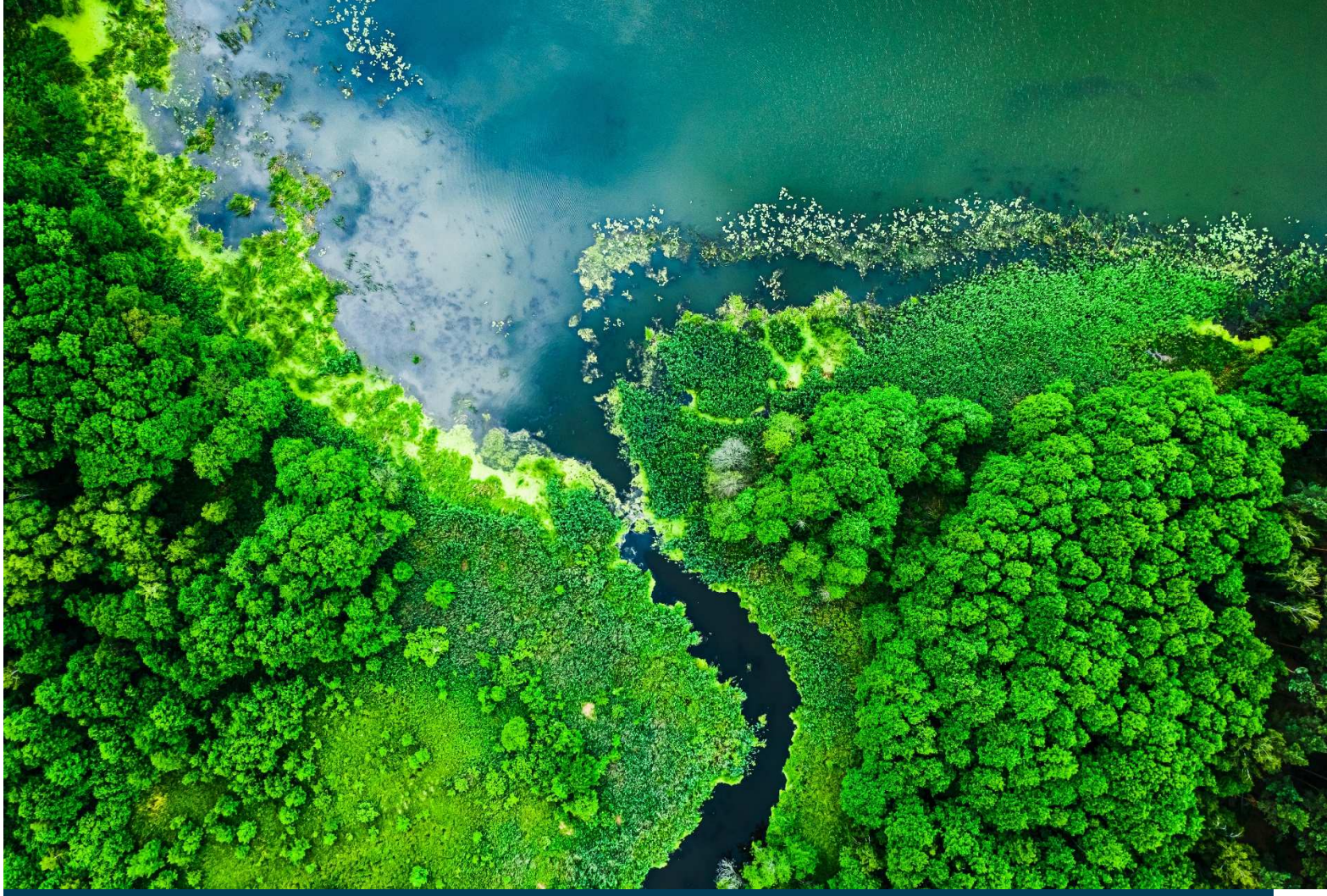

GOVAQUA policy matrix

GOVAQUA Deliverable 2.1

Governance innovations for a transition to sustainable and equitable water use in Europe (GOVAQUA)

Co-funded by the European Union

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GOVAQUA

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Contents

Introduction

Over the past two decades, Europe has witnessed a concerning trend of escalating water scarcity and more frequent drought events and floods, with projections indicating a continuation of this trend into the future. Further, despite decades of efforts to curb pollution, the health of water ecosystems in Europe continues to decline. In particular, the intensification of drought frequencies and water scarcity has led to heightened competition for water resources, forcing difficult trade-offs between supplying sufficient clean water for human needs, supporting various economic sectors, and preserving water needs of the environment. This complex situation has prompted European water managers and policymakers to seek innovative governance approaches capable of addressing unsustainable water use and enhancing resilience to water scarcity and droughts.

