that cover the full costs of water management.

Each chapter also includes recommendations for Member States and the European Commission, drawing on lessons learned from the case studies and our wide-ranging work on water issues across the EU. These recommendations outline key measures for strengthening implementation in order to achieve the objectives of the WFD, ensuring that our waters continue to provide vital services for people and nature.


© iStockphoto.com /wmaster890

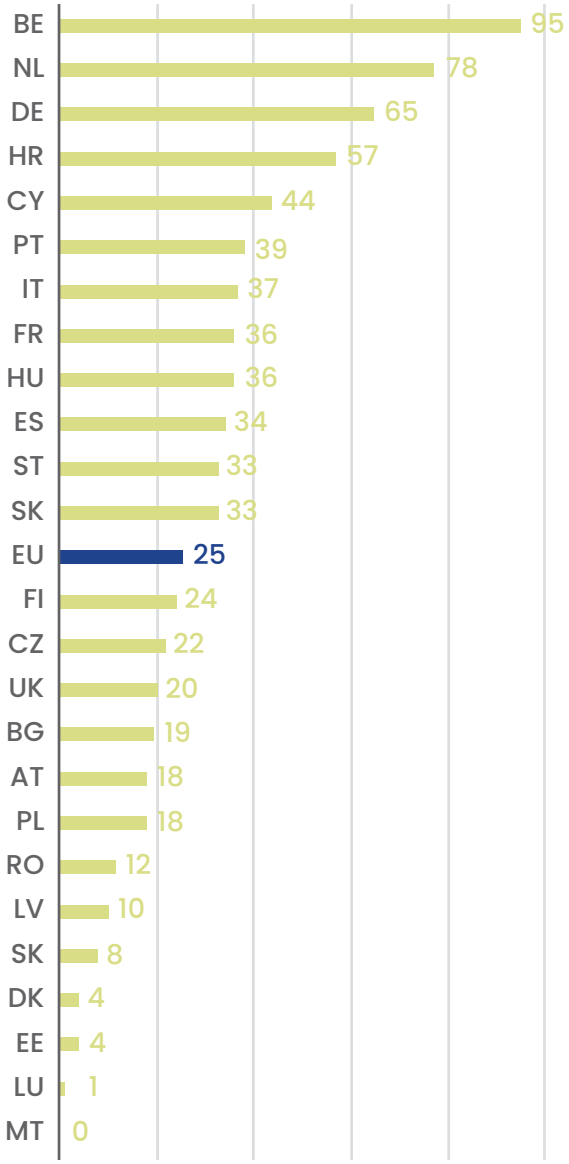
1 AGRICULTURE

Pollution from agriculture remains one of the core pressures on Europe's water bodies. A quarter of EU surface waters fail to meet WFD targets as a result of fertiliser, pesticide and sediment pollution from farms. This figure is considerably higher in some Member States, reaching 95 per cent in Belgium. However, figures vary widely between states with similar agricultural systems, suggesting inconsistent monitoring regimes.

Abstraction for agriculture remains a significant pressure in the EU, changing the flow regime of many river basins and lowering groundwater levels. It is especially problematic in the Mediterranean climate, often pushing Member States into situations of water scarcity. Current planned measures to address over-abstraction and ensure the long-term sustainability of abstraction are inadequate.[iii]

Similarly, no Member State has addressed agricultural pollution effectively, despite evidence that the benefits of doing so often exceed costs and the availability of adequate funding through various EU mechanisms. Elements of good practice do however exist across many Member States. Collectively, the examples outlined in the following case studies cover each step set out in the WFD: the identification of targets, of basic and supplementary measures, and of appropriate funding. Together they demonstrate that a proportionate and effective response is possible, and start to provide a toolkit for achieving one.

Percentage of surface waters failing due to agricultural pollution



Data from EEA WISE (2018)
NB Data not yet reported by EL, IE, LT

Sustainable funding

The Common Agricultural Policy (CAP) is the main EU funding stream for agriculture, and the current framework explicitly provides funding to cover all measures under the WFD. Pillar I provides direct payments to farmers, which depend on maintaining land in good agricultural and environmental condition and on good soil management. Pillar II – the EU rural development policy – complements this by supporting rural areas to meet economic, social and environmental challenges; relevant measures include Measure 12.3, which provides for additional payments for river basin management.

The European Court of Auditors found significant shortfalls in the use of CAP funding to support WFD measures.[iv] Measure 12.3 has only been applied in France, Luxembourg and parts of Italy – and budget allocations have been low even in these countries.[v]

The use of Measure 10 – for agri-environment-climate measures – is more common and substantial funding has been allocated to WFD measures in this way. For example, the current English RBMPs use it to allocate £300 million per year to WFD measures. This covers 85 per cent

of the cost of agricultural measures; farms are expected to contribute the remaining £50 million annual cost for new infrastructure that will benefit them financially.

Funding is also available through other routes, most notably investment by public water suppliers to improve raw water quality. This has financed substantial programmes to address agricultural pollution in some Member States. While these have proven effective and economically beneficial, they also raise ethical issues by requiring public water customers to remedy pollution from private farms.

Establishing basic measures

The WFD relies on "basic measures" to address widespread threats to the water environment. These are defined in Article 11(3) as minimum requirements to meet all Community water legislation, including the Drinking Waters, Bathing Waters and Nitrates Directives which protect coastal and drinking waters from pollution. Basic measures are designed to control critical activities that may damage the water environment and should be the foundation for preventing agricultural pollution, but few Member States have comprehensively implemented them.[2]

2. See for example the European Court's ruling (case c-543/16) that Germany is failing to prevent manure and other agricultural nitrates from polluting water courses, in breach of the Nitrates Directive.

© Global Warming Images / WWF

Basic measures in Scotland

Scotland is enforcing new rules to protect the freshwater environment as a condition of receiving CAP subsidies.

Enforcement offices have walked

5,000km

of Scottish riverbank

In Scotland, basic measures have been established through the Controlled Activities Regulations. These cover all activities that pose a risk to the water environment, including agricultural ones. The Regulations are designed to be proportionate and to minimise administrative effort. For lower-risk activities the regulations provide simple rules ("general binding rules") based on widely accepted standards of good practice. Higher-risk activities such fish farming or the disposal of waste sheep dip to land require those responsible to notify the competent authority, the Scottish Environment Protection Agency (SEPA), or obtain prior authorisation through a permit. SEPA has provided detailed guidance, training events and demonstration farms. Basic measures are not directly compensated – instead they have been made a condition of receiving CAP subsidies, through cross-compliance.

General binding rules are currently in place that cover:

- storage and application of fertilisers, pesticide and sheep dips
- keeping of livestock
- cultivation of land
- discharge of water from fields into water bodies
- construction and maintenance of roads and tracks.

In each case rules are simple to understand and appropriate to the user: for example the rules for discharges from fields stipulate simply that they must not erode riverbanks, contain sewage, or cause any visible discolouration or foaming, and that field drains and any facilities in place to prevent pollution (such as silt traps) must be well maintained.

A small team of SEPA staff has walked 5,000km of Scottish riverbank to enforce the regulations, concentrating on the catchments at greatest risk of failing WFD targets. This has uncovered widespread agricultural breaches – one every kilometre on average – but has also led to substantial improvements. Only 34 per cent of farms met the general binding rules during the first RBMP cycle, but this had risen to 57 per cent in the second cycle[vi] Where farmers have received advice, 85 per cent of farms are compliant on the second visit, and 98 per cent by the third visit – when financial penalties are possible.

Widespread improvements in WFD status are expected as good practice becomes commonplace.

Implementing the Nitrates Directive in Jucar river basin, Spain

Basic measures to control nitrate pollution have recently been put in place across the Jucar river basin in eastern Spain.

The Jucar river basin district's second RBMP found that 64 per cent of surface waters and 31 per cent of ground waters were affected by diffuse pollution – a figure considerably higher than the national average. This was in most cases nitrate pollution, which had contaminated 28 of the district's aquifers.

To address this problem the competent authorities for water and agriculture have enforced an area-specific code of good practice for fertiliser use, and a mandatory action plan for designated nitrate vulnerable zones. These have been designed to reduce nitrate concentrations to safe levels, and their requirements are based on specific modelling of the polluted aquifers. This should enable the district to meet the objectives of the WFD and the Nitrates Directive.

Measures were introduced in March 2018. Early monitoring results suggest pollution is being halted in around two-thirds of surface water bodies (178 of 276), though to date improvements have been recorded in only a small proportion (17 of 276, or 8.5 per cent of sampling points). No improvements are visible yet in groundwater bodies; however, the trend of ever-increasing pollution seem to have been halted. Aquifers are often slow to recover from contamination, so the long-term results should be more positive. However, if continued monitoring shows no further recovery then revisions to the mandatory action plan may be needed.

64%
of surface waters and
31%
of ground waters in Jucar river basin were affected by diffuse pollution

© Jorge Sierra / WWF

Vineyard in Daimel, Spain near the Júcar river basin district.

Targeted supplementary measures in the Poole Harbour Special Protection Area, UK

Upstream farmers are being encouraged to reduce the impact of agricultural pollution on a Natura 2000 site.

Poole Harbour is a large natural harbour in southern England. Hosting a variety of estuarine habitats, it is designated as a Special Protection Area under the Birds Directive and is part of the Natura 2000 network of protected areas. The Poole Harbour Special Protection Area and its main tributaries are failing to meet conservation objectives due to nitrate and phosphate pollution – 84 per cent of which is from agricultural sources.

Article 11 of the WFD calls for "supplementary" measures wherever basic measures are not enough to protect a water body or protected area from damage. If a programme of supplementary measures is necessary then the Member State has a duty to implement it, although particular measures may not be mandatory for individual farms.

The WFD requirement has driven a detailed review and an action plan by the competent authorities. Groundwater and ecological modelling has determined targets for agricultural pollutants that will allow the rivers and Harbour to recover. To meet these limits the agreed action plan includes substantial supplementary measures, above the basic measures required nationally in any nitrate vulnerable zone. Alongside major investment in sewage treatment, these include:

- requirements to plant over-winter 'cover crops' between the main agricultural crops, which prevent nitrates leaching into groundwater while the land is bare
- tighter controls on fertiliser use and livestock numbers
- the conversion of some arable land to pasture.

These measures are currently voluntary for individual farms, with targeted funding available from the rural development programme and the regional water company. The 2009 RBMPs had set out plans for a water protection zone (WPZ), a regulatory tool for protecting water bodies at serious risk from pollution. However, although a WPZ was identified as essential for tackling agricultural pollution, it was not used and was subsequently dropped from the second RBMPs. A coalition of NGOs challenged this voluntary approach to preventing damage at Poole Harbour and other Natura 2000 sites, bringing a judicial review to the English courts. As part of the settlement of that case the competent authority agreed to investigate what measures would be most effective to achieve the objectives for the site, where they should be deployed, and what mechanism is most appropriate to implement the identified measures – whether a WPZ, other regulations, anti-pollution works notices, or voluntary measures. For Poole Harbour, the Environment Agency recommended in summer 2018 that reducing diffuse pollution should be given regulatory backing through a WPZ or other mechanisms.

