FUTURELAKES

For Nature, Climate and People

Policy Mapping for NbS & CBS implementation

Deliverable D3.1

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Summary

In this policy report we map policies that are relevant for the implementation of innovative restoration measures, particularly for implementing nature-based solutions (NbS) and circular blue economy-based solutions (CBS) in lake restoration. We present results of a policy mapping exercise at European, national and regional scales. Many lake restoration measures are supported by the Nature Restoration Regulation, that entered into force in 2024. This regulation is raising Europe's ambition to halt biodiversity loss. It sets binding targets to restore degraded ecosystems and enhance priority habitats and species. Other key directives for safeguarding Europe's biodiversity and water quality, some of which came into force decades ago, include the Habitats Directive (HD), Birds Directive (BD), Water Framework Directive (WFD), Urban Wastewater Treatment Directive (UWWTD), Nitrates Directive (ND) and Groundwater directive (GWD). The report compares implementation of key policy areas in countries where FutureLakes demonstration and pilot basins are located. Five of them are located in EU Member States (Lake Ormstrup (Denmark), Lake Vesijärvi (Finland), Lake Karla (Greece), Kartuzy Lakes (Poland) and Lake Ijssel, Groote Melanen and Bleiskwijkse Zoom (the Netherlands). Two of the Demo sites belong to non-EU Member States (Lake Vansjø (Norway) and Loch Leven (UK)). Comparison of FutureLakes demo and pilot sites reveal the diverse ways European legislation is implemented and the existence of other legislation relevant to lake restoration across the countries examined. All 5 EU Member States compared here, as well as Norway, implement the WFD and have adaptive management and River Basin Management Plans in place. Scotland has local laws in place that match the objectives of the WFD. Lakes should be restored in accordance with the EU Biodiversity Strategy objectives and other relevant legislation, such as Habitats Directive and Nature Restoration Regulation. There is a need to overcome the operational challenges for biodiversity conservation of lake ecosystems and to establish pathways for lake restoration.

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Abbreviations

BAT – Best Available Techniques

BD – Birds Directive

CAP – Common Agricultural Policy

CBD – Convention on Biological Diversity

CBS – Circular Blue Economy Solutions

CFP – Common Fisheries Policy

CJEU – Court of Justice of the European Union

CSRD – Corporate Sustainability Reporting Directive

DUTH – Democritus University of Thrace

EAGF – European Agricultural Guarantee Fund

EAFRD – European Agricultural Fund for Rural Development

EEA – European Environment Agency

EEC – European Economic Community

EIA – Environmental Impact Assessment

EIAD – Environmental Impact Assessment Directive

EU – European Union

EQS – Environmental Quality Standard

EQSD – Environmental Quality Standards Directive

FCS – Favourable Conservation Status

GAEC – Good Agricultural and Environmental Conditions

GWD – Ground Water Directive

HD – Habitats Directive

IED – Industrial Emissions Directive

IEEP – Institute for European Environmental Policy

MS – Member States

MSFD – Marine Strategic Framework Directive

NbS – Nature Based Solutions

ND – Nitrates Directive

NIVA – Norwegian Institute for Water Research

NMWTP – National Municipal Wastewater Treatment Program (Poland)

NSWRP – National Surface Water Restoration Program (Poland)

RBMP – River Basin Management Plan

PoM – Programme of Measures

SAC – Special Area of Conservation

SDG – Sustainable Development Goal

SEPA – Scottish Environment Protection Agency

SER – Society for Ecological Restoration

SPA – Special Protected Area

SYKE – Finnish Environment Institute

UKCEH – UK Centre of Ecology & Hydrology

UN – United Nations

UWM – University of Warmia and Mazury in Olsztyn

UWWTD – Urban Wastewater Treatment Directive

WFD – Water Framework Directive

WISE – Water Information System

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Executive summary

This policy report reviews 13 European policies and compares their implementation across seven countries involved in the FutureLakes project. It focuses on how these policies support innovative Nature-based Solutions (NbS) and Circular Blue-Economy Solutions (CBS) for lake restoration.

Key directives that underpin lake restoration efforts include the Habitats Directive (HD), Water Framework Directive (WFD), Nitrates Directive (ND) and Urban Wastewater Treatment Directive (UWWTD). The implementation of these directives at the Member State level has contributed to reduced nutrient concentrations in European lakes and some recovery in the ecological status of lakes, most notably sites that were originally in bad or poor status. The implementation of the Urban Wastewater Treatment Directive (UWWTD) has been particularly successful in reducing nutrient loading to lakes from sewage treatment works. However, these policies have generally not succeeded in improving lakes in moderate status or halting the decline in freshwater biodiversity. New EU legislation has recently been adopted, most notably the Nature Restoration Regulation and the Water Resilience Strategy, to provide new policy momentum to strengthen Europe's ambitions to reduce pollution and restore biodiversity. Both offer mechanisms to transform lake restoration with a focus on climate resilience and systemic change and particularly highlight NbS and CSB measures as being relevant to achieving policy goals. Agriculture is one of the main sectors impacting the water quality and quantity of European freshwaters. Implementation of Common Agricultural Policy (CAP) measures in Member States has been criticised as both insufficient and ineffective in terms of tackling excessive water use and diffuse pollution.

A comparison was carried out of implementation of key policies in seven countries where FutureLakes demo and innovation basins are located. Five of these are EU Member States (Denmark, Finland, Greece, Poland and Netherlands), while two are located outside of the EU (Norway and Scotland, UK). All EU Member States compared here, as well as Norway, implement the WFD and have adaptive management and RBMPs in place. Scotland has water and biodiversity legislation that was adopted before the UK withdrew from the EU, that aligns closely with the objectives of the WFD and HD. Neither Norway nor Scotland have adopted the EU Nature Restoration Regulation. Analysis of policy implementation at the FutureLakes case study sites reveals national policy contexts and needs matter, although sufficient enforcement of policy and associated financing for implementing restoration measures remains an issue in all countries. Different policy contexts and pressures will require different NbS and CBS for effective lake restoration.

To deliver a successful transformation in lake restoration, it is necessary to improve implementation, enforcement and financing of restoration measures. We recommend that more attention needs to be paid to policy integration and coherence. Aligning WFD, biodiversity, climate, and circular economy policies could unlock co-benefits and funding for implementing NbS & CBS measures. The EU Nature Restoration Regulation and Water Resilience Strategy are significant attempts towards policy integration. Together they consider the broad benefits of nature restoration and take a more systemic approach to achieving them. Both consider agricultural and urban landscapes, with the Water Resilience Strategy establishing a range of specific actions across agriculture and industry sectors, and in governance and financing. The changing policy landscape across Europe appears to be moving towards a more integrated enabling environment for lake restoration.

There is also a need to understand how the EU policy mix could be better integrated to enable public and private sectors to facilitate this transition efficiently and equitably. Guidance is necessary to ensure that the impacts of this transition do not impose excessive burdens on local communities, industries, or agricultural practices. Rather than creating obstacles or delays, policy design should actively promote and accelerate opportunities for effective and equitable lake restoration.

1. Introduction

Lakes provide essential ecosystem services, such as biodiversity and climate change mitigation, and contribute to human well-being as sources of drinking water, fisheries and recreation (Schallenberg et al., 2013; Poikane et al., 2024). Tourism can also benefit from access to lakes, although it may contribute to eutrophication and degradation of lake ecosystem. Exposure to blue spaces can benefit health and well-being (Poulsen et al., 2022). Water quality predefines the usability of waterbodies and the types of activities they support, which is particularly relevant in spatial planning. People tend to prefer aquatic environments that are aesthetically pleasing and perceived to be of good quality (Flotemersch & Aho, 2021; Keeler et al., 2015). Clear water increases the perceived recreational value of waterbodies and is associated with a higher number of visits (Curtis & Stanley, 2016; Keeler et al., 2015).

Lake ecosystems are under pressure from multiple stressors contributing to their ongoing degradation across Europe. Climate change poses a significant threat to the lake ecosystems (Poikane et al., 2024), compounded by human-induced pressures, such as irrigation, drinking water extraction, municipal wastewater, agriculture, aquaculture, fisheries and tourism. Legacy pollutants in soils and sediments are expected to maintain or worsen current conditions. Lakes in northwestern and central Europe have a low proportion of waterbodies reported in good ecological status. According to the EEA's WISE database countries, such as the Netherlands, Germany, and Poland, report more than 60% of surface waters as having less than good status (European Environment Agency, 2025). Progress toward achieving Water Framework Directive (WFD) objectives has stagnated. Many EU lakes remain "stuck" at moderate ecological status, with some that previously reached good status now declining. Degraded ecosystems weaken the ecosystem services lakes provide and lead to more frequent harmful algal blooms and fish kills. This development is further accelerated by climate change.

The European Union (EU) has developed an extensive set of directives, regulations and policies to protect water resources, including the Water Framework Directive, Nitrates Directive, the Groundwater Directive, Urban Wastewater Treatment Directive and the Common Agricultural Policy. Through implementation of these directives, significant effort has been undertaken to reduce nitrates and phosphorus concentrations in European lakes. Implementation of the UWWTD has been particularly effective in reducing lake nutrient inputs. However, legacy phosphorus stored in lake sediments continues to cause internal nutrient loading, slowing ecological recovery. Diffuse agricultural pollution remains a challenge and the implementation of CAP measures in Member States has been criticised as inefficient in terms of achieving good ecological status (Aznar, 2023).

The EU's biodiversity policy framework, with Habitat Directive and Birds Directive at its core, has improved the conservation network for European habitats and species through the Natura 2000 network and has contributed to the conservation of migrating bird species (Institute for European Environmental Policy, IEEP, 2025). The recently adopted Nature Restoration Regulation is a new EU policy instrument that complements the Habitats and Birds Directives and is an explicit and extensive policy aimed at increasing actions to safeguard biodiversity in its territory (European Commission, 2025c). It attempts not only to halt biodiversity loss but to restore ecosystems and their services (Hering et al., 2023).

Achieving successful lake restoration requires significant changes to existing water management practices, land use, and pollution control strategies. Additionally, the sustainability of lake restoration needs to be improved by incorporating restoration methods that support the overarching societal targets in circular economies, biodiversity conservation, and greenhouse gases emissions reductions within a multifaceted, co-beneficial context (Tammeorg et al. 2024). The newly adopted EU Water Resilience Strategy is a framework that tries to address this more systemic and innovative thinking.

Nature-based solutions (NbS) and Circular Blue Economy solutions (CBS) are both relevant to the Water Resilience strategy as they have the potential for providing multiple benefits alongside restoring biodiversity, reducing pollution from catchments and dealing with legacy pollutants from lake sediments. NbS refers to actions aimed at protecting, sustainably manage and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (Cohen-Shacham, 2016). CBS, on the other hand, are herewith defined as actions that include efficient recovery of resources from lakes, such as nutrients and biomass, thus integrating circular economy principles into lake restoration. Enabling and supporting policies for the implementation of such measures are crucial for them to become mainstream approaches in lake protection and restoration. Policy guidance must emphasize combinations of policy instruments that enable the public sector to facilitate the transition in lake restoration efficiently and equitably (Werbeloff & Brown, 2016). Moreover, it is critical to ensure that the impacts of this transition do not place excessive burdens on local communities, industries, or agricultural systems that support livelihoods. Policies should facilitate—rather than delay or obstruct—opportunities for effective lake restoration.

FutureLakes is at the forefront of transforming lake restoration in Europe by implementing a diverse set of in-lake and catchment-based innovations (https://futurelakes.eu/). By integrating nature-based solutions, circular economy principles, and biodiversity-focused approaches, the FutureLakes Project introduces new approaches and strategies for lake basin management. The aim is to demonstrate implementation of these innovative solutions in operational lake basin management at six large European lakes (Demo Basins) along with best-practice and innovation in public engagement, governance, financing and policy.

Critical to this is developing a FutureLakes Blueprint for understanding best-practice and innovation in to deliver successful lake restoration. The purpose of this policy report (Deliverable 3.1) is the first step in developing the policy guidance for the FutureLakes Blueprint that identifies best practice and innovation in policy implementation and policy cohesion that enables successful restoration.