The overarching objective of the GOVAQUA project is to identify, assess, develop, and validate innovative water governance approaches that accelerate the transition towards sustainable and equitable water use in Europe. This endeavor encompasses a spectrum of innovations, ranging from legal and regulatory measures to advancements in public and stakeholder participation, collaboration, economic and financial instruments, and digital tools. Part of the GOVAQUA research work aims to characterize and assess the legal and regulatory challenges, levers and good practice to support a transition towards sustainable and equitable water use, in particular by contributing to achieve the objectives and ambitions of the EU Water Framework Directive (WFD), the European Green Deal (EGD) and the Sustainable Development Goals (SDGs).

Sustainable water use can be defined as "The use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it" (Gleick, 2000). In other words, water use should be managed so that environmental, social, and economic needs can be met now but also in the future. Complementing this, equitable water use can be understood as the fair allocation of water between different users, regions, stakeholder, and communities. This could, for example, be understood as equity between different administrative regions or between upstream and downstream areas (Speed et al., 2013). Equitable water use ensures reasonable and sufficient access to water for both basic needs and sustainable development.

The EU's approach to managing water resources revolves around three complementary pillars:

- EU environmental legislation, such as the Water Framework Directive (WFD) (2000/60) and its daughter directives, the Nature Directives (92/43; 79/409), the Groundwater Directive (2006/118) and Floods Directive (2007/60) establish binding targets and requirements to preserve aquatic ecosystems and manage water resources sustainably.
- Policy initiatives like the European Green Deal and its various strategies (e.g. Biodiversity, Climate Adaptation and Farm-to-Fork strategies), Circular Economy Action Plan and related strategies. Also previous policies such as the Communication on water scarcity and droughts and the Roadmap to a resource-efficient Europe set out policy objectives, targets and priorities that are directly or indirectly relevant to address water stress.
- Sectoral policy instruments such as the Common Agricultural Policy (CAP) may support more efficient water use, an adaptation of economic activities to available resources or the development of new water supply infrastructures.

With the WFD, the European Union has set ambitious targets for achieving sustainable water management and attaining good water status by 2027, goals which have been reinforced through the European Green Deal. Good status is assessed both from a qualitative and quantitative standpoint, with the objective to remove and reduce pollution on the one hand, and to ensure sufficient water supply for both humans and ecosystems on the other. The WFD specifically emphasizes the safeguarding of flow regimes to achieve good ecological status, encompassing low flows, high flows, and groundwater-surface water exchanges essential for protecting water-dependent ecosystems. To achieve these aims, Member States are required

to implement River Basin Management Plans and Programmes of Measures to protect and restore water bodies.

The 2020 Fitness Check of EU water legislation concluded that the WFD's objectives are still unmet, due to slow implementation, a lack of funding, and inadequate environmental targets in sectoral policies. In addition to pressures from pollution and hydromorphological changes, water abstraction is seen as an important challenge for freshwater in Europe, especially in light of intensified agriculture and energy production. Progress in curbing significant water abstractions and mitigating pressures on water body quality and hydromorphology has however been limited (EEA, 2024). Challenges persist in implementing effective measures within river basin management plans, including issues concerning capacity, enforcement, and investments (EC, 2019). Particularly, the slow progress in implementing ecological flows poses a significant obstacle.

Additionally, a lack of integration between water and sectoral policies has resulted in conflicting incentives and unsustainable economic development. Achieving transformative change demands greater attention not only to water-intensive sectors such as irrigated agriculture and hydropower but also to the broader value chains, like food and energy systems.