RECOMMENDATIONS ON AGRICULTURAL POLLUTION AND OVER-ABSTRACTION

- **Member States should put in place basic measures to ensure baseline good practice, and to safeguard designated bathing, drinking and wildlife areas. As basic measures will not be enough for all water bodies and protected areas, Member States should also put in place a robust system to identify and implement appropriate programmes of supplementary measures.**
- **Member States need to adopt and implement binding measures to tackle diffuse pollution, as voluntary approaches have proven not to deliver the scale of change needed to achieve the WFD objectives.**
- **Member States need to ensure appropriate and robust compliance regimes are in place for basic and supplementary measures, linked to advice, training and proportionate penalties.**
- **Member States should better use existing funding for WFD measures – in particular Measures 10 and 12 under rural development programmes.**
- **Member States need to ensure that modernisation of irrigation is improved, not only to strengthen water-use efficiency on the farm but to reduce overall water use in the river basin, resulting in improvements in the status of water bodies; projects need to improve before-and-after evaluation and increase knowledge of water use.**
- **Member States should ensure that their agriculture policies incorporate into their planning the variables of climate change to avoid future pressures on river basins (e.g. introducing measures to reduce farming's gross and net water demand).**
- **To reduce agricultural pressure on water ecosystems Member States need to implement the 'polluter/user pays principle' (cost recovery) as defined by the WFD.**

2 HYDROPOWER

Europe has more than 25,000 hydropower plants. They are one of the main drivers affecting the status of rivers, resulting in loss of connectivity, altered water flow and changes in sediment transport.[vii]

Despite the fact that the EU's potential for hydropower has already been largely harnessed,[vii] we are experiencing a worrying surge of new hydropower development. Much of the planned development is for small hydropower, which produces very little energy but has significant adverse effects on water status. Eastern Europe and the Balkans, which hold some of Europe's last few remaining free-flowing and healthy rivers, are especially vulnerable, with thousands of new hydropower plants, from small to large, being planned.[3] Plans for new hydropower are underway also in parts of Central and Western Europe, where rivers have been heavily modified and degraded for centuries. Along with countries such as Austria that have had hydropower dams for generations, this includes countries that have not in the past relied on hydropower: in the Netherlands, for example, plans are being explored for at least 23 small hydropower plants, contributing only 0.3 per cent to national electricity production.

3. In the Balkans alone 2,500 projects up to 10MW installed capacity are planned (balkanrivers.net/en/news/new-report-hydropower-tsunami-balkans). In Albania, BiH, Montenegro, Serbia, Kosovo and Macedonia, 480 large-scale plants (above 10MW) are planned *(Mott Macdonald/ IPF Consortium. 2017. Regional Strategy for Sustainable Hydropower in the Western Balkans. Background Report No. 7, Inventory of planned hydropower plant projects. www.wbif.eu/content/stream//Sites/ website/library/WBEC-REG-ENE-01-BR-7-HPP-Inventory-05.12.pdf).*

Hydropower dams have numerous negative impacts on water bodies. They can fragment rivers, block fish migration routes, destroy wetlands and, as a consequence, threaten the species that depend on them for their habitat and survival. The change in sediment transport they cause can result in the erosion of riverbanks and can cause deltas to collapse and changes to water tables. Natural flow is also altered by fluctuations in flow to meet changes in electricity demand (hydropeaking), which additionally threatens ecosystem health and biodiversity.

Although state-of-the-art technology and mitigation measures can reduce these impacts to some extent, they remain significant. When properly calculated, costs to the environment and local communities often outweigh the benefits. This makes hydropower particularly difficult to reconcile with the conservation objectives of freshwater ecosystems as defined by the WFD as well as the Nature Directives (Natura 2000). To properly implement the WFD, Member States need to avoid new hydropower development, and deal with the impacts of existing dams through mitigation measures or removal.

Member States have an obligation under Article 4(1) of the WFD to prevent deterioration of the status of all water bodies. Strictly applying this without resorting to exemptions (Article 4(7)) should prevent new hydropower development. Article 4(7) requires Member States to consider "significantly better environmental options": they should investigate sustainable alternatives to new hydropower (wind, solar, smart power grids, energy savings, demand reduction, etc.). Strategic, transparent, integrated planning, including energy planning, is needed to comply with the WFD, including its non-deterioration obligation.

In order to implement the WFD and reduce pressure from new hydropower development, some regional and national governments have introduced **pre-planning** instruments. These aim to identify areas not suitable for developing hydropower projects because of the impacts on nature. The pre-planning mechanisms covered in this report have been introduced relatively recently and their impacts are therefore hard to assess. Nevertheless, protecting priority rivers against hydropower development (no-go areas) in countries like Norway, Finland and Sweden has proven to be an effective tool for managing hydropower pressure.

Pre-planning instruments to balance hydropower development in France

To minimise the impacts of hydropower, France has compiled lists of rivers to be protected and restored.

At 25.5GW, hydropower accounts for almost 20 per cent of installed capacity in France, second only to nuclear. In addition, France is seeking to increase hydropower capacity by at least 550–750 MW and average annual production by 2–3TWh by 2023.[ix] Hydropower thus puts significant pressure on water bodies in France and risks the achievement of WFD objectives.

France has a long history of addressing the impacts of hydropower. A first law requiring fish ladders on new problematic dams was introduced as far back as 1865; a classification of "reserved rivers" where no new hydropower could be built was introduced in 1919, and modified in 1980. As the primary goal of these classification systems and associated rules was to limit impacts on fish migration,[4] they had limited impact on the overall status of rivers in France. To better reflect the requirements of the WFD, in 2006 the French government adopted the Law on Water and Aquatic Environments (LEMA).[x] This foresaw the need for new tools to achieve the WFD objectives of preventing deterioration and achieving good status, including a new classification of water courses for which specific obligations regarding infrastructure projects (including hydropower) would apply. The competent authority was required to establish for each basin and sub-basin (i) a list of rivers to preserve from new segmentation, which includes high ecological status rivers and rivers acting as "biological reservoirs", and (ii) a list of rivers to restore, where sediment transportation and fish migration have to be ensured.

© ERN

La Dorche River, France, one of the country's wild rivers.

4. Just prior to the enactment of the 2006 Law on Water and Aquatic Environments (LEMA) of 2006, rivers were classified as: rivers where new hydraulic structures are prohibited; and rivers where hydraulic structures may be installed provided they are no longer an obstacle.

French authorities had to try to reconcile the objectives of generating an additional up to 3TWh of annual hydropower on the one side, and achieving good status for two-thirds of surface water bodies by 2015 on the other. Following extensive discussions with various stakeholders a commitment agreement for the development of sustainable hydropower in compliance with aquatic environment restoration requirements was signed in June 2010[xi] by the Environment Minister and local elected authorities (especially of mountain areas), hydropower producers, several NGOs and the national committee for professional freshwater fishing. The general aim of the agreement is to lower the impacts of existing and new hydropower on freshwater bodies.[5] One objective is to avoid construction of new hydropower plants in biodiversity-rich areas, and to improve existing hydropower plants and remove hydropower dams with high impacts (like the Sélune dams – see page 26).

The lists of water courses to be protected and restored to achieve good ecological status were set out between 2012 and 2015. The first list[xii] contains water courses where construction of any new obstacle to continuity cannot be authorised regardless of its use, and where existing dams must ensure ecological continuity when their licence is renewed. The criteria for selection of these water courses included rivers that reach high status under the WFD (some of which are part of the Natura 2000 network of protected areas), diadromous[6] migratory fish rivers (which are often also Natura 2000 sites) and "biological reservoirs".[7] Together they represent around 25-30 per cent of the water courses in France. The second list is of rivers where continuity must be restored – to ensure upstream and downstream fish migration and sufficient transfer of sediment – as a priority, i.e. within five years. These rivers, which represent about 10 per cent of the country's water courses, include other diadromous migratory fish rivers, and rivers at risk of failing environmental objectives defined in their RBMPs due to hydromorphological pressure and the inefficient functioning of biological reservoirs. In some cases, a water course may benefit from both classifications (protection and restoration) simultaneously.

The lists function as a pre-planning instrument. Regional renewable energy plans[xiii] can use the lists, in conjunction with data from developers, to identify areas which are and are not appropriate for hydropower development.

5. For the objectives of the agreement see https://circabc.europa.eu/sd/a/85a4834a-5733-4474-9686-d6d94d722b95/Presentation-Planning%20instruments%20for%20hydropower%20and%20preserved%20rivers%20in%20France.pdf, p.3.
6. Diadromous refers to all fish that migrate between the sea and fresh water.
7. "Biological reservoirs" are water courses or parts of water courses recognised as very rich in biodiversity and endowed with species that indicate that the environment is functioning well. These environments play a nursery role because they allow the natural repopulation of disturbed sections of the same catchment area. To fulfil this role, aquatic organisms must be able to circulate freely within the reservoir, but also to disturbed sections. The first lists of biological reservoirs were defined in the master plans for water development and management (SDAGE) established for the period 2010-2015.

Pre-planning instruments to balance hydropower development in Lower Austria

The province of Lower Austria has developed a new planning framework to protect rivers of high ecological value.

Lower Austria's catalogue of criteria for hydropower development covers

4,300km

of water courses

Hydropower plants affect

56%

of water bodies in Austria

Hydropower plants affect more than half (56 per cent) of water bodies in Austria[xiv], with pressures including interruption of river continuity, insufficient environmental flows and rapid flow changes to meet power demand (hydropeaking). Accounting for about 56 per cent of total installed power generating capacity, hydropower is considered an important sector of the Austrian energy system. More than 3,000 hydropower stations are connected to the national grid, with a further 2,000 very small projects used for on-site consumption off the grid[xv]. There is strong political will to increase renewable generation and to decrease dependency on imported energy. The government plans to expand hydropower generation, both through new projects and expanding and retrofitting existing developments; currently around 200 such projects are in the pipeline.

Much remains to be done to address the pressures posed by both existing installations and planned developments. However, the provinces of Styria and Lower Austria[8] have taken an important step towards compliance with the WFD by adopting a strategic planning framework for hydropower development on a regional level. The regional programme from the provincial government of Lower Austria is provided as an example here.