This first Deliverable involves mapping the existing policies implemented on a European and regional scale that are relevant to lake protection and restoration and identifying new policies that have recently been adopted that may provide new opportunities for NBS and CBS implementation. First, we introduce the framework used for policy mapping and the key relevant policies. Secondly, we present the results of policy mapping of EU, national and regional policy at the six FutureLakes Demo basin sites. Finally, we compare policy implementation at the six Demo sites. A later report (Deliverable 3.2) will focus on policy integration and cohesion, examining both policy enablers as well as policy barriers.

2. Framework for policy mapping in FutureLakes

2.2. Sustainability Transition

The transformation of lake restoration requires policies that encourage the development of new restoration techniques, support best practices and innovation in water management, and encourage rapid adoption and upscaling of lake restoration measures. Equally important is the phase-out of bad practices and outdated technologies that contribute to pollution and biodiversity loss.

In this report we refer to the concept of a **sustainability transition**, which is broadly referring to achieving societal change (Geels & Schot, 2007). A sustainability transition requires policies that support the development and acceleration of new practices and technologies as well as widespread establishment of their use. Equally important is the departure from established practices and technologies that are damaging to nature, climate or socially unsustainable. Policies should also ensure

there is no "burden-shifting", unintended consequences associated with the transition (Lai & Karakaya, 2024). Policy can support and accelerate the sustainability transition. In addition, policy guidance is needed to ensure that the impacts of the sustainability transition do not put too much strain on people's health and well-being or on production and consumption patterns that are central to well-being (Heffron & Heffron, 2021). It is equally important to ensure that policies do not slow down, or hinder, opportunities for the sustainability transition. It is particularly important to focus on policy combinations that allow society and economic sectors to support the sustainability transition effectively and fairly (Kern et al., 2019).

This report refers to an x-curve for sustainability transitions, which applies to lake restoration as well (Hebinck et al., 2022; Loorbach et al., 2017) (Figure 1). Different policy instruments can support various stages of this transition (Kaljonen et al., 2024; Kanger et al., 2020). Public guidance in lake restoration should aim to 1) encourage the emergence of innovative restoration and conservation practices; 2) transition through the widespread adoption of effective restoration techniques; 3) phase out unsustainable land and water use practices that contribute to lake degradation; and 4) mitigate the social and economic impacts of the transition by providing support to affected communities.

For a just and effective transition in lake restoration, it is essential to establish clear restoration targets, monitoring mechanisms, and cross-sectoral coordination (5-6). By strategically directing policy measures at these key areas, it is possible to simultaneously foster innovation and eliminate harmful practices while ensuring social and ecological sustainability (Kaljonen et al., 2024).

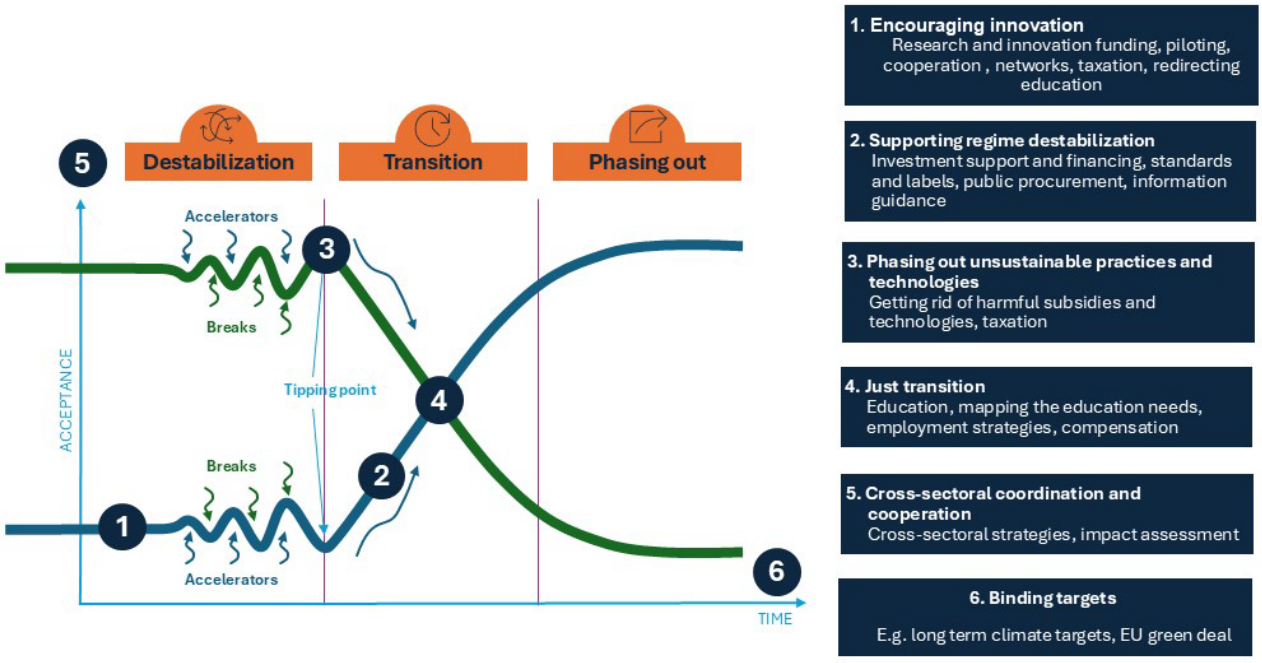

Figure 1. *Sustainability transition to support NbS and CbS solutions and innovation in lake restoration. Based on (Kanger et al., 2020).*

2.2. Methods for policy mapping

In this report, data were gathered from policy documents at the EU, national and regional level. At the European level the report focused on binding policies, e.g. directives and regulations that were most relevant to lake restoration and management and innovative NbS and CBS solutions. A total of 15 key EU environmental and sectoral policies were selected as most relevant.

A participatory mapping exercise was conducted following the X curve framework trajectory to illustrate innovation in lake restoration and implementation of NbS and CBS. This included a broader set of policies and legislation relevant to innovation in lake restoration. The interactive workshop was organized in Volos, Greece with about 20 participants, involving FutureLakes consortium members, Demo site leads and lead stakeholders from each of the Demo sites.

The mapping process included an online workshop with key stakeholders from the six Demo Basins (identified by WP2, Task 2.1), followed by a qualitative survey to capture their perspectives on current policy practices, as well as policy needs and barriers to the implementation of NbS and CbS for lake protection and restoration. The online workshop was organized in March to gather input from the demo sites and was attended by 17 participants. A brief qualitative survey was circulated in advance among the demo site leaders to collect information on Member State and regional demo site specific policies and regulations on NbS and CBS implementation. The survey focused on the WFD, CAP and climate change and adaptation policies while also allowing for the inclusion of other relevant policies. The purpose of the survey and workshop was to better understand implementation of policy at national and regional scales and identify any country-specific national or regional policies that support lake protection and restoration.

2.3. Limitations

The report is subject to several limitations. The analysis was conducted primarily as a collective desk-based assessment, which implies that the findings are based on the textual content of the policy documents, also referred to as a policy formulation phase, rather than detailed analysis of their implementation in national legislation. Policy effectiveness and outcomes in individual countries may be very different than the aims on paper. Despite the limitations of this methodology, it is important at this first stage to map and analyse the key European policies that are relevant for lake restoration innovation and that can support the transition to improved status of lakes.

The mapping also does not encompass all conceivable EU policies but those selected as most crucial for lake restoration. The list of policies reviewed is not comprehensive. Instead, our analysis focuses on the main environmental policies and regulations that were believed to be particularly relevant for the implementation of lake restoration measures, especially innovative NbS and CBS measures. The desk-top analysis was extended with an online workshop and surveys sent to Demo leads to gather information about the national implementation of these directives and identify any gaps in policy implementation.

3. Policy mapping

3.1. Participatory mapping on policies that support NbS and CbS implementation

Focus areas of this report are related to policies relevant to restoring water quality (reducing pollution) and biodiversity. In table 1 we summarize the main EU policies and how they relate to the intervention points for sustainability transition.

Table 1. Results of the participatory mapping for lake restoration innovation and NbS and CBS solutions. The environmental and sectoral policies encouraging innovation is point 1 in Figure 1., supporting regime destabilisation is point 2, to provide coordination to multi-regime interaction is point 5 and binding targets is point 6.

Intervention logic	Levels of intervention	Policy Programmes
Encouraging intervention	EU	Horizon Europe, EU taxonomy, Common Agricultural Policy, Farm to fork strategy, Water Resilience Strategy
	National, regional	Regional plans for restoration, e.g. Venice Lagoon, Italy
Supporting regime destabilisation	EU	Nature Restoration Regulation, Nitrates Directive, Wastewater Directive
	National	European court of justice vs Ireland, court case, Ireland, Nature protection areas outside of Natura 2000
Providing coordination to multi-regime interaction	International	Kunming-Montreal Global Biodiversity Framework, Convention on Biological Diversity
	EU	Nature Restoration Regulation, Habitats Directive, Birds Directive, Water Framework Directive, Nitrates Directive, Common Agricultural Policy, Environmental Impact Assessment Directive, Environmental Quality Standards Directive, Water Resilience Strategy
	National	Act on the Organisation of River Basin Management and the Marine Strategy (1299/2004), Finland, Water boards, the Netherlands
Binding targets	International	UN Decade on Ecosystem Restoration, Bonn Challenge, The SDGs, Kunming-Montreal Global Biodiversity Framework, Convention on Biological Diversity
	EU	Nature Restoration Regulation, Habitats Directive, Birds Directive, Water Framework Directive, Nitrates Directive, EU Biodiversity Strategy, EU Adaptation Strategy, Common Agricultural Policy

4. Nature directives and regulations

4.1. Nature Restoration regulation

The Nature Restoration Regulation (NRR; 2024/1991/EU, European Commission, 2024b) is a comprehensive piece of legislation that aims at restorations of ecosystems for people, climate and the planet. As part of EUs biodiversity strategy, the Commission proposed the Nature Restoration Regulation with an overarching restoration objective for the long-term recovery of nature in the EU's land and sea areas and binding restoration targets for specific habitats and species (European Commission 2025a). The regulation is established to provide explicit, directly legally binding obligations on Member States on implementing restoration measures to improve European ecosystems, habitats and priority species. Restoration measures should support and enforce the obligations on reaching the favourable conservation status (FCS) of the Nature Directives (Stoffers et al., 2024).

The NRR enforces a general obligation for Member States to establish effective and area-based restoration measures with the aim to jointly cover, as an EU target, a minimum of 20 % of land areas (including inland waters) and a minimum of 20 % of sea areas by 2030, and all ecosystems in need of restoration by 2050 (Art 1(2)).

Article 4 *Restoration of terrestrial, coastal and freshwater ecosystems* focuses on targets for priority habitats and species listed in the Habitats Directive (HD) and Birds Directive (BD). However, it extends the focus beyond the HD, to consider the need for restoration measures at any habitat that EU priority species are dependent on, irrespective of whether they are a priority habitat. Article 4, therefore, covers specific priority lake habitat types and other lake habitats that priority species are dependent upon. Member States should enforce restoration measures to improve to good condition priority habitat types listed in Annex I, which are not in a good condition. There are several lake types listed in the Annex I, varying from oligotrophic to eutrophic lakes (Table 2).

Table 2 Lake habitat types covered explicitly by Article 4 of the Nature Restoration Regulation, following the types listed in Annex I of the Habitats Directive.

- Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)
- Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean, with *Isoetes* spp.
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* — type vegetation
- Natural dystrophic lakes and ponds
- Lakes of gypsum karst

Articles 5, 8, 9, 11 and 12 of the NRR are focused on biodiversity targets for specific ecosystems (marine, rivers and floodplains, urban, agricultural and forest ecosystems) and although not directly relevant to lake ecosystems, they potentially include the need for restoration measures in lake catchments that could contribute to restoration of lake ecosystems. For example, Article 11 *Restoration of agricultural ecosystems*, requires implementation of "restoration measures necessary to enhance biodiversity in agricultural ecosystems, taking into account climate change, the social and economic needs of rural areas and the need to ensure sustainable agricultural production". Annex VII

of the NRR goes on to list examples of restoration measures, including introducing high-diversity landscape features in agricultural land, such as buffer strips and ponds (NbS) and increasing agricultural area subject to agro-ecological management approaches, including nutrient management (potential for enhancing CBS).