More recent policy documents have emphasized the need to address barriers to sustainable water management. The European Green Deal (EGD) recognizes the cross-cutting nature of water and thus promotes a systemic and integrated approach to sustainability. The EGD introduced a range of instruments relevant to water management, such as the EU Biodiversity Strategy for 2030, the Farm-to-Fork Strategy, the EU Adaptation Strategy, and more. The EU Biodiversity Strategy for 2030 includes a number of targets related to water, covering both quality and quantity aspects. For example, the strategy aims to "increase efforts to restore freshwater ecosystems and the natural functions of rivers" and to "restore at least 25,000km free flowing rivers" by 2030. With regards to water quantity and sustainable water use, the EU Biodiversity Strategy for 2030 calls to review water abstraction and impoundment permits to restore and preserve ecological flows. The EGD also supports renewable energy (including hydropower) as well as mobility and transport issues, with a shift of most inland freight transport from road to rail and waterways, which would have implications for water allocation planning in some Member States.

The EU Adaptation Strategy also recognizes the importance of protecting and restoring aquatic ecosystems like wetlands and coastal/marine ecosystems, as well as the role of blue-green infrastructure in increasing climate resilience. The strategy mentions that ensuring sustainable freshwater availability is fundamental to climate resilience and will require transformational changes across sectors. In addition, the strategy highlights the need to improve thematic plans, water resource allocation planning, and water permits to ensure sustainable water use across sectors and borders. Water efficiency is also mentioned, through water saving requirements and improved drought management plans, soil management, and land use. Finally, the Adaptation Strategy points to the need for a guaranteed stable and secure supply of drinking water by including climate risks in water management analysis.

Finally, the European Commission proposed a Water Resilience Initiative in 2023 which aims to ensure access to water for citizens, nature and the economy, tackle floods and droughts, and identify and assess how best to manage climate risks across EU policies (EC, 2023). Key aspects that the Water Resilience Initiative is expected to cover include the improvement of water efficiency (with measures to reduce water abstraction and/or consumption in various sectors), investing in water infrastructure, promoting sustainable water management practices (sustainable water use, pollution prevention, integrated water resource management) and supporting research and innovation.

Objective and scope of report

In the context of key EU policy initiatives described in the previous section, three themes of legal and regulatory nature with high relevance to sustainable and equitable water use in Europe and in the GOVAQUA Living Labs have been chosen for closer inspection in this report:

- The design and implementation of water allocation regimes (how to provide enough water for users within limits of system)
- The design and implementation of eflows policies and strategies
- The regulation of water value chains.

The three selected themes are key building blocks for increasing water resilience in Europe, as they address the integration of environmental needs into legal and policy frameworks on water use, the reconciliation of current and potential water uses and the role of corporate behaviour for sustainable water use.

The integration of ecological flows and water allocation mechanisms in water management systems present innovative approaches to managing water with the aim to enhance resilience. Ecological flow (eflow) is the amount of water required for the aquatic ecosystem to continue to thrive and provide the services we rely upon (Tharme, 2003). Water allocation mechanisms define who is allowed to access water, how much may be taken and when, how it must be returned, and the conditions attached to the use of the water (OECD, 2015). Ecological flows defined to sustain aquatic ecosystems provide ecological boundaries for water allocation regimes. The water allocation process must then harmonize the requirements of water users with these ecological limits. The integration of eflows in water allocation is therefore a crucial step for their implementation. Managing allocations for water resources also plays a crucial role in ensuring effective and equitable distribution of water as a common good. With the present report, GOVAQUA contributes to research needs on the design and implementation of regulations being used for water allocation and ecological flows in different European countries and can highlight areas where actions need to be strengthened.