In 2016, the provincial governor of Lower Austria enacted a regional programme for the preservation of rivers with ecological value[xvi]. The objective was to safeguard the ecological function and protect selected valuable stretches of rivers in line with the WFD. The programme represents a practical application of the national approach to hydropower development, which comprises a catalogue of criteria for new hydropower development.[xvii]

Proposed as a measure under the first river basin management cycle, the catalogue is designed as a decision-making support system for applying Article 4(7) of the WFD (exemptions for projects in case of status deterioration) and as a basis for regional planning of hydropower development. It includes criteria for rating new hydropower projects according to their relevance for energy management (e.g. security and quality of supply, energy efficiency), water management aspects (e.g. flood management, drinking water supply, water quality, recreation) and the ecological value of river stretches (e.g. naturalness, rarity).

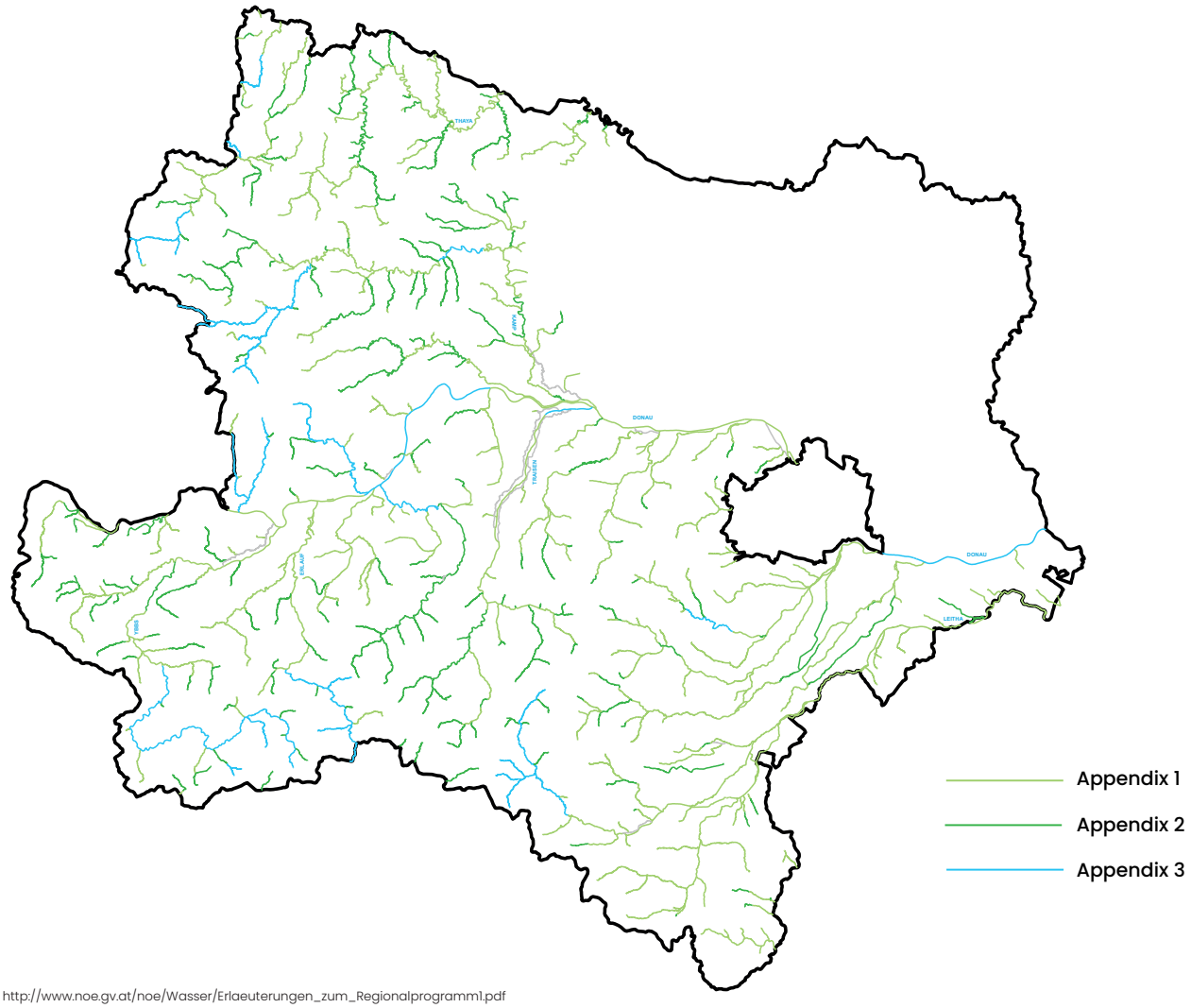
Based on the ecological value of rivers and river stretches, Lower Austria's regional programme introduced different categories of water courses and specified water management conditions for each of them to assess planned projects (both hydropower and water abstraction). It applies to all water bodies with a catchment area of more than 10km², and affects water courses with a total length of around 4,300 km.

8. In the Province of Upper Austria the regional programme designating sites that are favourable, less favourable and non-favourable has been developed, however its adoption is pending due to a political decision to protect the most valuable economic routes in Upper Austria.

The three main categories are:

- 'Priority' water courses, where construction of new hydropower plants is not permitted. Changes to existing hydropower plants, and initial construction and modifications of water abstraction not for drinking water supply, might be possible only if this does not cause deterioration in the overall status of the affected surface water body. (Appendix 3)
- Water courses where construction of new hydropower might be possible only if there is no deterioration in the overall status of the affected surface water body. The same applies for changes to hydropower plants and initial construction and modifications of water abstraction which do not serve drinking water supply. (Appendix 2)
- Water courses where construction of new hydropower might be possible only if there is no deterioration in the overall status of the affected surface water body. Changes to existing hydropower plants and water abstraction are not covered. (Appendix 1)

Regional programme for the preservation of rivers with ecological value in Lower Austria



© Office of the Provincial Government of Lower Austria,

Source: http://www.noe.gv.at/noe/Wasser/Erlaeuterungen_zum_Regionalprogramm1.pdf

However, for political reasons part of Lower Austria (Weinviertel, in the northeast) is excluded from the programme, so not all ecologically important areas are covered or protected strictly enough, meaning the scope of the programme will need to be extended. The effectiveness of the programme will depend also on how thoroughly and transparently the deterioration in status of affected water bodies will be detected and assessed. More targeted methods will be needed for capturing modifications in hydromorphological quality elements, alongside methods for assessing biological quality elements.[9] If the programme is applied consistently and assessed robustly, with strict regard to the WFD non-deterioration obligation, we can expect hydropower pressures in Lower Austria to reduce.

Mitigating impacts of existing hydropower plants – fish passes and dam removal

Ensuring connectivity and good ecological status of rivers requires action to mitigate pressures from existing hydropower plants. These may include **retrofitting** – for example, by building effective fish passes. Often, however, these cannot fully alleviate the impacts of dams on river dynamics and morphology and the loss of biodiversity. To meet legal requirements for achieving good status under the WFD, **removal of obsolete hydropower installations** has to be taken more seriously. Dam removal often leads to remarkably rapid recovery of natural functioning of sediment dynamics and biodiversity, facilitating achievement of the WFD's good status objective. For example, in Denmark, the removal of a dam on the Gudenå River saw trout numbers upstream rise from 0 to 4-5 per square metre. Meanwhile, the removal of the Maisons-Rouges Dam in France in 1999 has resulted in a spectacular surge in fish numbers, with sea lamprey numbers soaring from barely any to over 41,000 within eight years.[xviii]

9. The JRC Discussion Paper *European surface water ecological assessment methods – an overview of their sensitivity to pressures* points out that from the intercalibration technical reports, there is not much evidence that the biological quality elements (BQE) methods currently in use reliably pick up the effects of hydromorphological (hymo) alterations. It is therefore very important to use hymo classification methods alongside BQEs. See: *https://circabc.europa.eu/sd/a/0ce84a75-0988-44c5-b02e-c10e3ceb1363/7%20-%20BQEs_Pressures_sep2017.docx*

Ottensheim-Wilhering fish bypass, Austria

Nearly 40 species of fish are already using a recently completed dam bypass on the Austrian Danube.

One of Europe's largest fish migration aids to date is the 14.2km bypass channel at the Ottensheim-Wilhering hydropower plant on the Austrian Danube. The bypass, which discharges an average of 17m^3 per second at its lowermost section, enables both up- and downstream fish migration and provides high-quality key habitats. It was created to contribute to the objectives of the WFD as well as the Habitats Directive, due to hydropower's impacts on the Eferdinger Becken Natura 2000 site.

Ottensheim-Wilhering, on the southern stretch of the Danube in Upper Austria, has been in operation since 1975 by Verbund Hydro Power GmbH (VHP). As a major obstacle to fish migration, blocking important spawning grounds situated along the river's tributaries, it also impeded the achievement of WFD objectives.

The dynamic bypass channel was opened in spring 2016. The water volume is provided by the Danube and adapted to the seasons and the natural drainage dynamics of the tributaries, providing the conditions fish need to pass through. In addition, the near-natural design, which includes deep pools, fords and inlets, recreates additional type-specific river habitats for the Danube's rich fish fauna, especially key habitats like fish spawning and nursery grounds.[xix]

The bypass, which took 14 months to complete, cost around €8 million and was built with support from the EU LIFE+ Programme. Initial monitoring conducted a few months after opening found over 7,000 fish migrating through the new arm, comprising 38 species, some of which are protected under the Habitats Directive.[xx] Moreover, monitoring indicated that the channel is being used as a reproduction area by some species.

38

species of fish were recorded in the Ottensheim-Wilhering bypass in the first few months after opening

© VERBUND

The new bypass channel is near-natural designed with deep areas (pools), fords and inlets and additional habitats for fishes.

© Iwan Hoving

The Vézin hydroelectric dam on the Sélune river in Normandy, France. The French governement officially announced its removal in November 2017. Dam removals will start in spring 2019.

Removal of hydroelectric dams in France

In November 2017, the French government officially announced[xxi] plans to remove the 36 metre-high Vézin and 16 metre-high La Roche-qui-Boit hydroelectric dams from the Sélune River in Normandy.

The Sélune River flows for 90km from a rural landscape in the Regional Nature Park of Normandy-Maine to Mont Saint-Michel Bay, a UNESCO World Heritage site. Its watershed covers 1,083 km² with 57,000 inhabitants. The Sélune is one of four salmon rivers flowing into Mont Saint-Michel Bay; iconic Atlantic salmon and European eel are among the seven diadromous species that migrate in this area. However, its hydromorphology, landscape and biodiversity have been significantly altered due to two hydroelectric dams built in the first half of the 20th century, La Roche-qui-Boit and Vézin. Moreover, their reservoirs are now filled with sediment, reducing profits, and in the summer host toxic cyanobacteria.[xxii]

To restore the biodiversity of Sélune valley and ensure compliance with the WFD good status objective the French government decided to remove these hydroelectric dams. The first step in the process was the decision in 2012 not to renew their licence. However, it took several more years for the Minister of the Environment to give a green light for the removal of the dams in 2017. Emptying of reservoirs began in spring 2018 and removals are scheduled for spring 2019.