In order to fulfil the directives' aim, the most suitable restoration areas should be determined based on best available knowledge and scientific evidence on the condition of priority habitat types (Article 4.8). The regulation sets an obligation that areas where good condition and adequate quality of species' habitats have been achieved should not deteriorate (Article 4.11).

The Member States are additionally expected to prepare national restoration plans (NRPs, Article 14) with detailed content of plans outlined in Article 15 and in follow-up Implementing regarding a uniform format for national restoration plans. Commission Implementation Regulation (2025/912/EU, European Commission 2025b) adds detail on how to conduct the national restoration plans. A draft of each Member State NRP is due by September 2026 (Article 16) and a final version following EC assessment by September 2027 (Article 17). To conduct preliminary monitoring and research to identify the necessary restoration measures to restore habitats and increase biodiversity (Article 14, 15). The plans should consider the quality and quantity of specific habitats needed for species protection, such as nursery and spawning areas and the connectivity between habitats for species. The restoration plans should identify areas suitable for restoration within and outside the Natura 2000 network (Article 15.14). The restoration plan should also include dedicated sections for the conservation and management activities Member State aims to adopt under the Common Fisheries Policy (CFP) and the Common Agricultural Policy (CAP) (Article 14.10) 15.14 (g), (h). Member States shall identify synergies with agriculture and forestry and the obligations caused by the Nature Restoration Regulation should not re-programme any funding under the CAP or CFP (Article 14.10 & 14.11). They should include in the plans for monitoring restoration areas and evaluation of the ecological efficacy of restoration measures. They should also ensure long-term effects, consider climate change scenarios, collaborate with national energy and climate plans, and estimate financing needs.

4.2. Habitats Directive

The Habitats Directive's (HD; 92/43/EEC, European Council, 1992) overall objective is to ensure that all species and habitat types are maintained or restored to a favourable conservation status (FCS) within the EU. Further decline of species and their habitats should be halted and in the long run the conservation and restoration should aim at their recovery and thriving. The HD aims to protect over a thousand species, including mammals, reptiles, amphibians, fish invertebrates and plants and 230 habitat types (European Commission, 2025g). In the Habitats Directive's Annex I 32 river and lake habitat types as well as several alluvial and riparian habitat types are listed for protection. Seven are lake habitat types requiring restoration actions under the NRR (Table 1). Protected species requiring designation of protected area (Natura 2000 sites) are listed in HD Annex II plus additional species in need of strict protection listed in Annex IV.

According to the HD the conservation level of a species to be favourable is when it is maintaining itself on a long-term basis as a viable component of its natural habitats, and its natural range is neither being reduced, nor is likely to be reduced, for the foreseeable future. The species should have a sufficiently large habitat to maintain its populations on a long-term basis (Art 1(1), paragraph (i)). The conservation level of a habitat is favourable when its natural range and area it covers within that range are stable or increasing, the specific structure and functions necessary for its long-term maintenance exist, and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable (Art 1(1) paragraph (e)).

4.3. Birds Directive

Birds Directive (2009/147/EC, European Commission, 2009) on conservation of wild birds was adopted in 2009. The directive's most significant obligation is laid down in Article 2, according to which "Member States must take all necessary measures to maintain the populations of the bird species at a level that meets especially ecological, scientific and cultural requirements, taking into account economic and recreational requirements, or to adapt these strains to this level." Although the BD does not explicitly use the concept of a favourable conservation status, its objectives are generally associated to mean striving for a favourable conservation status for all wild birds (European Commission, 2025e).

Member States must prohibit all forms of capture or killing in the wild, all forms of disturbance particularly during breeding and rearing, the destruction of or damage to the nests or eggs (Article 5) They should also prohibit the use of any method for large scale and non-selective capture or killing, such as nets, cages and clue and the keeping, transport and sale of specimens taken from the wild (Article 8). The directive lists bird species in Annex I. LIFE regulation provides a possibility to prioritize funding under the LIFE programme for a particular list of species. Also, the European Red list of birds assesses the extinction risk of 544 bird species occurring in Europe (BirdLife International, 2021). Member States must also report on the population status of species protected under BD.

5. Directives related to Restoring Water Quality

5.1. Water Framework Directive

The Water Framework Directive (2000/60/EC; WFD, European Commission, 2000) was enacted in 2000 and it regulates the ecological condition of rivers, lakes, transitional waters, coastal waters and groundwater. Member States must implement river basin management and produce river basin management plans (RBMPs) (Kaika & Page, 2003; Voulvoulis et al., 2017). According to art 2.13 "river basin" means the area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta. The directive establishes adaptive management through a cyclical approach of 6-year planning cycles. RBMPs are drafted each 6 years in a process, supposedly with extensive public consultations. They are put into operation through Programmes of Measures (PoM) in implementation cycles of 2009–2015, 2016–2021 and 2022–2027. The WFD aims at achieving good ecological and chemical status of all European surface waters and groundwaters by 2015 or by 2027 the latest. For each surface waters category – lakes, rivers, transitional waters and coastal waters – the good status objective covers good ecological status and good chemical status (Art 4(1), paragraph a). The surface waters of each category are further separated into types based on natural geographical characteristics. In article 4.10 "body of surface water" is defined as "a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water." Lake types are classified according to a number of factors, including altitude, depth, size and geology (alkalinity, humic content). The WFD applies to lakes >0.5 km^2.

Ecological status classification aims to describe the structure and functioning of the surface water ecosystem. The water status is monitored and assessed based on a classification of ecological status into high, good, moderate, poor, and bad as classified (Heiskanen et al., 2004). The ecological status assessment is based on physico-chemical and hydro-morphological quality elements, which should reach a certain level to safeguard a functioning ecosystem. The Biological Quality Elements should show only a low level of distortion caused by human activity (WFD Annex V).

By the non-deterioration clause, EU Member States are required to implement all the necessary measures to prevent further deterioration of water bodies in their territory (WFD Article 4.1(a)(i); 4.1(b)(i)). This non-deterioration clause regulates all waters including those in less than good status, good status, and high status. The good ecological status and non-deterioration requirements are both legally binding for the EU Member States as confirmed by the Court of Justice of the European Union in the Weser-ruling (CJEU C-461/13). States must account for the WFD requirements when permitting new projects with impact on water quality (Soininen and Platjouw, 2018).

Programmes of Measures should include measures under a number of daughter directives listed in Annex VI (Part A), including the Urban Wast-water Treatment Directive, Nitrates Directive, Habitats Directive and Integrated Pollution Prevention Control Directive. Supplementary measures should be considered including negotiated environmental agreements with landowners and emission controls, recreation and restoration of wetland areas and water efficiency and reuse measures. In this respect, the WFD encourages the implementation of NbS and CBS measures through River Basin PoMs.

The European Commission monitors WFD implementation and has updated the legislation over time. The implementation report of the WFD (European Commission, 2025d) identified several positive trends, such as improved knowledge and monitoring of surface and ground water bodies, increased spending on water quality related measures and application of EU water-related legislation. Despite this increased knowledge and spending on measures, nutrient concentrations have not declined sufficiently in many lakes to see improvements to good ecological status. Analysis of WISE data[1] indicates that improvements are most visible in lakes that were at Poor or Bad ecological status in the 1st cycle of RBMPs, but there has been little overall change in the proportion of sites in good or high status, indicating no change of sites improving from Moderate status to Good or High (Lyche Solheim et al., 2025).

5.2. Nitrates Directive

Since its enactment in 1991, the Nitrates Directive (ND; 91/676/EEC, European Council, 1991b) has been guiding water protection from nitrates contamination. Nitrates concentration results from nitrogen compounds from fertilizers, manure leaching into the groundwater, and runoff from agricultural land to the surface waters. The directive aims at promoting good farming practices and preventing nitrates pollution from agricultural sources. It regulates the monitoring of nitrate concentrations of water bodies, designating nitrate vulnerable zones, and establishing codes of good agricultural practices and measures to prevent and reduce water pollution from nitrates.

The goal of establishing Nitrate Vulnerable Zones is to focus water protection measures on waters where the concentration of nitrates exceeds 50 mg/l. The ND with its national implementation has decreased N leaching to the surface and ground waters and to the atmosphere (Velthof et al., 2014). In nitrate vulnerable zones, nitrate levels are exceeded because of failure in ground water management, rather than lack of knowledge or available water protection techniques (Musacchio et al., 2020). In non-vulnerable zones, Member States can propose a set of voluntary measures, such as time periods and weather conditions for fertilizer use. Many of the measures are aligned with the WFD objectives. The ND is one of the Statutory Management Requirements of the Common Agricultural Policy (see below).

5.3. Groundwater Directive

Groundwater Directive (Directive 2006/118/EC, European Commission, 2006) aims to prevent and control groundwater pollution from harmful substances. The directive sets assessment criteria on good

[1] https://www.eea.europa.eu/data-and-maps/dashboards/wise-wfd

chemical status of groundwaters and for identification of an upward trend. Groundwater is considered to have a good chemical status, when the measured nitrate levels do not exceed 50 mg/l and active pesticides do not exceed 0.1 µg/l or 0.5 µg/l. Levels of certain high-risk substances are below threshold values set by Member States[2]. The concentrations of any other pollutants should conform to the good chemical status limits of the Water Framework Directive Annex V. When exceeding the groundwater quality standards, there should be an investigation confirming that this does not pose any significant environmental risk.

5.4. Urban Wastewater Treatment Directive

The Urban Wastewater Treatment Directive (UWWTD) (Directive 2024/3019, European Commission, 2024a) aims to protect human health and the environment from untreated wastewater. The directive introduces measures to protect the environment from wastewater discharges and to ensure that domestic and industrial wastewater is properly collected, treated, and discharged. The directive was adopted in 1991 and during the 30 years of enforcement water quality in European rivers and lakes improved a lot. Wastewater treatment plants have been built with the support of EU funding in the EU Member States. The UWWTD was revised at the end of 2024 with new requirements to extend the need for tertiary treatment of wastewater. Specifically relevant to FutureLakes, is a new target that, by 2033, "all EU cities above 100 000 inhabitants will set up integrated urban wastewater management plans prioritising nature-based solutions and green/blue infrastructures". The revision also pushes circular economies from wastewater which could create a strong policy incentive for implementing CBS.

5.5. Floods Directive

The Floods Directive (2007/60/EC, European Commission, 2007) on the assessment and management of flood risks, establishes a comprehensive framework for assessing and managing flood risks across the EU. Its main objective is to reduce the risks and adverse consequences of floods on human health, the environment, cultural heritage, and economic activity. The Floods Directive aligns with international instruments, e.g. the United Nations Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

The directive allows Member States to set their objectives based on local and regional circumstances based on the varying flood risks across different regions. It mandates Member States to conduct preliminary flood risk assessments, prepare flood hazard maps and flood risk maps, and to establish flood risk management plans. These plans are crucial for prevention, protection, and preparedness against floods and are expected to consider various factors such as costs and benefits, objectives of the WFD, soil and water management, spatial planning, land use and nature conservation.

The directive is a comprehensive piece of legislation, and it applies to all kinds of floods. It imposes specific measures and requirements on Member States such as conducting detailed management plans for coordination with authorities and for transboundary coordination with other countries. Member States implementing the directive may appoint similar authorities that the WFD or different ones. The directive follows cyclical approach of updating the flood hazard maps and flood risk maps every six years, as established in the adaptive management of the WFD. The first cycle of its implementation was in 2010–2015 and the second cycle of implementation covered the period from 2016 to 2021. The Commission assessed the second cycle's Preliminary Flood Risk Assessments as

[2] Such substances are ammonium, arsenic, cadmium, chloride, lead, mercury, sulphate, trichloroethylene and tetrachloroethylene.

prepared by the Member States. These assessments and an EU overview were published in the 6th Implementation Report in December 2021. The third cycle covers 2022–2027.