Alongside the dams' removal, a long-term scientific monitoring programme has been put in place. This will cover a range of complementary research areas including functional ecology, landscape ecology, social geography and geology. The programme includes a pre-removal phase (2012-2018) to provide information for assessing the success of removal, and a post-removal phase with scientific studies to be carried out for 10 years after the dams' removal.

Dismantling these dams after almost 100 years of hydropower generation will represent the largest dam removal project so far in Europe. It will be a major step towards bringing life back to the Sélune River, and compliance with the requirements of the WFD.

RECOMMENDATIONS ON HYDROPOWER

- Member States, the European Commission and international financial institutions should recognise that hydropower is not green and should not be given a privileged status as renewable energy in the national energy mix; this also includes provision of subsidies, which should be cut.

- Member States should strictly apply the non-deterioration obligation of the WFD. Assessment of potential deterioration should be carried out in a transparent manner with methods that are able to detect changes not only in biological but also hydromorphological quality elements.

- Member States should avoid further development of new hydropower infrastructure and instead invest in other ways of meeting energy security and greenhouse gas emissions reduction targets – e.g. energy efficiency, demand reduction, battery storage, and other renewable technologies such as wind and solar. Similarly, international financial institutions should not enable new hydropower development, but support alternatives.

- To facilitate compliance with relevant provisions of the WFD (e.g. consideration of significantly better environmental options in Article 4.7), as a preliminary condition, national government and regional authorities should put in place at national or regional levels respectively strategic and integrated planning aimed at protecting and restoring biodiversity. This should include as a minimum a comprehensive multi-year energy plan, which considers sustainable alternatives to new hydropower development (e.g. wind, solar, power grids, energy efficiency, demand reduction, improvements to existing hydropower installations, etc.). In some EU countries, where considered as an effective strategy for preventing new hydropower development, national or regional governments should define no-go areas where hydropower developments are prohibited due to their impact on nature, to meet the non-deterioration and good health obligations of the WFD.

- Member States need to ensure that all existing hydropower plants that undermine compliance with environmental standards are retrofitted as a priority to restore the natural status of rivers, including their connectivity, water flow and sediment transport. Where needed, national legislation should be changed to facilitate the process of retrofitting. Retrofitting should also consider incremental hydropower (making efficiency improvements or increasing capacity of existing installations) to avoid building new dams.

- Member States should significantly increase removal of hydroelectric dams. As a minimum, RBMPs should identify obsolete infrastructures that can be removed.

3 NAVIGATION

Europe's waterways have been used for navigation throughout history, and have been shaped by navigational locks, barrages, groynes, dredged channels and reinforced banks. The WFD recognises these can be functional features, but sets the expectation that unnecessary structures should be removed and that infrastructure should be redesigned wherever possible to improve habitats and fish passage and to restore natural shorelines. Moreover, it sets the expectation that such infrastructure should not lead to further deterioration in the current state of rivers.

Waterway management on the Danube in Austria

A new action programme is aiding navigation while maintaining good ecological status on a busy and biodiverse waterway.

The Danube is one of Europe's busiest waterways. The river carries 80 million tonnes of freight each year,[xxiii] making up 15 per cent of all European river cargo. [xxiv] It is also of huge ecological importance: home to unique species such as the Danube salmon and currently one of the last two rivers in the EU to support sturgeon.

Between Vienna and Bratislava, around 40km of the Danube has been declared a national park. The river here is free-flowing and well connected to wooded floodplains, and has good ecological status under the WFD. However, river ecology was declining and hydromorphology was severely altered as a result of upstream hydropower dams, loss of continuity in movement of the particles along the riverbed and the way the river was managed for navigation. Collectively, these pressures were causing falls in fish populations and degradation of the riverbed, which had sunk by more than a metre since major dams were constructed in the 1950s.

The need for secure navigation and to prevent deterioration under the WFD[xxv] in an integrated manner spurred a series of pilot projects between 2007 and 2014 and subsequently the Aktionsprogramm

80 million

tonnes of freight is transported on the Danuble every year

© Gerhard Egger

High-speed public transport vessel by a restored riverbed, Danube east of Vienna, Austria.

Donau [Danube Action Programme] 2022 – a comprehensive and targeted strategy agreed in 2015 to prevent deterioration in navigation or WFD status.[xxvi] The strategy and pilot projects were both designed in close consultation between the competent authority and stakeholders.

Pilot projects have had notable successes: halting riverbed erosion, increasing the capacity to store floodwater safely by widening the profile of the river channel[xxvii] and significantly improving natural fish populations. The Aktionsprogramm expects to implement one project each year on the scale of these pilot projects:

- The Witzelsdorf pilot project replaced groynes along 1.2km of the Danube. The new, downstream-facing groynes have significantly reduced erosion of the riverbed, and gaps between the groynes and shore have restored a natural shoreline and better fish passage.
- The 3km Bad Deutsch-Altenburg pilot project trialled the full suite of measures that will be implemented throughout the Danube National Park. Riverbanks were restored by removing rock armour and lowered to allow more riverbank dynamics, a 1.4km side-arm of the river was reconnected to provide a fish refuge and nursery, and low water regulation was optimised by removing or lowering groynes and constructing lower, downstream-facing groynes. Testing of 'granulometric' improvements with larger gravel and cobbles led to improved knowledge on solutions for stabilizing riverbeds.

EU match-funding was available for each of these projects through the Trans-European Transport Network (TEN-T) programme, which supports measures to improve and connect transport networks across Member States.

The success of the pilot projects demonstrates the ability to make substantial improvements to both navigation and ecology on one of Europe's busiest rivers, and the importance of the WFD in spurring the redesign of outdated navigational infrastructure.

RECOMMENDATIONS ON TACKLING NAVIGATION PRESSURE

- Member States should ensure that navigation improvements and waterway maintenance measures are based on transparent assessment of impacts on water status, addressing all quality elements (biological, hydromorphological and physicochemical) and biodiversity. They need to improve methods for assessing potential deterioration due to planned navigation-related (as well as other infrastructure) projects. These should include more targeted methodologies relating specifically to hydromorphological quality elements, when these are not captured in biological quality elements assessment methods. In addition, Member States should develop pre-determined standards for hydromorphological status (high, good, moderate, poor, bad) to improve assessment of risk of new modifications.

- Member States must ensure, and the European Commission should enforce, full compliance with the WFD, as well as the Nature Directives, when new navigation projects and waterway maintenance are developed and implemented.

- Member States should carry out a systematic review of navigational structures to explore required improvements with a view to achieving WFD objectives.

- Member States should ensure that navigation project developers follow, wherever possible, the 'working with nature' principle – monitoring, adjusting and learning from the river through a step-by-step approach. They should maintain the natural hydromorphological processes and use engineering interventions only where these prove indispensable and the most sustainable solution. Integrated plans should fully exploit the potential for river restoration and side channel reconnection.

- Due to the multi-disciplinary character of waterways, participatory management is a must: Member States should ensure that all relevant stakeholders, including environmental organisations, are engaged in the planning process for new navigation projects and maintenance measures to reach commonly accepted solutions.

- Member States should reduce dredging of estuaries to avoid hydromorphological alterations to estuaries, deltas and coasts, and initiate a process of redesigning river ports to reduce their impact on nature.

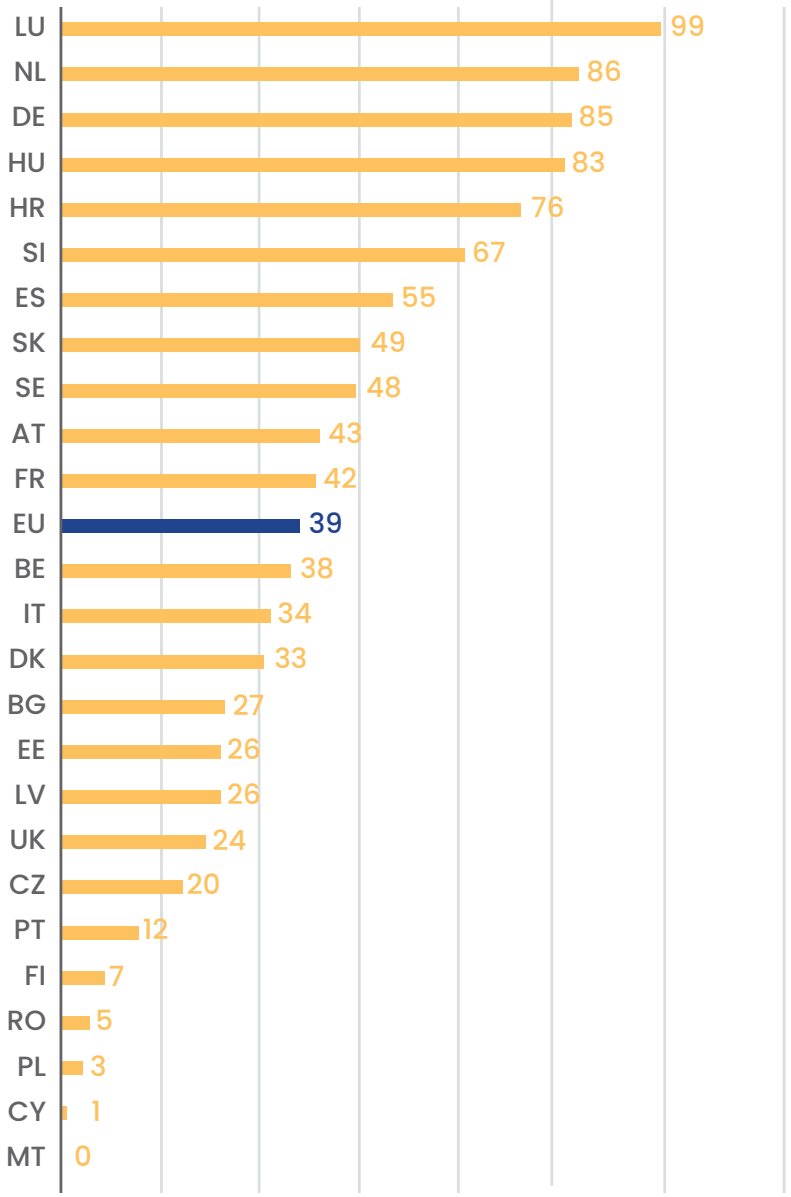
- Member States should avoid considering river navigation as a means of transport with fixed dimensions throughout the year and instead increase its flexibility by use of modern telemetric means and better logistical connections with other modes of transport.

- Member States and the European Commission should ensure that any existing and future EU transport and navigation policies are compatible with the WFD objectives.

4 MANMADE PRESSURES AND NATURE-BASED SOLUTIONS

Europe's rivers, lakes and coasts have been modified for centuries. Features such as weirs, reinforced banks, dams, diversions and straightened or dredged channels are common across the continent. It is not surprising that the most common pressures they face are hydromorphological, which affect 40 per cent of Europe's surface water bodies. In addition, 17 per cent of European water bodies have been designated in their second RBMPs as heavily modified (13 per cent) or artificial (4 per cent). As a result of these pressures, we have experienced major losses in freshwater biodiversity, the deterioration of natural flood retention capacity, riverbed deepening, and the fall of groundwater tables.

Percentage of surface waters failing due to hydromorphology



Data from EEA WISE (2018)
NB Data not yet reported by EL, IE, LT

The WFD sets the expectation that unnecessary structures should be removed and that infrastructure and management practices should be redesigned to achieve good status (or "good ecological potential" in the case of heavily modified or artificial water bodies where human use makes good ecological status impossible). Restoration measures are employed for a variety of reasons, including to:

- Restore river continuity by removing obstacles
- Ensure sediment transport along the length of the river
- Recreate aquatic habitats and restore populations of threatened species
- Safeguard and enhance the water storage potential of the landscape, soil and aquifers
- Restore lateral connectivity to reconnect former floodplains
- Re-establish natural water flow regimes by setting and ensuring ecological flows.

Nature-based solutions aim to protect and manage water resources using natural means and processes. They have the potential for delivering simultaneously the objectives not only of the WFD but also of other environmental legislation, such as the Floods Directive and Nature Directives, and other polices, including on agriculture, disaster risk management, forestry and green growth. They can produce additional socio-economic benefits for the environment, citizens and local economies. In view of the increasing impacts of climate change, they can also offer cost-effective, long-lasting and sustainable solutions for climate change mitigation and adaptation. Despite this, they haven't yet been sufficiently integrated in river basin management across the EU. Nevertheless, examples of implemented or planned nature-based solutions exist in various EU river basins.

Addressing flood protection and transport infrastructure pressures on Raba River, Poland

Nature-based solutions have improved WFD status while reducing flood risk.

The Raba river channel was straightened and canalised where it runs alongside the Kraków-Zakopane highway. Embankments and check dams (submerged barriers that halt sediment flow but only partially slow water flow) have also been installed along much of the river in an attempt to prevent the road flooding. These modifications to reduce flooding caused a range of ecological problems: damage to fish, plant and invertebrate populations (including mass mortality of fish) due to high temperatures in summer, increased flow rates, sediment shortage as a result of check dams, and the loss of riverbank vegetation and the floodplain.

Rather than reduce flooding, these measures are now commonly known to increase flood damage. The increased speed of the water flow in the upper part of the river, and loss of river sediment and floodplain, means that a larger mass and force of water is channelled to vulnerable areas. By 2010 a series of extreme floods had eroded the artificial riverbanks, destroying all regulation along the key Lubień–Pcim part of the river and threatening the highway. This provided the opportunity to improve the management of the Raba for both wildlife and flood management: guiding the development of a natural channel and floodplains able to hold back floodwaters.

The Raba has been managed since 2007 by a partnership between the Ab Ovo anglers' association and the Water Management Board in Kraków. Between 2012 and 2016 they made major changes to the management of 16.5km of the Raba and its tributaries, the Krzczonówka stream and the Trzebunka stream.

© Edward Stoklosa"

© Józef Jeleński

Left: Cascade across the Krzczonówka tributary before it was decommissioned. It was impossible for fish to get to their spawning grounds upstream, and difficult for terrestrial animals to find a safe path along the stream.

Right: The same dam once decommissioning was completed. All other tributaries to the Raba River in the area are now open for fish and other animals.

These were planned as a best practice pilot under the WFD and Floods Directive and supported by a grant from Switzerland through the Swiss Contribution to the Enlarged European Union.

The modifications aimed to broaden the river corridor, allowing the river to flow more freely and create single or multi-thread channels and pioneer riverine habitats that contribute to the river's Natura 2000 designation. Connections to the floodplain have been restored, and obstacles that blocked fish migration and gravel supply to the river – notably dams and check dams in the Krzczonówka and Trzebunka tributaries – have been removed. Gravel extraction, which was worsening the sediment shortage caused by check dams, has been halted by blocking access to the channels, and rocky ramps and riffles were installed to help settle gravel in particularly sediment-starved channel bed sections.

Collectively these changes provide more capacity to slow and store floodwaters, reducing erosion and flood risk to the valley's infrastructure, as well as protecting fish and vegetation from high temperatures and habitat loss. The outer boundaries of this corridor have been carefully delineated with rock fills and riparian woodlands to prevent flooding outside the area. The removal of obstacles also means that two-thirds of the Raba catchment between Stróża and Lubień is now accessible for fish spawning.

Monitoring shows substantial WFD classification improvements. The Raba moved from moderate to good ecological status between the 2009 and 2015 RBMPs, and the Krzczonówka from the moderate-good boundary to the good-high boundary. Restored sections of the main river are now at good hydromorphological status (as opposed to the moderate status of the remaining canalised sections) with a similar improvement seen in benthic invertebrate status. Alpine river habitat[10] protected by the river's Natura 2000 site designation is still not meeting habitat objectives but has shown improvement, including the successful reintroduction of the protected *Myricaria germanica* (German tamarisk scrub).

The Raba moved from moderate to good ecological status between 2009 and 2015 as a result of restoration measures

10. Habitats Directive (Council Directive 92/43/EEC), Annex I, habitat type code 3240.

Management of land drainage in Schleswig-Holstein, Germany

Reduced dredging, cutting of vegetation and maintaining natural features is improving the poor status of two river basins in northern Germany.

Rivers at good ecological status in 2009:
0% Eider
1.5% Schlei-Trave

Many of the rivers and ditches in Germany's Eider and Schlei-Trave river basin districts are managed to support land drainage for agriculture and urban development. Prior to 2009, plants within the river and along the banks were cut to the waterline and removed regularly, and many channels are dredged and straightened. This was a major contributor to WFD failures in the first RBMP: no rivers in the Eider river basin and only 1.5 per cent of those in Schlei-Trave were at good ecological status.

To improve their status, an expert working group from the competent authorities, federal state, NGOs and water management authorities put forward proposals to improve the river management regime. Five stretches of river were chosen to pilot these changes. After the pilot proved ecologically successful, the measures were fully implemented across the districts' 20,000km of water courses.

Half of these water bodies remain intensively cut and dredged as before. A further third will no longer be dredged or will be cut and dredged far less often: roughly once every 10 years or following extreme weather. For the remaining 13 per cent, riverbanks are cut alternately or at a higher level and only the centre of the channel is cut or dredged, so that some plants, deadwood, stones and coarse gravel are always left. The details of this less intensive regime – which rivers are managed in each way – are agreed consultatively between the competent authority and the water management associations. Associations only receive government subsidies for operating pumping stations if they follow WFD-compliant management plans.

The new measures have proved successful. The 2015 RBMP found that water courses under the new regime have on average improved by two classes under the WFD classification for the riverbed macroinvertebrates biological quality element – an indicator of water quality and ecosystem health. This indicates that it is possible to improve water status while maintaining the primary use of water bodies – in this case land drainage for agriculture and urban development.

Below: The River Eider in Schleswig-Holstein, Germany. Both images are taken from the same viewpoint – the first one in 2009 when the river was being managed intensively. The second was taken in 2013 following a shift towards more sustainable river management.

© Gabriele Stiller

© Gabriele Stiller

Urban river restoration at River Wandle, UK

A heavily modified London chalk stream has now been restored to good ecological potential.

The River Wandle is a chalk stream, flowing into the Thames from chalk groundwater springs in south London. Chalk streams are the classic English rivers, famous for their crystal-clear water and for trout and salmon fishing.

The Wandle, however, has been very heavily affected by flowing through London, where it was historically used to power mills for local industry. Under the WFD, the Wandle catchment is made up of two river water bodies and two groundwater bodies. Both of the river bodies have been designated as heavily modified as a result of urbanisation – almost 1 million people live in the catchment – and were classed at poor ecological potential in the 2009 RBMP.

One of these two rivers – the Carshalton branch of the Wandle – has now been restored to good ecological potential by tackling the full range of problems facing the over-widened, polluted, disconnected and impounded river. Restoration work was carried out in partnership by the charitable South East Rivers Trust, the national government Environment Agency, local government and two water companies operational in the catchment. Minor works, such as replanting natural vegetation and tree coppicing, were carried out also by volunteers. Works included:

© South East Rivers Trust

The new, narrower channel upstream of Butter Hill weir.

- Re-establishing fish passage at all five weirs on the river through new passes, and notching and lowering of weirs. This also reduced impoundment and restored more natural flows.
- Creating low-flow channels and in-stream habitat to shelter wildlife.
- Installing sediment traps and fixing sewer misconnections to prevent river pollution
- Reintroducing brown trout: the trout were released by local schoolchildren, and are now successfully recruiting in the river for the first time in 80 years.

Dam removal in Duero river basin district, Spain

Removing obsolete dams is expected to benefit many species – but funding, legal complications and a lack of monitoring present challenges.

Dams and weirs at **769** locations in Duero river basin will be demolished or modified with fish passes

The initial WFD planning cycle found that 83 per cent of the 646 natural rivers in the Duero basin were in worse than good status. For 58 per cent, fragmentation was a reason for failure: more than 3,500 minor weirs and dams made most rivers impassable for fish, and prevented natural flow regimes throughout the region. Most of these obstructions no longer served a purpose, having been built to serve mills, horticulture and other uses that were no longer operating.

The Duero River Basin Authority drew up a strategy[xxviii] within the programme of measures to improve the status and fluvial connectivity of affected water bodies, taking into account criteria such as ecological status, water body length, and frequency of non-connectivity. Planned activities included demolishing obsolete weirs and dams or installing fish passes at 769 locations and cancelling of water rights.

This work was expected to be complete by 2015 and to restore 61 water bodies to good or high ecological status. However, implementation has been severely delayed, partly due to lack of funding, and only 150 (20 per cent) of these dams and weirs have been addressed. Work has also been complicated by the need to revoke or purchase the water rights granted to the owners of the defunct structures – a common problem across the EU in addressing obsolete and uneconomic impoundments.