There has been an effort from the European Commission to integrate and create synergies between the WFD and the Floods Directive, recognizing that floods and water quality are intrinsically connected. Indeed, "Flood risk management is an integral part of integrated river basin management. The Floods Directive is therefore closely coordinated with the Water Framework Directive. In particular, coordinating flood risk management plans, river basin management plans, and public participation procedures" (Floods - European Commission).

Often the issues of floods and water quality are managed and governed by different entities, sometimes with different scope and scale. This may provide challenges in coordinating and integration between these two policy domains. For example, flood risk may be the responsibility of response-oriented risk management actors and hence solutions that address extreme events. As such, nature-based solutions may be considered inadequate to address these events. On the other hand, agencies responsible for the ecosystems that can help mitigate floods and reduce flood peaks, do not often have any formal role in flood risk management. Both communities may have different disciplinary backgrounds, training and working cultures. As such, policy integration between these two domains is needed but can be challenging (Johannessen & Granit 2015). Better integration could help with the wider adoption of NbS in lake catchments to increase flood resilience and reduce downstream peak flows. Further demonstration of the effectiveness of NbS implementation at large scales is needed. The management of natural lakes, typically modified with dammed outflows, is widely acknowledged to contribute to flood risk management. There may also be opportunities for NbS innovations to support biodiversity in lakes where water levels are managed primarily for flood risk management.

6. Common Agricultural Policy

The Common Agricultural Policy (CAP) is the primary tool for supporting and financing agriculture within the European Union (European Commission, 2021b, 2025f). CAP significantly influences water protection in agriculture through the so-called greening of the CAP. In the 2023–2027 CAP programme period, each Member State is required to develop a national strategic plan, detailing the specific measures and requirements of its agricultural policy. These plans must be approved by the EU. The new CAP model shifts more responsibility to Member States, moving away from a one-size-fits-all approach. This period also places greater emphasis on environmental and climate initiatives, though overall EU funding for CAP has been reduced. Member States outline subsidies in their CAP strategic plans for 2023–2027. Water protection measures are included in the eco-scheme and environmental payment system. Farmers must meet specific environmental standards to qualify for subsidies—a principle known as the cross-compliance mechanism (European Commission, 2024b).

The Green Architecture of the June 2021 agreement is divided into the conditionality requirements, eco-schemes and rural development (Guyomard et al., 2023). Conditionality requirements are also referred to as the cross-compliance mechanism that farmers must meet to receive subsidies. This system benefits European biodiversity and agricultural landscapes by safeguarding habitats, improving animal welfare, and establishing good agricultural and environmental practices. Cross-compliance includes statutory requirements such as Good Agricultural and Environmental Conditions (GAECs) and nitrogen application regulations under the Nitrates Directive. Compliance with these conditions is necessary for most CAP payments. Additionally, all farmers—whether receiving payments or not—must adhere to Statutory Management Requirements (SMRs), which cover EU rules on public health, animal and plant health, animal welfare, and environmental protection.

Eco-schemes support farmers to adopt and maintain farming practices that contribute to EU environmental and climate goals. This mechanism rewards farmers for preserving natural resources and providing public goods. The support scheme can be applied to organic farming, agro-ecological

practices, precision farming, agro-forestry, carbon farming and animal welfare improvements. 25 % of CAP Pillar I funding runs through eco-schemes (Guyomard et al., 2023).

Its framework is outlined in Regulation (EU) 2021/2115, which establishes rules for strategic plans designed by Member States under the CAP. The policy is funded through the European Agricultural Guarantee Fund (EAGF) and the European Agricultural Fund for Rural Development (EAFRD).

CAP has three overarching objectives, as stated in Article 5 of the regulation:

a) To foster a smart, competitive, resilient, and diversified agricultural sector that ensures long-term food security.

b) To support and strengthen environmental protection, including biodiversity, and support climate action, aligning with the EU's environmental and climate-related goals, including commitments under the Paris Agreement.

c) To strengthen the socio-economic fabric of rural areas.

While CAP is not primarily focused on environmental issues, its objectives encompass various aspects beyond environmental concerns. Given a focus on maintaining agricultural production and the economy of rural areas, some CAP goals may even lead to environmental degradation. However, Article 6 of the regulation defines ten specific objectives, three of which directly address environmental and climate-related issues:

- Contributing to climate change mitigation and adaptation by reducing greenhouse gas emissions, improving carbon sequestration, and promoting sustainable energy.
- Encouraging the sustainable use and management of natural resources such as water, soil, and air, including reducing dependency on chemical inputs.
- Aiding in the reversal of biodiversity loss, enhancing ecosystem services, and preserving habitats and landscapes.

The Common Agricultural Policy significantly influences lake management across various EU countries, including Greece, the Netherlands, Finland, Poland, Norway, and Scotland. In the following table, we report an overview of how CAP is affecting lake ecosystems in five EU countries.

Table 3. CAP Measures impacting lakes in five EU countries

Country	Key challenges	CAP measures
Greece	Aligning agriculture with water quality objectives, eutrophication challenges due to nutrient enrichment from agriculture and wastewater discharges.	Sustainable farming practices, wastewater management The Greek CAP Strategic Plan (2023–2027) aims to reduce the environmental footprint of agriculture by promoting sustainable practices.
Netherlands	Diffuse pollution from agriculture	Water Boards: Regional water boards manage surface water quality and are essential in

		implementing CAP-funded measures to mitigate agricultural impacts on lakes.
Finland	Balancing agricultural practices with lake health	Agri-Environmental Programme (FAEP): includes measures like controlled fertilization and buffer strips to reduce nutrient runoff into lakes, lake restoration projects: In lakes like Pyhäjärvi, CAP-funded measures such as no-till farming and vegetation cover have shown positive effects on water quality
Poland	Implementing effective nutrient management	-Sustainable farming under pilar 1 of the CAP -Nutrient Management: Poland's CAP Strategic Plan focuses on sustainable farming practices to protect water bodies -Lake Management: Implementing monitoring and improve the trophic status of lakes (e.g. Suwałki Landscape Park).
Denmark	Reduction of nitrogen leaching into water bodies, manure management, wetland restoration and creation	-The implementation of mandatory catch crops and the establishment of 10-meter buffer zones along watercourses -Regulations require farms to have sufficient storage capacity for manure - CAP funding supports the creation of wetlands (e.g. Karrebæk Fjord wetland, Egå Engsø in Aarhus region). -Financial support to farmers implementing organic farming and establishing of wetlands

7. Industrial Emissions Directive

The Industrial Emissions Directive (IED, known as Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control), European Commission, 2010), is an EU Directive that focuses on integrated pollution prevention and control. The directive primarily aims to protect human health and the environment by reducing harmful industrial emissions throughout the EU. The objectives of the IED are closely aligned with those of the EGD, particularly in the areas of pollution prevention and control.

The IED is a cross-cutting policy that affects various sectors, particularly targeting specific industries and activities. These include the combustion of fuels, waste incineration, and the use of organic solvents, with the directive outlining specific requirements for these activities. A key aspect of the IED is its emphasis on the use of the best available techniques (BAT) to determine emission limits and control measures. This approach is central to achieving the directive's objectives. Additionally, the directive upholds the "polluter pays" principle and stresses the importance of preventing soil and groundwater quality deterioration. As a directive, this policy instrument is binding upon the EU MS, who are responsible for its implementation and enforcement. The directive came into force in 2010 and does not explicitly integrate international instruments into its framework.

8. Environmental Impact Assessment Directive

The Environmental Impact Assessment Directive (EIA Directive, 2014/52/EU, European Commission, 2014), has a primary objective to ensure that the environmental effects of public or private projects are considered at the earliest possible stage to mitigate their adverse impacts. The Directive aims to enable public authorities and other relevant bodies to make informed decisions on projects that could significantly affect the environment, as well as human health and well-being. It is a cross-cutting policy instrument as it mandates the assessment of the environmental impacts of certain public and private projects.

The directive outlines projects that require environmental assessment. Annex I of the directive lists projects mandatorily subject to assessment, including but not limited to crude-oil refineries, nuclear power stations, chemical installations, waste management facilities, water treatment plants, and dams. Annex II, lists projects for which Member States must decide on the need for an environmental assessment. These projects cover various sectors, including agriculture, silviculture, aquaculture, the extractive and energy industries, metal production and processing, the mineral and chemical industries, the food industry, and sectors involving textiles, leather, wood, paper, and rubber. Additionally, infrastructure projects, other miscellaneous projects, and those related to tourism and leisure are included in Annex II.

The implementation of the EIA Directive requires member states to adopt appropriate laws, regulations, and administrative provisions. Member States must ensure that their existing procedures for adopting plans and programmes follow the requirements set out in the directive. In terms of integration of policy objectives, the EIA Directive acknowledges the United Nations Convention on Biological Diversity (CBD), which the EU has signed and ratified.

9. Environmental Quality Standards Directive

Environmental Quality Standards Directive (2008/105/EC, EQSs Directive, European Commission, 2008), focuses primarily on establishing environmental quality standards for priority substances and certain other pollutants, as outlined in Article 16 of the WFD. The Directive entered into force in 2018

and forms an integral part of the EU's broader water policy framework, integrating with other EU directives and regulations related to water and environmental quality. Its central aim is the management and protection of water environments, specifically targeting the reduction of chemical pollution in surface waters and to achieve of good surface water chemical status, aligning with the objectives and provisions of Article 4 of the WFD.

The Directive mandates the application of environmental quality standards for priority substances and certain other pollutants, which are listed in the directives' annexes. Member States can apply these standards to sediment and/or biota in surface waters, which are subject to defined conditions and requirements. This involves conducting long-term trend analysis of concentrations of priority substances prone to accumulation in sediment and/or biota. The directive emphasises the need for regular review of technical and scientific progress and, when needed, proposing revisions to the environmental quality standards. It also requires the establishment of an inventory of emissions, discharges, and losses of all priority substances and pollutants. It addresses the issue of transboundary pollution, ensuring that Member States are not held accountable for pollution sources outside their jurisdiction, and reviews the necessity of amending existing acts and the potential for additional specific Community-wide measures.

10. European Climate Law

European Climate Law (ECL, European Commission, 2021a). This regulation is a key legislative instrument on mitigating climate change which is directly binding in all Member States without the need for transposition into national law (European Parliament and the Council, 2021b). The main objective of the regulation is to establish a framework for the reduction of anthropogenic GHG emissions by sources and enhancement of removals by sinks as regulated in Union law and stated in Article 1. The European Climate Law is a cross-cutting regulation, impacting various sectors across the Union, e.g. energy, industry, agriculture and waste management. It applies to all sources and sinks of GHG regulated under EU law. This inclusive approach is evident in paragraphs 7 and 10 of the preambles.

The regulation sets specific targets of achieving climate neutrality within the EU by 2050 with the aim of reaching net zero emissions and then moving towards negative emissions, as outlined in Article 2. This ambitious goal requires alongside emission reduction in all sectors, balancing Union-wide GHG emissions and removals as regulated in Union law. Additionally, it establishes a target of reducing net GHG emissions by at least 55 per cent compared to 1990 levels by 2030, as specified in Article 4. The regulation also emphasises continuous progress in enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change, in line with Article 7 of the Paris Agreement, and stated in Article.

The European Climate Law requires EU Institutions and Member States to implement necessary measures for reaching the 2050 climate neutrality objective, with a focus on fairness, solidarity, and cost-effectiveness (Article 2, Paragraph 2). Additionally, it establishes an obligation for the European Commission to review EU legislation to facilitate meeting the intermediate and final targets (Article 4, Paragraph 2). The regulation requires continuous progress in adapting to climate change as outlined in Article 5.

The European Climate Law aligns with and supports global environmental commitments of the Paris agreement and the UN 2030 Agenda for Sustainable Development. This alignment demonstrates the EU's commitment to global climate action and sustainable development goals. The ambitious nature of the objectives, coupled with the relatively short timeframe and the need to balance fairness, solidarity, and cost-effectiveness, underscores the Regulation's comprehensive approach.