Funding for dam and weir works has come from a variety of sources, including EU LIFE+ for dams in Natura 2000 sites. This has covered for example the recent removal of the 22m-high Yecla de Yeltes dam on the Huebra River. Built in 1958 to supply drinking water, the dam was not maintained and ceased functioning, but still prevented 27km of the Huebra from reaching WFD targets. The Duero River Basin Authority removed the dam in 2018 once its water rights expired, a measure expected to improve both WFD status and Natura 2000 condition. This dam removal is expected to benefit several species including otters, European pond turtles, trout and the sarda (*Achondrostoma salmantinum*), an endangered endemic fish.

It is too soon in this case for WFD status improvements to register, but a lack of monitoring has caused problems in understanding the benefits of earlier dam and weir removals: rivers throughout the region have not been resurveyed for WFD fish status, making the impact of the dam and weir strategy hard to assess.

© Herman Wanningen

Removal of the 22m-high Yecla de Yeltes Dam on the Huebra River.

RECOMMENDATIONS ON RESTORATION

- **Member States and the European Commission should invest more effort in and support projects for raising awareness among society and relevant decision-makers on the value of water and freshwater ecosystems. This should emphasise the effectiveness of nature-based solutions and their potential for delivering multiple benefits beyond nature conservation (e.g. socioeconomic benefits such as green growth, improved health and quality of life, climate change mitigation and adaptation), as compared to other measures for addressing water-related challenges.**

- **To address hydromorphological pressures Member States should significantly increase the uptake of nature-based solutions and dam removal in their RBMPs and flood risk management plans (FRMPs), and adjust funding streams, including subsidies, away from purely structural, traditional engineering measures towards nature-based solutions. Traditional engineering measures to address water challenges (e.g. flooding, water scarcity or drought) should be used only as a supplement to optimise nature-based measures.**

- **Member States should systematically review water bodies with a view to removing or adapting unnecessary and uneconomic structures, and amending land-use policies that drive deterioration and prevent restoration. This should include changing national permit and water rights regimes, as well as subsidy schemes, to ensure obsolete and damaging features are improved or removed quickly, and that land-use policies and plans support WFD and Nature Directives implementation.**

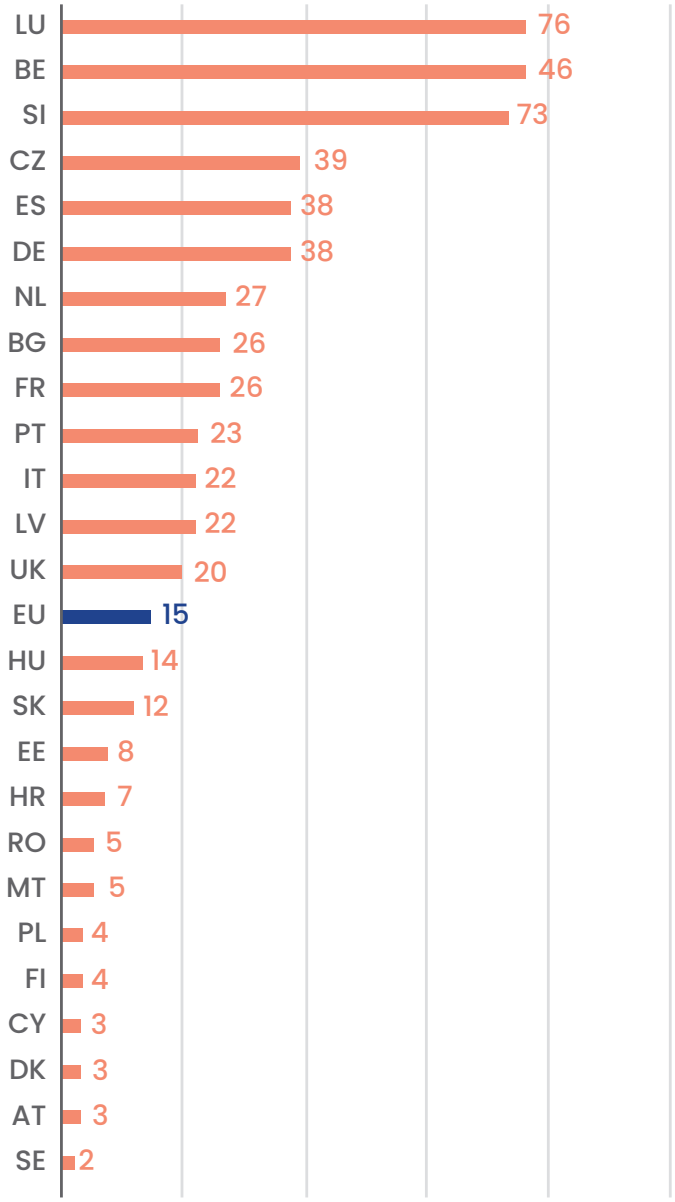
- **Member States should make more use of a range of funding sources available at EU[11] and other levels for financing nature-based solutions, and enhance coordination between sector-based planning processes, including blending and integrating financial resources available from different sources.**

11. Funding opportunities for nature-based solutions exist in most of the EU funding mechanisms, in particular the European Agricultural Fund for Rural Development (EAFRD), the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (CF); also relevant are the LIFE 2014-2020 programme, and as regards enhancing the existing knowledge base on and monitoring of nature-based solutions the EU research programme Horizon 2020.

5 WASTEWATER TREATMENT

Sewage is one of the most widespread and ecologically damaging pollutants in the EU, but it is also the area where the WFD has had the greatest impact. Investment driven by the WFD and the associated Urban Waste Water Treatment Directive (UWWTD) has removed raw sewage and other wastewater from rivers, lakes and coasts across the continent. This rapid improvement has been possible because Member States retain substantial control over public water treatment, and have been willing to use available EU and water customer funding to tackle the problem. This contrasts sharply with slow progress on agricultural pollutants, which require coordinated action across a varied sector. Wastewater pollution does, however, remain a considerable problem, affecting 15 per cent of EU water bodies and requiring continued improvement.

Percentage of surface waters failing due to wastewater pollution



Data from EEA WISE (2018)
NB Data not yet reported by EL, IE, LT

Wastewater treatment in Bucharest, Romania

A new sewage treatment works has reduced organic pollutants in a tributary of the Danube by 50 per cent.

Until 2011, sewage from the 2 million residents of Bucharest was discharged untreated into the Dâmboviţa River, which flows into the Danube. This had a catastrophic impact on the health of the river – classed at good status upstream of Bucharest, and bad downstream of the sewage discharges.

The legal obligation to meet the requirements of the UWWTD was the main trigger for establishing modern sewage infrastructure for Bucharest. It was also set out as a basic measure under the first Romanian RBMP, in order to achieve good potential of the Dâmbovita downstream water body.

This is being delivered in practice through the new Glina wastewater treatment plant, constructed between 2005 and 2011. The plant now provides full tertiary (three-stage) treatment of just over half (55 per cent) of Bucharest's effluent. However, theuntreated. The limited capacity at the Glina plant means that large quantities of sewage are still discharged after only primary (mechanical) treatment. A second phase of works aims to deliver full treatment of all effluent from the city by 2021, through additional sewerage connections and improved capacity at the plant.

Works costs of €108 million in the first phase have been funded jointly by EU Structural and Cohesion programmes (65 per cent to date), and Bucharest's water customers and Romanian taxpayers (35 per cent). The estimated €350 million

© Pixabay

Bucharest, Romania

cost of the second phase of works is set to be divided in similar proportions. Romanian domestic water costs have risen considerably during the country's accession and membership of the EU – for a variety of political reasons as well as greater investment in clean water supply and treatment. In the case of this project, costs to customers will be spread over time through financing provided by the European Investment Bank and European Bank for Reconstruction and Development.

The initial phase of works has already had a noticeable impact on sewage pollutant levels in the Dâmboviţa and Arges rivers: monitoring shows a 50 per cent reduction in all organic pollutants, and specifically a 60 per cent reduction in total phosphorous and a 30 per cent reduction in total nitrogen loads. Although this still reflects the large pollutant load from the high remaining raw sewage input, it does demonstrate the positive impact of improved sewage treatment.

Reduced pollution following the opening of the Glina wastewater treatment plant:

-50% organic pollutants
-60% phosphorous
-30% nitrogen

RECOMMENDATIONS ON WASTEWATER TREATMENT

- **Member States should complete the implementation of the UWWTD.**
- **Member States should review and remedy misconnections and combined sewer overflows, which spill raw sewage and urban runoff into rivers and coastlines.**
- **Member States should introduce tertiary sewage treatment to protect particularly vulnerable bathing, shellfish and nature areas.**
- **Member States should address damaging sewage pollution from the small settlements that are not fully covered by the UWWTD.**
- **The European Commission should propose and Member States agree on tighter EU standards on potentially damaging products are found in wastewater, such as phosphate levels in detergents.**

6 COST RECOVERY – WATER PRICING

The WFD plays a major role in furthering the use of economic instruments in water management. Specific provisions of the WFD require use of water pricing to help meet environmental objectives and, more specifically, to recover the costs (financial, environmental and resource costs) of water services. Article 9 of the WFD outlines three main concepts to ensure water pricing delivers on sustainable water management and WFD objectives, as well as delivering ethical and practical benefits:

- **Polluter-pays principle:** this is about who should pay for water used and/or tackling water pollution (e.g. industry, agriculture, households), and to what extent, considering their contribution to the total costs generated by their activities.
- **Cost recovery for water services:** this is about the amount of money being paid for water services, which needs to include not only financial (investment and operational) costs but also the costs of associated negative environmental impacts (environmental costs) as well as forgone opportunities of alternative water uses (resource costs).
- **Incentive water pricing:** this relates to how water is being paid for, and how the water price affects water user and polluter behaviour (e.g. by incentivising efficient water use and reduction in use of polluting substances).

Water services are defined broadly, so cost recovery provisions are applicable to a wide range of uses that may have an impact on water and could undermine the objectives of the WFD. As also confirmed by the EU Court of Justice (C-525/12)[xxix] water services are not limited only to supply of water and wastewater treatment, but can for example also include impoundment for hydroelectric power generation, navigation and flood protection, and abstraction or storage for irrigation and industrial purposes. Moreover, WFD's water pricing and cost recovery requirements capture not only the use of water but also discharges to water affecting its quality (diffuse and point source pollution). Prices in relation to water services can be charged in many ways, e.g. taxes, water tariffs and water charges.[xxx]

Although a great majority of Member States introduced or adjusted water pricing mechanisms to meet WFD requirements, adequate water pricing remains a big challenge across the EU.[xxxi] In general water pricing has not been fully and adequately implemented across sectors, and is instead often limited to wastewater treatment and provision of drinking water. Prices do not reflect the real cost, with environmental and/or resource costs rarely integrated in the pricing system. Some mechanisms are selective and exclude certain major users or polluters (e.g. cooling water for thermal power plants and agricultural sludge in Poland[xxxii]) and there is often a huge disparity between contributions of different water users, with households often carrying the biggest burden by paying much more than agriculture and/or industry (e.g. in France,[12] Netherlands).

The European Commission has regularly called on Member States to adjust their pricing systems to cover a broader range of services, with tariffs reflecting environmental and resource costs and providing incentives for more efficient water use.[xxxiii] To reinforce this political pressure, EU cohesion and rural development funds are subject to implementation of WFD pricing and cost recovery provisions.[13] Member States' own environment ministers have also spoken out on the need to use incentive water pricing.[14] Along with enforcement efforts, this has yielded some positive results. However, water pricing policies remain largely inadequate and hence have had a limited impact on the freshwater environment to date.

12. Although often considered one of the better systems in the EU, the French cost recovery and water pricing system is still very doubtful, as recognized in 2015 by the French Court of Auditors (French Court of Auditors 2015 report 'Water agencies and water policy: a coherence to be found' (Les agences de l'eau et la politique de l'eau: une cohérence à retrouver). For example, there is still a strong level of inequities between contributions of different users; agricultural effluent charges are low and do not properly reflect the polluter-pays principle, mainly due to legislative choices. Urban consumers pay the major part of the bill, and the figure is increasing (e.g. in 2013, they paid 87 per cent of the total costs, while the industrial share fell to 7 per cent and that of farmers stagnated at 6 per cent on average). There is, therefore, still an effort to be made, mainly for agriculture as well as to capture some of the industry that currently does not seem to be addressed (e.g. navigation).
13. To improve implementation of water pricing provisions, the MFF Common Provisions Regulation established ex-ante conditionality (ExAC) for accessing Rural Development and Cohesion policy funds, on having in place water pricing systems in line with the WFD (e.g. relevant where investments in irrigation were programmed in the 2014-2020 Rural Development Programmes). This has triggered some amendments to national legal frameworks on water pricing policies e.g. in Bulgaria, Cyprus, Hungary, Italy, Malta, Poland and Slovakia. Often these are not yet adequate and more efforts are needed to recover the cost of water services and provide adequate incentives to change negative behaviour of users and polluters. *(Cf. EC. 2017. Commission Staff Working Document, The Value Added of Ex-ante Conditionalities in the European Structural and Investment Funds (SWD(2017) 127 final); WRc for European Commission. 2017. European level report: Evaluation of the contribution of Operational Programmes to the implementation of EU water policy, Report Reference: UC12474.01,*
14. Council Conclusions on a blueprint to safeguard Europe's water resources (December 2012) (Doc. 17872/12); Council Conclusions on Sustainable Water Management (October 2016) (Doc. 13342/16).

Spanish Supreme Court upholds polluter-pays principle

A court ruling in Spain's Júcar river basin district confirms that farmers, not households, should bear the costs of managing agricultural impacts on water sources.

Diffuse pollution from agriculture represents a major pressure on the water environment in the Júcar river basin in the Valencia region, affecting 64 per cent of surface water bodies and 31 per cent of groundwater bodies, especially near the Mediterranean coast. This has a negative effect not only on the ecological status of water bodies, but also on certain water users (e.g. urban water users) due to increased costs associated with managing the pollution of water sources.

As one of the measures to address this problem, in its first RBMP the Júcar River Basin Authority (RBA) changed the source of water for human consumption. Instead of two polluted aquifers (groundwater bodies) which were now of bad (chemical) status, a surface water body, previously destined for irrigation, would now be used to source up to 1,000m^3/year of municipal water supply.[xxxiv] The RBMP proposed that the costs associated with this substitution would be borne by the water users in nine municipalities.

© Jorge Sierra / WWF

Entrepeñas Reservoir in Guadalajara, Castilla–La Mancha, Spain. The photo was taken in 2017 during the most recent drought episode, and shows the environmental cost of overallocating water for irrigation.

Agricultural pollution in Jucar river basin affects:

64%

of surface water bodies

31%

of groundwater bodies

In 2014, these municipal authorities challenged the RBMP, including the financing of the measures, before the Supreme Court of Spain.[xxxv] In its ruling on 23 March 2017, the Supreme Court[xxxvi] confirmed that the financing of the measures as proposed by the Jucar RBA in the RBMP was not in line with EU law and especially the WFD provisions on cost recovery and the polluter-pays principle, and nullified the respective provision of the RBMP. The Court was clear that the principle of cost recovery cannot be applied at the expense of violating, or simply nullifying, the polluter-pays principle. It was known that farming practices caused the deterioration of groundwater bodies, and it was thus unfair to expect households rather than the polluters – farmers – to bear the cost of substitution.

The ruling sets an important precedent for cost recovery in Spain as well as other EU countries. Following the ruling the current Júcar RBMP 2016-2021 now includes a new provision specifying that the Júcar RBA will assume the costs of changing the water sources. Although it is not specified how and to what extent the RBA is going to recover these additional costs, the WFD and the Supreme Court's ruling suggest that at least part of the environmental costs will be recovered by water tariffs applied to the farmers responsible. Importantly, this should lead to savings on Júcar domestic water bills. In addition, the new RBMP includes several measures for improving the quality of the aquifers in the basin, especially as regards pollution by nitrates and pesticides; unfortunately they do not include direct measures for the two affected aquifers and remain too general.

Development of a water pricing scheme in Cyprus

Despite the potential benefits, attempts to reform water pricing in Cyprus have faced significant opposition.

The WFD has been the main driver for reforming the water pricing scheme in Cyprus, with the aim of ensuring water charges take account of scarcity and environmental costs.[xxxvii] This example warrants a closer look for two reasons. On the one hand, the proposed pricing as set out in the Regulation ΚΔΠ128/2014 on "pricing and full cost recovery of water supply services" can be seen as exemplary in integrating the WFD requirements: it aims to recover costs, including environmental and resource costs, across various users, and to develop adequate pricing incentives for more efficient water use and protection of water resources. On the other hand, it demonstrates a common problem with the introduction of fair pricing policies across the EU: that measures are withdrawn or halted before they have the chance to take effect, due to political reasons and opposition by various sectors. This is particularly true of measures that would affect agriculture.

To ensure continued availability of water resources in a water-stressed environment Cyprus has been using water pricing for decades (since the 1960s). Located in the eastern Mediterranean with a semi-arid climate, Cyprus ranks as the most water-stressed country in the EU.[xxxviii] Water resources rely on a highly variable precipitation, and rainfall has dropped in the last 50 years.[xxxix]

Initial volumetric pricing schemes aimed to recover only the financial costs of governmental water projects such as dams and conveyors and related infrastructure for transporting water from wet to drier areas.[15] In addition to being limited to

15 They serve 85-90 per cent of the total domestic water supply, and up to 40 per cent of total irrigation use. Groundwater aquifers, which represent another source of water, are today highly exploited and deteriorated and piezometric levels decrease rapidly. They provide 10-15 per cent of the total domestic water supply and up to 60 per cent of the total irrigation use. In addition, non-conventional water resources – desalination for drinking water and water reuse (tertiary treatment of sewage effluent) for irrigation – are also used. (*Cf.* Hadjipanteli, op. cit.).

© Panagiota Koutsofta

Paralimni Lake, a Natura 2000 area affected by unsustainable water management.

59.1%
of waster use in Cyprus is for irrigation

recovering only financial costs, these schemes had other deficiencies. Because of the importance of farming for food security, preserving the rural landscape and avoiding urbanisation, irrigation water was heavily subsidised, with the price not exceeding 40 per cent of the financial costs. Moreover, private groundwater abstraction, which accounts for more than 70 per cent of irrigation water, was not charged for (except from pumping costs paid by the well owner).[xl] Irrigation represents the biggest water use in Cyprus, at 59.1 per cent, compared to industry (3 per cent), livestock (3.3 per cent), drinking water (29.6 per cent) and tourism (4.9 per cent).

Although the pricing schemes changed in 2004 when Cyprus joined the EU, especially by revising and increasing considerably the rates for irrigation water, it was not until 2014 that regulations integrated the pricing and cost recovery provisions of the WFD. The new pricing scheme, set out in the Regulation ΚΔΠ128/2014 adopted by the Council of Ministers, aimed to capture all users, uses and sources; this includes the supply of drinking water for households and other uses (e.g. industry), and for irrigation from governmental water projects and recycling water distribution networks, but also from private wells and other sources. In addition, for the first time, it was proposed that water tariffs should reflect environmental and resource costs of water consumption. A study (2008-2010) commissioned by the competent authority to re-assess the total water services costs estimated these at an average of around €0.10 per cubic metre for domestic and industrial water users, and about €0.15 per cubic metre for irrigation water for farmers. Revenues are collected through water bills and charges for environmental and resources costs go to the general budget – they are unfortunately not earmarked for water management measures.

If full cost recovery water pricing were implemented, revenues would be expected to reach around €10 million per year. Moreover, water savings should lead to improvements in the status of overexploited and highly deteriorated aquifers, and reduce dependence on desalination plants, which use large amounts of fossil fuel-based electricity, damage marine ecosystems and rely on government subsidies (the cost of fresh water produced by current desalination plants in Cyprus is more than one euro per cubic metre).[xli]

Unfortunately, there was a strong opposition to additional water charges, especially by farmers. Subsequently various politicians and local authorities, who considered the increase as politically too costly, also opposed the new pricing scheme, while consumer associations were sceptical as Cyprus experienced economic recession during 2013-15. The Regulation was therefore not implemented until April 2017 and even then not in full. [xlii]

Despite prices not fully reflecting the estimated costs (e.g. prices for irrigation are considerably lower than estimated), the new water tariffs do for the first time distinguish the type of costs (financial, environmental and resource costs) and impose environmental and resource costs also on private, mainly groundwater, consumers. This represents a step in the right direction. However, current prices remain unfair, for example by applying full cost recovery to domestic water users but not to agriculture, while compliance mechanisms, especially regarding private consumers, are unclear. Much remains to be done for WFD-compliant pricing to be fully implemented.

RECOMMENDATIONS ON WATER PRICING

- Member States should develop and implement legally correct water pricing to comply with Article 9 of the WFD. This should include incentive pricing and adequate cost recovery for water services, to ensure that major water users, like energy, transport and agriculture, are adequately contributing to the financial, environmental and resource costs of the water services they receive.
- Member States should ensure that taxes and tariffs reflect the polluter/user pays principle to drive change in the behaviour of users and polluters.
- Member States should earmark collected revenues for sustainable water management measures and nature conservation.
- The European Commission and Member States should ensure that decision-making processes on water management take full account of the benefits healthy freshwater ecosystems provide. Member States must carry out a comprehensive economic assessment of water uses and water management measures, in particular of environmental and resource costs and values of ecosystem services.
- Member States must enable effective stakeholder participation in decision-making on economic aspects of water management, including development and decision-making around water-pricing schemes.
- The European Commission should facilitate collection and demonstration of good practice examples of WFD-compliant implementation of economic instruments, especially as regards calculation of environmental and resource costs and values of ecosystem services.
- The European Commission should increase political and legal pressure on Member States with regards to the implementation of Article 9 on cost recovery and water pricing.