10.1. EU Circular Economy Action Plan (CEAP)

The EU's Circular Economy Action Plan (CEAP) is a comprehensive body of legislative and non-legislative actions adopted in 2015, which aimed to transition the European economy from a linear to a circular model. The Action Plan mapped out 54 actions, as well as four legislative proposals on waste. The European Commission adopted the new circular economy action plan (CEAP) in March 2020, which is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth. The Action Plan provides more political impetus for implementing CBS measures.

10.2. Corporate Sustainability Reporting Directive (CSRD)

Business leaders face increasing regulatory and market pressures within the EU Member States to disclose sustainability-related information. One of the most recent biodiversity-focused frameworks is the Corporate Sustainability Reporting Directive (CSRD) (EU) 2022/2464.

CSRD is an EU regulation that requires large companies and non-EU companies with significant operations in the EU to disclose detailed information on environmental, social, and governance (ESG) factors. Its purpose is to increase transparency and ensure that investors and other stakeholders have access to reliable, comparable, and consistent sustainability information.

The CSRD requires companies to report detailed, standardised sustainability data, including nature-related disclosures such as biodiversity, land use and water use. CSRD reporting must align with the EU Taxonomy, which classifies environmentally sustainable activities. Companies must disclose how much of their revenue aligns with environmentally sustainable activities, such as ecosystem restoration, pollution prevention, and biodiversity conservation. Accordingly, companies are incentivised to invest in restoration actions to meet sustainability targets and improve their environmental, social and governance performance.

10.3. EU Water Resilience Strategy

Adopted on June 4th, 2025, the EU Water Resilience Strategy aims to enhance water management across Europe in response to climate change, pollution, and water scarcity[3]. Key objectives include: (1) restoring and protecting the water cycle to ensure resilience against floods, droughts, and water scarcity, (2) adopting water-smart practices and green infrastructure to improve water retention on land and prevent water pollution and (3) securing clean and affordable water and sanitation for all at all times, and empowering citizens for water resilience. The strategy will be addressed by more effectively implementing already existing EU laws for freshwater (e.g. WFD)[4]. As part of this, the strategy explicitly highlights the Nature Restoration Regulation as a policy that provides an opportunity to support water quantity management (floods and droughts) with NbS and the need to redress the natural sponge function of our landscapes by giving priority to using the full potential (of NbS) to store, purify, release, and restore water on land. It also incorporates the UWWTD target By 2033, that all EU cities above 100 000 inhabitants will set up integrated urban wastewater management plans prioritising nature-based solutions and green/blue infrastructures.

The strategy outlines a number of specific actions to support the strategy, summarised in Annex I. Under "Restoring and Protecting the Water Cycle" it includes two actions to reduce pollution. The first is an action to establish a public-private initiative by 2027 to achieve a technological breakthrough in feasible and affordable methods for the detection and remediation of PFAS and other persistent chemicals. The strategy indicates that bio-based technologies (potentially including CBS) will be promoted in the Bioeconomy Strategy for this purpose. The second is an action to launch, by 2026-27,

[3] https://environment.ec.europa.eu/publications/european-water-resilience-strategy_en
[4] https://ec.europa.eu/commission/presscorner/detail/en/ip_25_1404

an Assistance Toolbox to support Member States to reduce nutrient pollution and exchanges of best practices, which could include NbS and CBS measures being demonstrated by FutureLakes.

Under the water-smart economy objective, it includes an action to continue to incentivise farmers to improve the environmental and climate performance of their holdings, including towards better water management.

The strategy also focuses a number of Governance and Implementation actions, including organising a regular exchange with regions, cities and water authorities, to promote exchange of best practices on “sponge landscapes”.

Importantly for upscaling restoration measures it outlines, by 2025, to “adopt a Roadmap for Nature Credits to tap the potential of these instruments and incentivise the scale-up of these markets” and by 2027, to launch a Green and Blue Corridors initiative to support the restoration of ecological settings and infrastructure to restore the water cycle with a source-to-sea approach.

11. Results from the FutureLakes demo and innovation pilot sites

11.1. Denmark

Denmark implements the WFD to protect its water environments and has conducted RBMPs for 2021 to 2027 (Miljoe och ligestillingsministeriet, 2025a). From Danish waterbodies about 5000 km2 of total of 18 600 km2 are in good condition (Miljoe och ligestillingsministeriet, 2025b). Despite multiple measures introduced in RBMPs and PoMs to improve status of waters out of 986 lakes in Denmark, only five are in good condition.

Danish Government lists measures that aim to improve status of lakes (Ibid). By establishment of 800 ha of phosphorus wetlands, it is possible to reduce the phosphorus discharges into the lakes by about 4 tonnes. Additionally, 41 lakes are to be restored by chemical cleaning and by planting fish. Acquisition of approximately 30 fish farms would cause an expected reduction of phosphorus to the lakes of approximately 2.75 tonnes. Wastewater treatment is to be established for 8 lakes and wastewater treatment is to be improved in up to 56 rain-related discharges, i.e. discharges that occur during major rain events.

Denmark is an intensively farmed country with 61% of total land area cultivated. Therefore, the CAP implementation plays a role in improving the status of lakes. Denmark implements the CAP through national action plan in which the main measures have been adopted as mandatory rules for all farmers (Landbrukstyrelsen, 2025).

CAP measures in Denmark include land use management through the fertilizer accounting system, obligation to prepare fertilizer accounts in the fertilizer accounting system and limits for farms to apply more nitrogen for fertilizer purposes than the fertilizer quota calculated for the farm, which is based on the economic optimal rate and on crop specific norms evaluated every year.

There is also a mandatory catch crops scheme aiming at 240,000 ha of catch crops in Denmark. Since 2016 Denmark had implemented catch crops in the WFD river basins, where there is a requirement of reduction in N loadings (now ca. 340,000 ha). Instead of catch crops farmers can also implement other measures, e.g. early seeding of winter crops, in between crops, set aside, set aside buffer strips, energy crops and precision farming. There can also be an individual additional catch crops requirement for

certain holdings and demand for more catch crops in catchments to vulnerable estuaries, e.g. protected groundwater and Natura 2000 areas.

There are also limits for application of manure, such as a maximum of 170 kg N per hectare per planning period of manure, application of liquid manure only by trailing hoses, foot/shoe applicators or injection and period when liquid livestock manure shall not be applied (harvest to 1st February). There is also demand of 75% and 70% N use efficiency of pig and cow slurry. The application of fertilizers must be carried out using a technique that ensures uniformity of spreading.

Denmark also implements bans on applying fertilizers, such as ban on applying fertilizers to sloping areas within a certain distance to surface waters, ban on applying fertilizers to soil that is water-saturated, flooded, frozen or snow-covered and ban on applying fertilizers in a way that could risk surface loss to water courses. There are also requirements for the design of stables, stalls, and other facilities for animals to ensure that groundwater and surface water is not polluted. Denmark implements also specific requirements for storage of fertilizers, e.g. the requirement to the capacity of storage facilities for livestock manure (9 months) and requirement to the frequency of emptying and maintaining the facilities for storing livestock manure. Farmers need also permission for water intake for irrigation that is issued for a limited period.

In Denmark, there is funding under collective measures for afforestation, rewetting of peat soils and restored wetlands and lakes. Lake and wetland restoration was added in 1998 to the list of measures. Catchment officers can assist farmers to find suitable areas for restoration within the constructed wetland programme. The farmers were motivated to take part in the programme because of a promise in 2015 to allow an increase in fertilization level to the 'normal' EU standard after a period with a mandatory reduction of 10% that increased to 20% in 2015. The farmers take voluntarily part in the programme because of the pressure to reintroduce mandatory lower fertilization standards than the economic optimum in Denmark by politicians. The constructed wetland programme is fully covered by EU funding – 650,000 Dkr per ha constructed wetland made by a farmer.

The Danish Climate Act, agreed on politically in December 2019, was adopted in June 2020, and includes two reduction targets. By 2030, the country should reduce its GHG emissions by 70 % compared with 1990 levels, and by 2050 at the latest, achieve climate neutrality. In October 2023, the Danish government (comprising the Social Democratic Party, Denmark's Liberal Party and the Moderates) launched Climate Adaptation Action Plan. The plan launches several national initiatives, including new legislation on managing high groundwater levels, guidance for municipalities on how to include nature and environmental considerations in climate adaptation and coastal protection for the west coast of Jutland and its critical infrastructure. The Ministry of Environment is responsible for the task alongside coordinating ministries, agencies and others in the concerted national efforts.

11.2. Finland

Finland implements the WFD through a set of directives and regulations in its eight river basin districts that conduct RBMPs and PoMs. According to the Act on organizing the water and marine management (1299/2004), the Regulation of the council of state on organizing the water management (1040/2006), and the Regulation on river basin management districts (1303/2004), the Ministry of the Environment and the Ministry of Agriculture and Forestry lead and monitor the implementation of the WFD. The Finnish Environment Institute and the Natural Resources Institute shall perform the tasks assigned by these ministries for the implementation of the directive. The regional Centres for Economic Development, Transport and the Environment shall perform the tasks within their areas of responsibility, such as monitoring requirements, classification requirements, and RBMP drafting. Other state and municipal authorities operating in the water management area and marine waters

participate in the organisation of water management and marine management within their respective areas of responsibility.

In Finland, many of the suggested measures listed in the RBMPs, aiming at improved water quality are related to the environmental payment system of the CAP and aiming at decreased nutrient load of agriculture (Kipinä-Salokannel & Mäkinen, 2022). Regarding the funding of water protection measures, one of the targets in the RBMPs for agricultural water protection is the targeting of CAP project subsidies for water protection measures (Ibid.), such as buffer strips and two-stage channels that are considered as NbS. However, agricultural land in Finland covers only about 8 %, whereby forests cover over 75 % of Finnish land area (Ministry of Agriculture and Forestry, 2025). The Forest Act 1093/1996 is the main regulatory instrument for forestry. Its purpose is to promote the economically, ecologically and socially sustainable management and use of forests in Finland. It also protects small water bodies, which, according to the Act, are defined as habitats of special importance for biodiversity. Additionally, forestry is regulated via certificates such as the Programme for the Endorsement of Forest Certification (PEFC) and Forest Stewardship Council (FSC) promoting more sustainable forestry and supporting the implementation of NbS, such as sufficient buffer widths and leveraging implementation of continuous cover forestry.

In terms of agriculture, Finland joined the EU in 1995 and has implemented the EU's common agricultural policy ever since. The agricultural policy aims at high self-sufficiency in agricultural production. Because of its Northern location, the programmatic measures in Finland have been focusing on direct payments. However, environmental measures have been introduced as part of the cross-compliance mechanism, which is voluntary for farmers, but they need to commit in order to receive payments. 86% of the farmers are committed to the system in Finland (Kipinä-Salokannel & Mäkinen, 2022).

National strategic plan in Finland includes rules on fertilization, manure storage, and NbS such as buffer strips, catch crops, collector plants, soil properties and tillage, mulching requirements, minimum winter plant cover, hydrotechnical measures, rewetting peat soils. Also, the usage of CBS such as soil amendments from recycled sources, is being promoted. Main measures in place are listed in Finnish Food Authorities' (Ruokavirasto, 2023) guide to cross-compliance.

Fertilizer spreading should not cause runoff into the water and compacted subsoil. There should be no fertilizer spreading on snow-covered, frosted, or waterlogged soil. There is a ban on the use of fertilizers closer than five meters from a water body. In case of spreading manure or organic fertilizers on the field, mulching, or plowing should take place within a day. The mulching requirement does not apply if the manure or organic fertilizer is spread with a hose spreader of scattered application. On fields with winter plant cover, manure and organic fertilizers may be spread from 15th of September onwards. There are maximum limits for soluble nitrogen used in nitrogen fertilizers based on the plant, soil type, and yield level. The main rule for phosphorus fertilizer use is considering 100% of the total phosphorus contained in manure and fertilizer products. Larger nitrogen amounts are allowed if only livestock manure is used for phosphorus fertilization. The manure exception may not be used closer than 25 meters to a water body and it is in use until 1st of January 2025.

There are rules on manure storage, such as animal farms must have manure storage with a capacity for storing manure which has accumulated over 12 months except for manure that stays on the pasture during grazing season. In exceptional situations it is allowed to openly store dry manure with dry matter content of 30%, if needed for technical or hygienic reasons, such as malfunction of technical equipment. A technical reason for the exception is, for example, a cellar malfunction or breakdown of manure equipment or to avoid pathogens.

Finland also has specific rules on buffer strips in agriculture, which should be covered with vegetation and left uncultivated alongside of the watercourse. However, with CAP, the buffer strips do not have minimum width requirements and their usage alongside drainage channels is no longer required. Use of pesticides and fertilizers is prohibited, although exceptions can be applied from the Regional Centre for Economic Development, Transport and Environment. The vegetation on buffer strips can consist of herbaceous plants or other than woody plants.

The country has rules on winter plant cover, that require keeping minimum of 33% of field area with plant cover from 31st of October until 15th of March next spring. A subsidy for winter plant cover is granted to an area kept uncultivated or with defined uncultivated or lightly cultivated plants, and the requirement cannot be met with fields under permanent grass cover. The areas must be annually reported. As an integral part of the environmental scheme, one can cultivate catch crops during the growing season. The seeds of the catch crop or plant mixture must be sown evenly either as an underplant of the main crop or after harvest.

Ground water level management responds to the needs identified in the water management plans to regulate the groundwater level in fields with peat and acidic sulfate soil to slow down composting of peat and to prevent acidic leaching. There are several methods, such as drainage control, submersible pumps, or a drainage water recirculation system. During the breaks in farming activities the groundwater level must be kept at its maximum. There are also other requirements, such as manure analysis, soil fertility survey, and promotion of a circular economy.

Alongside the Common Agricultural Policy, mitigation measures and the following support mechanisms are based on following regulation and policies: Water act 587/2011, Degree of the Council of State on limiting certain emissions from agriculture and horticulture (1250/2014) implementing the Nitrate Directive (91/676/EEC), agricultural phosphorus regulation (entered into force on 17th of January 2023. It is based on the Fertilizer Act (711/2022) article 6).

Finnish Climate Act (423/2022), adopted in July 2022 is a framework legislation setting the climate policy targets. Finland has also established National Climate Change Adaptation Plan until 2030. The plan aims to establish nature-based solutions to increase society's preparedness for climate risks, to improve water quality, and at the same time increase biodiversity. The plan also aims to increase the preparedness for droughts and other extreme events caused by climate change.

11.3. Greece

In Greece, the pressures on water resources are increasing, because of the growing demand from various users for sufficient quantity and quality of water (Ministry of Environment and Energy, 2025). The country has relatively good hydrological resources for a Mediterranean country. However, mismatches between the temporal and spatial distribution of rainfall and demand has been created in the past and continue to create water shortage problems, especially during periods of drought. The exploitation of groundwater is carried out at a faster rate compared to surface water. This has severe consequences on lake ecosystems in Greece, also visible at lake Karla.

Because of the increasing pressure on the aquatic environment, it is necessary to turn the focus on sustainable management of water resources. Greece implements the WFD through national legislation (Law 3199/2003), including long-term protection of water ecosystems and the improved quality and ecological status as well as reduction of discharged pollutants and elimination of toxic waste. As a consequence, the 1est and the 2ed RBMPs reports were published in 2015 and 2017 respectively while the 3ed one has been recently submitted to EC.

Sustainable water management policies should consider infrastructure projects and interventions to manage supply and demand through water conservation and reuse measures that go beyond traditional water pricing (Kagalou et al., 2021). The water management in Greece must also consider extreme phenomena and crises such as water scarcity and floods, that are becoming more frequent. While the Greek environmental policy is largely based on EU directives, the lack of implementation is the "Achilles heel" weakening the effectiveness of the Program of Measures foreseen in the RBMPs (Kagalou and Latinopoulos 2020).

Greece implements since 1992 the Habitats and Birds Directive through national legislation (Law 3937/2011). The Greek Natura 2000 network consists of 215 areas designated as Special Areas of Conservation (SACs), 181 as Special Protection Areas (SPAs), 24 as SAC and SPA, 24 as Sites of Community Importance (SCIs), and 2 as SCI and SPA.241 designated SACs and 202 SPAs that often overlap and cover about 27.09 % of the terrestrial area and 19.8 % of marine area (Biodiversity Information System for Europe, 2025). The Biodiversity Law and other Ecological Values finalized the transposition of the Habitats Directive in the country and introduced significant improvements for the conservation of endangered species, biodiversity legislation enforcement and administrative support (Koutalakis, 2011; Frederiksen et al., 2017). According to the Greek legislation implementing the EU's Bird Directive, it is illegal to cage or trade wild birds illegally taken from their natural environment. However, although the Greek law prohibits trapping and trading, wild birds fall victim of trappers and traffickers every year. In Greece, lack of keeping records of successful conservation efforts and limited availability of data, has led to non-conformity to EU environmental law as highlighted by the large number of proceedings against Greece (Koutalakis, 2011).

A Law passed by the Greek Parliament in May 2020 (Law 4685/2020 (A 92)) proposes a new system of governance for the Protected Areas of Greece through a comprehensive and cohesive management framework. The overall, unified planning concerns innovative governance and targeted management to achieve sustainable development, while at the same time enhancing the resilience of all the factors that require protection (natural environment, society, economy). The Natural Environment & Climate Change Agency (NECCA) is a new scientific, advisory, and coordinating organisation created to deal with all the matters mentioned above, i.e., to systematically organise the governance and management of Protected Areas.

Rural areas cover about 63 % of Greek land areas with about 5.3 million hectares of agricultural land (European Commission, 2024). There are about 700 000 farms in Greece, of which 70 % are smaller than 5 hectares. Approximately 29 % of the population lives in rural areas. Greece has conducted the national CAP strategic plan 2023-2027 and it was accepted among one of the first ones in November 2022 (General Secretariat for Union Resources and Infrastructures, 2025). The eco-scheme payments in Greece consist of:

1) Use of resistant and adaptive species and varieties

2) Expanding the application of ecological focus areas (crop specific payments)

3) Implementing improved vegetation cover while enhancing biodiversity (e.g. catch crops 50 e/ha and collector plants 150 e/ha)

4) Circular economy applications in agriculture

5) Improving agroforestry ecosystems with landscape elements

6) Implementation of environmentally friendly management practices using a digital application for managing inputs and monitoring environmental parameters (e.g. mechanical weed control with parallel mulching in wooded areas 173 e/ha, precision farming applications during spraying

of arable and permanent crops 700 e/ ha, annual payment for the use of slow-release fertilizers in horticultural and permanent crops, 60 e/ ha, annual support for the implementation of voluntary integrated pest management guidelines for citrus fruits 175 e/ ha)

7) Environmental management of livestock systems

8) Conservation and improvement of crops on terraced lands

9) Maintaining organic farming and livestock farming methods

10) Protection and conservation of landscapes and agricultural systems of high environmental importance

Greece has established a binding target of net zero by 2050 in the climate law (4936/2022) and emission mitigation targets for the years of 2030 and 2040. The law sets also measures and policies to strengthen adaptation to climate change at the lowest possible cost. It contains provisions for indicators to monitor the progress towards the achievement of those objectives and procedures to evaluate and readjust the objectives and taking additional measures. The country has also national strategy for climate change adaptation from 2016, which aims to contribute to climate change resilience against climate change's impacts.1) Use of resistant and adaptive species and varieties

11.4. Poland

Poland is the member state of European Union since May 1, 2004. After access to EU Polish Law System has been adapted to European law acts. In the case of WFD adaptation time was relatively long, but the WFD has been implemented in Poland into the Water Law of 2017. In Poland, as in many other EU countries, the transposition of the directive still faces many difficulties. The Polish Water Law (Article 1) regulates water management following the principle of sustainable development, and in particular, the formation and conservation of water resources, water use and management of water resources. With the establishment of the new water law, the management of water resources was transferred into the hands of a newly established state body. The State Water Management Polish Waters (PGW Polish Waters) is the central organization responsible for flood and drought protection, as well as sustainable water management in Poland.

Regarding surface waters such as lakes, Section III of the Act specifies the environmental objectives and principles of water protection (Zębek, 2022). Status assessment of surface waters includes classification and determination of ecological status, ecological potential and chemical status of surface waters (Article 38). Moreover, environmental objectives consist of achieving and maintaining good status of surface waters, including good ecological status and chemical status, as well as preventing their deterioration, in particular concerning water ecosystems and other water dependent ecosystems (Pchalek, 2020).

In Poland, RBMPs and PoM target water pollution by nitrates from agricultural sources and aim to prevent further pollution RBMPs introduce measures for improving water quality, such as targeting the nutrients in floodplains and areas of intensive farming by runoff and erosion management, targeting nutrient runoff and erosion of soils and watercourses. The 2nd cycle of RBMP introduces multiple measures that are included within the river basin management framework, such as damming and retention of underground and surface water, increasing disposable water resources for agricultural production (e.g., small retention reservoirs) and increasing soil retention (e.g., ponds). There are measures introduced in national documents that are consistent with the 2nd cycle of RBMP, such as the plan for counteracting the effects of drought regarding activities aimed at normalizing

water relations in catchments, improving the quantitative state of water, and protecting and increasing natural retention, restoring natural flow conditions.

Poland implements EU CAP, including environmental funding scheme for farmers. Agriculture is one of the economic cornerstones of Poland and the profitability of the agricultural sector is comparably good. Agricultural policy has focused on modernization of agriculture. CAP measures are related to, among others, more efficient fertilization, improving soil properties, reducing leaching of pollutants from agricultural areas, and creating and maintaining buffer zones and retention zones in agricultural areas.

There is also a good agricultural practice advisory code on reducing ammonia emissions, which promotes activities related to appropriate nitrogen management, considering the nitrogen cycle, methods to reduce ammonia emissions from livestock production, including animal housing methods, and systems and low-emission fertilizer storage and application techniques for reducing emissions during application. The recommendation to apply a set of good agricultural practice has been indicated in the water law.

In Poland, several measures and nature-based solutions (NBS) are being taken to reduce nutrient runoff from agricultural areas. Policy measures to increase the use of mitigation measures and NBS are established with several documents. The so-called Nitrate Program was adopted by the Polish Council of Ministers (published in the Official Gazette on February 7, 2023 (item 244). The program implements the EU Nitrates Directive with the primary task of reducing the impact of the agricultural sector on the status of surface and groundwater through rational fertilizer management, which will reduce the outflow of nutrients into waters. Within the Nitrate Program, rational fertilizer management is promoted to reduce the outflow of nutrients into waters. The program also supports application of NBS and other mitigation measures such as mulching, subsoiling, riparian buffer zones, use of catch crops.

In Poland, the National Surface Water Restoration Program (NSWRP) aims to improve the condition of waters with restoration activities by identifying priority areas of low surface water quality based on the degree of transformation of the aquatic ecosystem and other conditions of the water body.

National Municipal Wastewater Treatment Program (NMWTP) introduces measures to reduce eutrophication of waters (VI cycle of the Program). The catalog of good practices for hydrological and maintenance works promotes good practice about activities for sustainable and economical management of water resources.

Poland does not have a national climate law or a strategy to become climate neutral, however, the European Climate Law and other EU legislation obliges all Member States to reduce greenhouse emissions (Widuto, 2024). Adaptation plan dates to 2013, however, lack of coordination and monitoring slows down the effort.

11.5. The Netherlands

In the Netherlands, regional water authorities have facilitated the implementation of the WFD provisions. Most of the directive's provisions, such as the river basin approach, have already been implemented. However, the water quality in the Netherlands has not improved sufficiently and the latest forecasts by the Dutch environmental assessment agency show that by 2027 95% to 60% of Dutch water will not meet the WFD standards (Zebek, 2022).

Water quality objectives and the main water management instruments are defined in the Water Act (Waterwet, Stb. 2009, 107). The main instruments established by the act are plans and programs, such as the national water policy plan of the central government, regional water policy plans from the

Regional Water Authority, land development plans of the Ministry of Infrastructure and Water. Surface water quality standards are set in accordance with Chapter 5 of the Environmental Management Act (Wetmilieubeheer, Stb. 1979, 442). The ecological status parameters of waters are set out in the Ministerial Monitoring Ordinance. Regarding the ecological status, a division is made into natural waters and artificial or heavily modified waters that account for approximately 96–99% of waters in the Netherlands.