© Jorge Sierra / WWF Spain

CONCLUSION

With less than a decade remaining to the 2027 deadline, a vast amount of work still needs to be done to achieve good status across Europe's rivers and streams, lakes and wetlands, estuaries and coastal waters, and groundwater resources.. Nevertheless, as the case studies in this report demonstrate, it is possible to effectively address the main pressures facing freshwater ecosystems – where political will exists.

The WFD has been the engine driving these measures, leading to improvements in water management and subsequently in the status of freshwater ecosystems, biodiversity and the services they provide. While much more needs to be done to implement and enforce it, the WFD is fit for the purpose for which it was designed. Moreover, implementing measures under the WFD can support and reinforce other EU legislation and priorities in areas such as biodiversity conservation, climate mitigation and adaptation, and flood prevention. In the vast majority of cases, the benefits of achieving good status outweigh the costs.

Member States and the Commission should use the opportunity presented by the current fitness check of the WFD and related legislation to strengthen the implementation of the EU legal framework for water protection in order to meet the ultimate 2027 deadline, and not look for ways to weaken the framework.

© naturepl.com / Terry Whittaker / WWF

GLOSSARY

Benthic – Of organisms living at the bottom of a body of water.

Competent authority – Person or organisation with the legally delegated or invested authority, capacity or power to perform a designated function; in this report, to implement measures under the WFD.

Diadromous – Of fish that migrate between the sea and fresh water.

Embanked – A waterway confined within a manmade ridge or embankment.

Environmental flows – The quantity, timing and quality of water flows required to sustain freshwater ecosystems, and meet human needs respecting the WFD objectives.

Granulometric – Relating to the distribution or measurement of grain sizes in sand, rock or other deposits.

Groyne – A wall or jetty built out from a riverbank or seashore to control erosion.

Hydromorphology – The physical characteristics of water bodies, including their size, shape and structure, and the flow and quantity of water and sediment.

Hydropeaking – The practice of releasing pulses of water to increase power production at hydroelectric dams to meet peak electricity demand.

Impoundment – A body of water impounded within an enclosure, such as a reservoir.

Incremental hydropower – Increasing hydropower capacity by making improvements or additions to existing plants, or generating electricity from existing non-power dams and installations, rather than building new dams.

Macroinvertebrates – Organisms without backbones, visible to the eye without the aid of a microscope. Aquatic macroinvertebrates include, for example, worms, snails and the larvae of dragonflies, caddisflies and mayflies.

Volumetric – Measuring by volume (in water pricing)

i EEA. 2018. European waters – assessment of status and pressures 2018. European Environment Agency, Copenhagen, Denmark. www.eea.europa.eu/publications/state-of-water

ii European Commission. 2012. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Blueprint to Safeguard Europe's Water Resources (COM(2012) 673 final); European Commission (2015) Communication from the Commission to the European Parliament and the Council: The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risks (COM(2015) 120 final).

iii EC. 2017. Commission Staff Working Document, Agriculture and Sustainable Water Management in the EU (SWD(2017) 153 final).

iv European Court of Auditors. 2014. Integration of EU water policy objectives with the CAP: a partial success. European Court of Auditors, Luxembourg. www.eca.europa.eu/Lists/ECADocuments/SR14_04/SR14_04_EN.pdf

v European Network for Rural Development. 2015. RDP analysis: Support to environment & climate change; M12 Natura 2000 & Water Framework Directive payments. enrd.ec.europa.eu/sites/enrd/files/rdp_analysis_m12.pdf

vi Figures all from SEPA. 2017. Rural diffuse pollution priority catchment update. Scottish Environment Protection Agency. www.sepa.org.uk/environment/water/river-basin-management-planning/actions-to-deliver-rbmp/priority-catchments

vii EEA. 2018. European waters — Assessment of status and pressures 2018. EEA Report No 7/2018, European Environment Agency, Copenhagen, Denmark. www.eea.europa.eu/publications/state-of-water

viii International Energy Agency. 2015. World Energy Outlook Special Report 2015: Energy and Climate Change. OECD/IEA, Paris. www.iea.org/publications/freepublications/publication/weo-2015-special-report-energy-climate-change.html, p. 47

ix World Energy Council. Hydropower in France. www.worldenergy.org/data/resources/country/france/hydropower (accessed August 2018); www.ecologique-solidaire.gouv.fr/hydroelectricite; Presentation by Claire-Cécile Garnier, Planning instruments to balance hydropower development and protection or restoration of aquatic environments in France: Selection of preserved rivers and preparation of trends (EC. consultation meeting on Preparation of a guidance document on hydropower development and Natura 2000, 8 July 2015, Brussels), https://circabc.europa.eu/sd/a/85a4834a-5733-4474-9686-d6d94d722b95/Presentation-Planning%20instruments%20for%20hydropower%20and%20preserved%20rivers%20in%20France.pdf; World Small Hydropower Development Report 2016, France, www.smallhydroworld.org/fileadmin/user_upload/pdf/2016/Europe_Western/WSHPDR_2016_France.pdf.

x Article 6 of the LEMA and set out in article L. 214-17 of the environmental code and its regulatory part; ONEMA. 2011. La révision des classements de protection des cours d'eau: Un outil en faveur du bon état écologique et de la biodiversité. www.driee.ile-de-france.developpement-durable.gouv.fr/IMG/pdf/Brochure_Revision_des_classements_26_09_011_cle09b374.pdf

xi www.rivernet.org/loire/soslv/pdfetdocs/20100623_convention%20hydro_et_rest.pdf

xii Article 6 of the LEMA and set out in article L. 214-17 of the environmental code and its regulatory part (see note x).

xiii A regional plan for climate, air and energy (Schéma régional du climat de l'air et de l'énergie, SRCAE) was jointly developed by the state and the regional authorities.

xiv Commission Staff Working Document, Report on the progress in implementation of the Water Framework Directive Programmes of Measures, Accompanying the document Communication from the Commission to the European Parliament and the Council, The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risk (SWD.2015. 50 final, p. 86.

xv International Hydropower Association. 2018 Hydropower Status Report. www.hydropower.org/publications/2018-hydropower-status-report, p. 76.
xvi Lower Austria's regional water management programme 2016 for the preservation of valuable water courses. www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=LrNO&Gesetzesnummer=20001118.
xvii Österreichischer Wasserkatalog: Wasser schützen – Wasser nutzen. Kriterien zur Beurteilung einer nachhaltigen Wasserkraftnutzung. www.bmnt.gv.at/dam/jcr:debcf252-b506-4802-a98b-1afd0e2bc815/Erlass%20Kriterienkatalog.pdf
xviii Gough, P., Fernández Garrido, P., Van Herk, J. 2018. Dam Removal: A viable solution for the future of our European rivers. Dam Removal Europe, p. 34-59.
xix Zauner, G. et al. 2017. Dynamischer Umgehungsarm Donaukraftwerk Ottensheim-Wilhering – Durchgängigkeit und Lebensraum, Wasserwirtschaft 107(12): 51-57; see also: www.life-netzwerk-donau.at/en-at/measures/ottensheim-wilhering-bypass-channel.
xx Zauner, op. cit.
xxi https://ecologique-solidaire.gouv.fr/sites/default/files/2017.11.14_cp_vallee_de_la_S%C3%A9lune.pdf
xxii Cf. www.ern.org/en/selune-libre
xxiii Danube Commission Navigation Statistics for 2015-16.
xxiv Eurostat. 2018. EU-28 transport by type of goods and type of transport.
xxv Viadonau Project database. www.viadonau.org/en/home/
xxvi Viadonau. 2015. Aktionsprogramm Donau 2022 (Danube 2022 Action Programme) Maßnahmenplan für Schifffahrt, Ökologie und Hochwasserschutz
xxvii Viadonau Project database. www.viadonau.org/en/home/
xxviii www.chduero.es/descarga.aspx?fich=/Publicaciones/estrategia-actuaciones-chd.pdf
xxix Commission v Germany C-525/12; see also Analysis of Case C-525/13 – German Water Services Commission preliminary reaction (Commission document for Strategic Coordination Group meeting, November 2014).
xxx EEA. 2013. Assessment of cost recovery through water pricing. Technical report No 16/2013 (p. 16-17).
xxxi EC. 2012. Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC) River Basin Management Plans (COM(2012) 670 final); COM(2015) 120 final, op. cit.; EC. 2017. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, The EU Environmental Implementation Review: Common challenges and how to combine efforts to deliver better results (COM/2017/063 final); SWD(2017) 153 final, op. cit.; Watkins, E. et al. 2017. Capacity building, programmatic development and communication in the field of environmental taxation and budgetary reform, Final Report (p. 61-90) and accompanying case studies, https://ieep.eu/publications/green-economy/new-suite-of-40-case-studies-on-environmental-fiscal-reform.
xxxii Paquel, K.2017. Wastewater fee in Poland. Case study prepared as part of the study "Capacity building, programmatic development and communication in the field of environmental taxation and budgetary reform".
xxxiii COM(2012)670 final, COM(2015) 120 final, COM/2017/063 final, SWD(2017) 153 final.
xxxiv Article 28.B.d) of the RBMP, cf. www.boe.es/boe/dias/2014/07/12/pdfs/BOE-A-2014-7371.pdf.
xxxv Appeal from the municipalities against the Júcar RBMP (2009-2015) – Recurso Ordinario (c/d) no. 878/2014.
xxxvi Ruling no. 508/2017 by the Spanish Supreme Court, of 23 March 2017.
xxxvii Zachariadis, T. 2016. Water Pricing in Cyprus. A case study prepared as part of the study 'Capacity building, programmatic development and communication in the field of environmental taxation and budgetary reform', carried out for DG Environment of the European Commission during 2016-2017 (European Commission Service Contract No 07.027729/2015/718767/SER/ENV.F.1) and led by the Institute for European Environmental Policy.
xxxviii Eurostat, data from 2015 (water exploitation index plus (WEI+), "assessing the total freshwater used as a percentage of the total renewable freshwater resources available").
xxxix Presentation by Agathi Hadjipanteli. Water Pricing Policies in Cyprus. Water Pricing Workshop, 24 April 2018, Lemesos.
xl Presentation by Christos Zoumides, Water Supply and Irrigation Water Pricing in Cyprus. Final conference of the study "Capacity building for environmental tax reform", 5 October 2017, Brussels.
xli Watkins E. et al. 2017. Op. cit.
xlii Regulation ΚΔΠ48/2017 published on 10 February, effective as of April 2017.