In the Netherlands, about 66 % of land is used for agricultural purposes (European Commission, 2025). The Dutch agricultural sector is highly productive, modern, innovative, and export oriented. It employs only about 2 % of the population. The country implements CAP's green architecture, which consists of cross-compliance, the eco-scheme in the 1st pillar and subsidies for agri-environmental measures in the 2nd pillar. CAP funding has been reduced for the implementation phase of 2023-2027, with the aim of redistributing the funding based on more ambitious environmental performance. Measures in place, that also impact the water quality, include among others maintenance of permanent grassland, protecting and establishing wetlands, buffer strips, tillage management, no bare soil, crop rotation and share of unfarmed features (van Doorn & Jogeneel, 2022). There are also fertilizer limits and rules on manure application in place among other measures and NBS that contribute to the management of nutrients.

The Climate Act (Klimaatwet, Stb. 2019, 253) regulates the climate change mitigation efforts in the Netherlands. The act mandates the government to achieve climate neutrality by 2050 and sets a national emission reduction target of reducing 55 % of emissions by 2030 compared to 1990 levels. The government needs to conduct a national climate plan every 10 years. The first climate plan is in place between 2021 and 2030 (Informatiepunt – Leefomgeving, 2025). In the Urgenda case (Urgenda Foundation v. State of the Netherlands (2015:7196)), Dutch environmental foundation sued the Dutch government to take more action in order to protect its citizens against the harmful impacts of climate change. The national climate adaptation strategy stems back to 2016. Deltaprogram sets the basis for the national climate adaptation strategy.

11.6. Norway

Norway is not an EU Member State; however, the country transposed the EU WFD into Norwegian law ("Vannforskriften") in December 2006. Other laws that are not directly related to the implementation of the WFD, but still relevant, include the Land Act, the Plan and Building Act, the Law on Pollution, the Law on Biodiversity, and the Water Resources Act. Norway has also implemented the Nitrate Directive in selected parts of the country. The CAP has not been implemented, but the country has its own regulations to ensure environmental measures in agriculture. Norway has also not implemented the Habitats Directive and, consequently, is not adopting the EU Nature Restoration Regulation.

Only about 3 percent of Norway's total land area is used for agriculture. The Norwegian funding system consists of implementation of environmental measures from the Regional Environment Plans (RMP). Its purpose is to stimulate the increased implementation of environmental measures in agriculture. Norwegian measures have focused on reducing phosphorus losses from land to freshwater and nitrates to coastal waters. Conservation tillage, cover crops and fertilizer planning are important measures to reduce nutrients.

In addition to measures related to water, the funding also covers activities to improve the cultural landscape, cultural heritage, recreation facilities, emissions of climate gases to air, and plant health. In addition to the RMPs, the Norwegian funding system also includes so-called 'Special Environmental Measures in Agriculture'. These are aimed at more physical, hydro-technical installations, such as improving drainage pipes and establishing constructed wetlands/sedimentation ponds. Since Norwegian agriculture varies a lot from county to county, each county has its own RMP-regulation.

Norway has established the Climate Act as part of its efforts to transform into a low emission society by 2050. Norway also has national action plan for 2021–2030 that introduces measures on climate change mitigation. To outline Norway's efforts to adapt to the consequences of climate change, the country has an adaptation communication and climate change adaptation plan for 2024–2028.

11.7. United Kingdom

The United Kingdom is no longer an EU Member State since it withdrew from the EU on 31 January 2020. The legal system in the UK is not unified: England, Wales, Scotland and Northern Ireland have separate jurisdiction, with environmental law implemented separately in the different countries. The legal system is based on common law, where precedents are established through case law and legislation passed by parliament. In this policy report only Scottish legislation was scrutinised, because the demo site of Loch Leven is located in Scotland.

Much of the UK legislation is aligned with EU directives and regulations, such as the Water Framework Directive. In Scotland, monitoring requirements and water status classification were established by the WFD before Brexit. River Basin Management Plans for Scotland are produced by Scottish Environment Protection Agency SEPA (2025) on behalf of Scottish Government (SEPA, 2025). These set out a range of actions to address impacts on the water environment, including water quality, physical condition, water resources and the migration of wild fish. The RBMPs summarise:

- the state of the water environment;
- pressures affecting the quality of the water environment where it is in less than good condition;
- actions to protect and improve the water environment;
- a summary of outcomes following implementation.

Legislation within the Water Environment (Controlled Activities) (Scotland) Regs 2011 (known as CAR) allows SEPA to mitigate nutrient loads to Loch Leven from the surrounding catchment by regulating sewage discharges, from private and public sources. CAR gives SEPA powers to regulate diffuse pollution from agricultural sources under various 'General Binding Rules', which includes cultivation of land, keeping livestock, the storage and application of fertliser, the making and storage of silage, and the storage of slurry (Scottish Environment Protection Agency, 2024). There is also a planning agreement with Perth and Kinross Council, for phosphorus (P) mitigation, i.e. upgrading existing septic tanks in the Loch Leven catchment to mitigate the additional P load from new developments (Scotland's Nature Agency, Perth & Kinross Council, Scottish Environment Protection Agency, 2020). Within CAR there are several levels of authorisation that may be required for engineering works; this could include dredging (i.e. removal of P rich sediment), the removal or installation of impoundments, water abstractions, controlling the loch level, etc.

The Waste Management Licencing Regulations 1994 include activities that do not require a licence but can be authorised under an exemption. A paragraph 7 exemption allows SEPA to regulate the spreading of certain wastes to agricultural land and a paragraph 8 exemption regulates the treatment of non-agricultural land with sewage sludge. A paragraph 7 exemption must take into account the nutrients already available in the soil and show that the spreading activity will provide agricultural benefit. The waste must only be spread under favourable conditions (not on sloping or frozen ground, etc) to prevent water pollution from occurring.

Rules on spreading in a Nitrate Vulnerable Zone (NVZ) apply in the Loch Leven catchment; each farm within the NVZ must have a management plan in place for fertiliser and manure (legislation.gov.uk). The Prevention of Environmental Pollution From Agricultural Activity (PEPFA) code provides practical guidance for farmers and those involved in agriculture on how to minimise the risks of environmental pollution from farming operations (Scottish Government, 2005). With advice from SEPA and other agencies, NetRegs have developed guidance for pollution prevention documents (GPP) which are publicly available for landowners/operators.

12. Discussion – implementation of NbS and CBS lake restoration policies

FutureLakes countries, where demo and innovation pilot sites are located, implement EU water and biodiversity policy differently. Our comparison reveals diverse approaches to national implementation of the key EU directives and regulations. This is explained through differences in legal architecture in each Member State and through differences in geographical context and cultural and political values. All EU Member States compared here, as well as Norway and Scotland, implement the WFD and have adaptive management and RBMPs in place. However, the biodiversity and water quantity and quality challenges and, consequently, the NbS and CbS implemented, vary across the demo and case study sites. These different contexts and needs can all impact which legislation is most suitable for implementing measures. For example, a biodiversity need may best be addressed through the new EU Nature Restoration Regulation and emphasise NbS measures, whereas a lake with a problem of internal loading from legacy nutrients released from nutrient-rich sediments, may have the best chance of being addressed through a restoration measure that aims to establish a circular economy from recovering nutrients from the sediment. As part of the European Green Deal, the EUs Circular Economy Action Plan was updated to support measures such as these.

Denmark has established multiple lake restoration measures through WFD PoMs, such as creating wetlands to capture phosphorus. In Denmark, agriculture is the major source of nutrients and therefore CAP measures are central in mitigating the nutrient load to lakes, such as fertiliser limits, buffer zones and catch crops. Eutrophication continues to be a problem in Denmark, with widespread upscaling of NbS sought, such as returning a significant proportion of its farmland back to nature. Denmark has a policy to remove 100 000 km^2 from agricultural production (Koch et al., 2023).

Finland has several lake restoration projects ongoing for large and small lakes, as well as wetland restoration, many of which are established through WFD PoMs. Many of the suggested measures listed in the RBMPs and PoMs, are related to the environmental payment system of CAP, targeting reducing nutrient loads from agriculture. Although Finland is not largely covered with agricultural areas, CAP subsidies are a major source of funding for water protection measures. The Climate Change Adaptation Plan also aims to establish NbS to increase preparedness to climate risks and to improve water quality.

In Greece, the focus is more on sustainable water management to prevent water shortages caused by drought, including infrastructure projects and interventions to manage supply and demand through water conservation and reuse measures (i.e. potentially NbS and CBS). Greece experiences a high degree of legal fragmentation, which increases the quantity of regulation and can result in inconsistencies and enforcement difficulties.

In Poland, RBMPs and PoMs target water pollution by nitrates from agricultural sources preventing further pollution e.g. in floodplains and areas of intensive farming. Mitigation measures and NBS are in place to reduce nutrient runoff from agricultural areas, e.g. the Nitrates Programme. CAP measures include efficient fertilization, improving soil properties, reducing leaching of pollutants and creating and maintaining buffer zones in agricultural areas. While many Member States have enacted climate

legislation, Poland currently lacks a national climate law or a clear strategy for achieving climate neutrality.

In the Netherlands, the WFD has been implemented in national legislation, but it is recognised that water quality has not improved sufficiently to achieve good ecological status. In the country, a division is made between natural waters and the many artificial and heavily modified waterbodies (as described by the WFD). On the basis of this, the Dutch government has decided that the good ecological status objective is only legally binding for a small percentage of water bodies, which is problematic considering EU law. The Dutch agricultural sector uses up to 2/3rds of the land area and is highly productive and modern. There are several CAP measures in place targeting nutrient loads from agriculture, such as fertilizer limits, buffer zones and maintenance of permanent grasslands. The country has a Climate Act in place with binding target setting and climate adaptation that aims to mitigate flood risk.

Norway implements the WFD and has its own legislation in place on agricultural nutrients. Agriculture is a major source of nutrients, although farming is not economically significant. Water management measures target these nutrients, by introducing environmentally friendly farming practices such as buffer strips, limitations on fertilizers and constructed wetlands. Although Norway is not implementing the CAP, many similar measures are implemented. Norway has also not implemented the Habitats Directive and, consequently, is not adopting the EU Nature Restoration Regulation. Norway has established a Climate Act to transform to a low carbon society, an adaptation communication, and Climate Change Adaptation Plan.

The UK, while no longer in the EU, remains aligned with many of the WFD objectives and Scotland, in particular, has national law that adopts the WFD's goals and ambitions. In this respect, Scotland is not greatly different to EU Member States establishing water status classifications, RBMPs and PoMs that are in line with the WFD. Scotland has climate change legislation and a Climate Change Adaptation Plan in place that ensures preparedness to address weather extremes and changing conditions.

13. Future Directions

In addition to the previously stated policy instruments and regulations, the mapping is complemented by an overview of upcoming regulation and policies currently under formulation and conception, including the Carbon Removals and Carbon Farming Regulation as well as the EU Green Claims Directive – all of which should be considered in the policy coherence analysis (D3.2).

13.1. The Carbon Removals and Carbon Farming Regulation

The Carbon Removals and Carbon Farming (CRCF) Regulation (EU/2024/3012) is a landmark voluntary EU regulation which entered into force on 26 December 2024. The regulation creates the first regional voluntary framework for certifying carbon removals, carbon farming and carbon storage in products across Europe. The CRCF Regulation is expected to facilitate investment in sustainable carbon farming solutions by laying down monitoring and reporting processes and setting criteria for certified activities, including quantifiable carbon benefits, additionality beyond statutory requirements, long-term storage, and environmental integrity.

Member states are currently encouraged to integrate carbon farming into their national strategies, leveraging EU funding mechanisms like the CAP (ICF, 2023). The approval of certification schemes as well as the first carbon removal units certified are expected by 2026-2027. The EU-wide CRCF registry should be operational by the end of 2028.

The CRCF Regulation could significantly affect the management and restoration of European freshwater ecosystems, especially through its potential to upscale measures that incorporate carbon farming or peatland rewetting, which can include NbS and CBS.

13.2. EU Green Claims Directive

The EU Green Claims Directive is currently being designed to prevent companies from making misleading claims about environmental merits of their products and services. Its entry into force is expected to take place in 2026–2027 (European Commission, 2023). The directive aims to combat greenwashing by establishing clearer and more enforceable standards for environmental claims.

It will contribute to aligning [5]the European consumption patterns with the circular economy action plan while making sustainable products, services and business models the norm.

Green Claims Directive aims to raise standards for environmental marketing of the active ecolabels (around 230 in 2024) by requiring claims to be scientifically substantiated, independently vetted, and lifecycle-aware, with meaningful penalties for non-compliance. This could be a particularly relevant directive for reducing the use of restoration measures that have no strong evidential backing (c.f. FutureLakes Deliverable 1.1 – Annex 1: In-lake measures to be avoided).

Local business associated with lake catchments that are currently eco-labelled could also be affected by the upcoming Green Claims Directive.

14. Conclusions

In this policy report, we have mapped European, national and regional policies that have the potential support lake restoration, particularly emphasising policies that support implementation of innovative NbS and CBS measures being demonstrated by FutureLakes. A total of 13 European policies were reviewed. Additionally, a comparison across seven countries, where FutureLakes demo and case study sites are located, focused on implementation of the WFD, CAP and climate mitigation and adaptation legislation.

Based on the policy mapping, this report documents clearly that lakes should be restored in accordance with the EU Water Framework Directive and EU Biodiversity Strategy objectives. New legislation has recently been adopted to strengthen these policy ambitions, most notably the EU Nature Restoration Regulation and the Water Resilience Strategy. Both particularly highlight NbS and CSB measures as being relevant to achieving policy goals. Sufficient enforcement of policy and associated financing for implementing restoration measures remains an issue in all countries. The WFD remains the main European policy for reducing pollution to freshwaters and restoring ecological health, however for the past and current planning phases, its implementation has been delayed due to insufficient integration of environmental objectives into sectoral policies (European Commission, 2025d).

Agriculture is one of the main pressures on both water quality and quantity across all FutureLakes demo basins due to its primary focus on food production. Tackling excessive water use and diffuse pollution from agriculture remains a major challenge for Member States. Agricultural pollution has not been significantly reduced at the European scale largely due to ineffective policy instruments and limited capacity to enforce actions aimed at reducing nutrient pollution from agricultural land. Lakes in Central and Northern European countries, such as the Netherlands and Denmark, are particularly affected by nutrient pollution. Lakes in Southern Europe have historically been affected more by water availability, although water scarcity is a growing problem across all regions of Europe, with Eastern Scotland and Southern Norway Demo sites being impacted in recent years. Therefore, more attention

[5] https://environment.ec.europa.eu/topics/circular-economy/green-claims_en

needs to be paid on policy integration, coherence and implementation. Climate change adaptation should also be considered more explicitly in restoration policy and other policy sectors, with these policy goals offering new opportunities for implementation of NbS that provide benefits to both nature restoration and climate resilience. CAP potentially supports the implementation of different NbS, such as buffer zones and constructed wetlands. The revised Urban Wastewater Treatment Directive supports implementation of CbS by pushing circular economies from wastewater.

The FutureLakes case study sites reveal diverse approaches to implementing the European legislation on NbS and CbS for lake restoration across Member States. All EU Member States compared here, as well as Norway, implement the WFD and have adaptive management and RBMPs in place. The UK, while no longer in the EU, remains aligned with many of the WFD objectives and Scotland, in particular, has national law that match the directive's goals. While many Member States have enacted climate legislation, Poland currently lacks a national climate law or a clear strategy for achieving climate neutrality.

Challenges also vary by country. In Greece water scarcity and droughts necessitate water management strategies to address resource constraints, whereas in Northern Europe nutrient loading and eutrophication are typically the main pressures requiring NbS and CBS solutions. There is a greater degree of fragmentation of the legal system across EU Member States. For example, Greece experiences a high degree of legal fragmentation, which can result in inconsistencies and enforcement difficulties. In contrast, Northern European Member States generally have well-established legal frameworks that implement EU directives alongside their own environmental legislation. Norway and Scotland are largely aligned with these Northern European counterparts.

Successful lake restoration is dependent on effective water management and strong governance. To facilitate a transformation in lake restoration, the EU policy framework should be refined to better support the public sector in guiding restoration measures more effectively and fairly across all sectors and encouraging public-private financing for restoration measures. For example, the Water Resilience Strategy establishes a source to sea approach to restore and protect European waters and adopts a range of actions across agriculture and industry sectors and in governance and financing, to scale-up water smart practices and green infrastructure (European Commission, 2025h). Public support and funding are also needed to mainstream a European wide innovation system for lake restoration. Clear public guidance is also essential to ensure that this transition does not place unnecessary strain on local communities, industries, or agriculture. Rather than creating obstacles or delays, policy design should actively promote and accelerate opportunities for effective and equitable lake restoration.

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Annex 1: National Policies

Denmark

Water Framework Directive

Lov om vandplanlægning; nr 126 of 2017 (Act on water planning), https://www.retsinformation.dk/eli/lta/2017/126

The Danish Action Plans for the Aquatic Environment (APAEs), https://www.euki.de/wp-content/uploads/2018/09/fact-sheet-actions-plans-dk.pdf

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Common Agricultural Policy

Bekendtgørelse af lov om miljøbeskyttelse; nr 1218 of 2019 (Act on Environmental Protection), https://www.retsinformation.dk/eli/lta/2019/1218

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Climate mitigation and adaptation

Klimatilpasning, (2025). Climate adaptation in Denmark, https://eng.klimatilpasning.dk/national-adaptation/climate-adaptation-in-denmark

Finland

Water Framework Directive

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Common Agricultural Policy

CAP-plan 2023–2027 for Finland, https://mmm.fi/documents/1410837/10668578/Suomen+CAP-suunnitelma_tuloste+17.1.2022_nettiin.pdf/5c74ae39-8feb-5c45-3afe-822aabae1651/Suomen+CAP-suunnitelma_tuloste+17.1.2022_nettiin.pdf?t=1642665061697

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Climate change mitigation and adaptation

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Other policies and initiatives:

Nature conservation act, 9/2023 (Luonnonsuojelulaki), https://www.finlex.fi/fi/lainsaadanto/saadoskokoelma/2023/9

Water act 587/2011 (Vesilaki), https://www.finlex.fi/fi/lainsaadanto/2011/587

Land use and building act, 132/1999 (Maankäyttö- ja rakennuslaki), https://www.finlex.fi/fi/lainsaadanto/saadoskokoelma/1999/132

Environmental protection act, 527/2014 (Ympäristönsuojelulaki), https://www.finlex.fi/fi/lainsaadanto/2014/527

Lahti city strategy, https://www.lahti.fi/kaupunki-ja-paatoksenteko/kaupungin-strategia/

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National fishways strategy, https://mmm.fi/documents/1410837/1516655/1-4-Kansallinen_kalatiestrategia2012.pdf/fae1c9f2-2908-4859-82ce-0b46c612f179/1-4-Kansallinen_kalatiestrategia2012.pdf?t=1444216497000

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Greece

Water Framework Directive

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- **Προεδρικό Διάταγμα 51/2007** «Establishing measures and procedures for integrated water protection and management in compliance with the provisions of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy», https://www.elinyae.gr/ethniki-nomothesia/pd-512007-fek-54a-832007

- **Υ.Α. 39626/2208/Ε130/2009 (Φ.Ε.Κ. 2075/Β` 25.9.2009) UNDERGROUND waters/ Aquifer PROTECTION** Establishment of measures to protect groundwater against pollution and deterioration, in compliance with the provisions of Directive 2006/118/EC "on the protection of groundwater against pollution and deterioration" of the European Parliament and of the Council of 12 December 2006, https://www.elinyae.gr/ethniki-nomothesia/ya-396262208e1302009-fek-2075b-2592009

Modified by Υ.Α. 182314/1241/2016 Φ.Ε.Κ. 2888/Β` 12.9.2016 https://www.elinyae.gr/ethniki-nomothesia/ya-18231412412016-fek-2888b-1292016

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- **Κοινή Υπουργική Απόφαση Αριθμ. Η.Π. 51354/2641/Ε103 (ΦΕΚ 1909 Β 08.12.2010)** Establishment of Environmental Quality Standards (EQS) for concentrations of certain pollutants and priority substances in surface water, in accordance with the provisions of Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 "on Environmental Quality Standards (EQS) in the field of water policy and amending and subsequently repealing Council Directive 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council', as well as on concentrations of specific pollutants in inland surface waters and other provisions, https://www.elinyae.gr/ethniki-nomothesia/ya-ip-513542641e1032010-fek-1909b-8122010

Modified by Y.A. οικ. 170766/2016 Φ.Ε.Κ. 69/Β` 22.1.2016

- **Υ.Α. Η.Π. 51354/2641/Ε103/2010 (ΦΕΚ 1909/Β` 8.12.2010**) Establishment of Environmental Quality Standards (EQS) for concentrations of certain pollutants and priority substances in surface water, in accordance with the provisions of Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 "on Environmental Quality Standards (EQS) in the field of water policy and amending and subsequently repealing Council Directive 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council', as well as on concentrations of specific pollutants in inland surface waters and other provisions, https://www.elinyae.gr/ethniki-nomothesia/ya-ip-513542641e1032010-fek-1909b-8122010

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- **Αριθ. Η.Π. 38317/1621/Ε 103/2011 (2)** (ΦΕΚ 1977 Β 06.09.2011) Technical specifications and minimum performance criteria for analytical methods for chemical analysis and monitoring of water status in accordance with the provisions of Directive 2009/90/EC of the European Parliament and of the Council of 31 July 2009 'laying down technical specifications for chemical analysis and monitoring of water status pursuant to Directive 2000/60/EC of the European Parliament and of the Council', https://www.elinyae.gr/ethniki-nomothesia/ya-ip-383171621e-1032011-fek-1977b-692011

- **Υπουργική Απόφαση οικ. 1811/2011 (1) (ΦΕΚ 3322 Β 30.12.2011)** Definition of upper acceptable levels for the concentration of specific pollutants, groups of pollutants or indicators of pollution in groundwater, in application of paragraph 2 of Article 3 of Joint Ministerial Decision No 39626/2208/E130/2009 (Β΄ 2075), https://www.elinyae.gr/ethniki-nomothesia/ya-oik-18112011-fek-3322b-30122011

- With **145026/10.01.2014 ΚΥΑ** the national index of water sampling stations Εθνικό Μητρώο Σημείων Υδροληψίας (ΕΜΣΥ) was set

- Geodtatabases, layout and services of ΕΜΣΥ is organized according to N.3882/2010

- **ΚΥΑ Αριθ. οικ.146896/14** (ΦΕΚ 2878 Β/27-10-2014-Διορθ.σφαλμ. Στο ΦΕΚ 3142 Β/21-11-14): Categories of authorisations for the use and execution of water utilisation projects. Procedure and conditions for issuing permits, their content and duration of validity and other related provisions, https://www.e-nomothesia.gr/kat-agrotike-anaptukse/kya-oik-146896-2014.html

With. **135275/2017 (ΦΕΚ Β 1751/22-5-2017) Απόφαση της Εθνικής Επιτροπής Υδάτων** we approved the general rules for water services costs and pricing, https://www.e-nomothesia.gr/kat-agrotike-anaptukse/apophase-oik-135275-2017-fek-1751b-22-5-2017.html **Biodiversity**

Overview of biodiversity laws, https://ypen.gov.gr/perivallon/viopoikilotita/nomothesia/

Directive 92/43/EEC (Οδηγία 92/43/ΕΟΚ) incorporated in national legislation with the following laws and degrees:

- Law 3937/2011 “Conservation of biodiversity and other provisions”, https://redlist.necca.gov.gr/en/legal-framework/

- ΚΥΑ 33318/3028/11-12-1998 (ΦΕΚ 1289/Β/28-12-98) «Definition of measures and procedures for the conservation of natural habitats and wild fauna and flora», https://www.e-nomothesia.gr/kat-periballon/koine-upourgike-apophase-33318-3028-1998.html

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