The regulation of water-intensive value chains seeks to enhance the sustainability of corporations' water use, thus contributing to sustainable water management practices. A corporation's value chains consist of the activities it undertakes to transform raw materials and components into final products, and cover both the corporation's own activities as well as those of its suppliers (Bair, 2008; Salminen and Rajavuori, 2019). Value chains may be fully domestic or – more often – geographically split into the areas of many legal jurisdictions (Pedersen *et al.*, 2017). Through such value chains and the related trade and business relations, a corporation may have an impact on water use in other EU member states and beyond. Managing corporations' water-related value chains is a crucial step in promoting sustainable water use by corporations. Corporate water stewardship is "socially and culturally equitable, environmentally sustainable and economically beneficial water use, achieved through a stakeholder-inclusive process that includes both site- and catchment-based actions" (AWS, 2023). The present GOVAQUA report analyses the legal and regulatory approach to value chain management in different European countries particularly from the perspective of water.

A host of environmental and sectoral legislation and policies at EU and national level build the legal and regulatory framework of these three themes linked to water use regimes. The analysis of national policies on water allocation, eflows and water value chains focuses on the six countries of GOVAQUA Living Labs (France, Spain, Sweden, Finland, Romania, England in UK), where innovative governance approaches for sustainable and equitable water use are to be developed and tested.

The results of the analysis are presented in three distinct parts of the report, so that they can also be made available as separate reports to interested audiences. **Part A** reviews national water allocation policies. **Part B** reviews national eflows policies and strategies. **Part C** reviews regulations for value chains and sustainable water footprints.

Although the results are presented in three distinct parts, the analysis of regulations on water allocation, eflows and water value chains followed a similar methodology.

Methodology and structure

For each of the three themes (water allocation, eflows, water value chains), a structured template was developed to collect and examine information on the key elements of national policies, laws and regulations in France, Spain, Sweden, Finland, Romania, and England in UK. For the development of each template, a review of literature was carried out, including other material such as policy evaluation consultancy reports if available. Each template includes a different set of questions adapted to the details needed for the characterization and analysis of the policy and regulatory frameworks on the three different themes.

Each of the national templates on water allocation, eflows and water value chains regulations was filled in by national experts of the GOVAQUA project through desk-based review of documentation. Interviews with nine national experts from governmental bodies and agencies were carried out to complement the data collection. Interview questions were tailored to each national context, and they primarily concentrated on the design and implementation of water allocation mechanisms and eflows policies. Value chain questions proved to be challenging for national expert interviews due to the lack of mature policies and lack of national experts in this field in many countries.

The results of the analysis for each theme are presented in a similar manner in each of the three parts of the report. Each part starts with a review of key EU policies and EU-level discussions for the respective theme (water allocation, eflows, water value chains). Then, the overarching legal, regulatory and institutional settings are characterised in the six countries analysed. Based on the more descriptive chapters, concluding sections highlight key challenges in implementing regulatory regimes for water allocation, eflows and water value chains in Europe and conclude with avenues for further work on innovations and solutions that can facilitate future implementation.

Links to the GOVAQUA project

The current deliverable D2.1, which analyses national water allocation and eflows policies and regulations of value chains and sustainable water footprints, feeds directly into the first building block of the GOVAQUA project on the analysis of thematic water governance innovations (see Figure 1 below)). This analysis is closely linked to the other key building blocks of the project, as described in the figure.

The deliverable D2.1 has been developed in WP2 (legal and regulatory approaches) and is linked to all the other thematic work-packages of the project:

- It provides background information on legal and regulatory aspects of sustainable water use for the development and testing of the water governance assessment tool in WP1. It also contributes to the development of the overall GOVAQUA project recommendations on transitions to sustainable water governance in WP1.
- It provides a review of key legislation and policies as well as key policy implementation challenges in the domestic national context, as input to the groundwork setting of each of the GOVAQUA Living Labs in WP6.
- It provides direct input to the development of Policy Briefs in WP7 which target policy-makers, the river basin manager community as well as water use sectors in the context of the upcoming EU Water Resilience Strategy.

- It provides policy and legal contextual information for various case studies which will be developed in WP3, WP4 and WP5 respectively on participatory, economic and digital instruments for water governance.

Further work in WP2 will focus on collecting and assessing specific governance innovations and good practice related to the three themes (Task 2.2) and drawing policy recommendations to support the new water resilience agenda, as highlighted by the EEA's recent State of Water report (EEA, 2024) and the political guidelines of the new EU Commission 2024-2029 (van der Leyen, 2024).

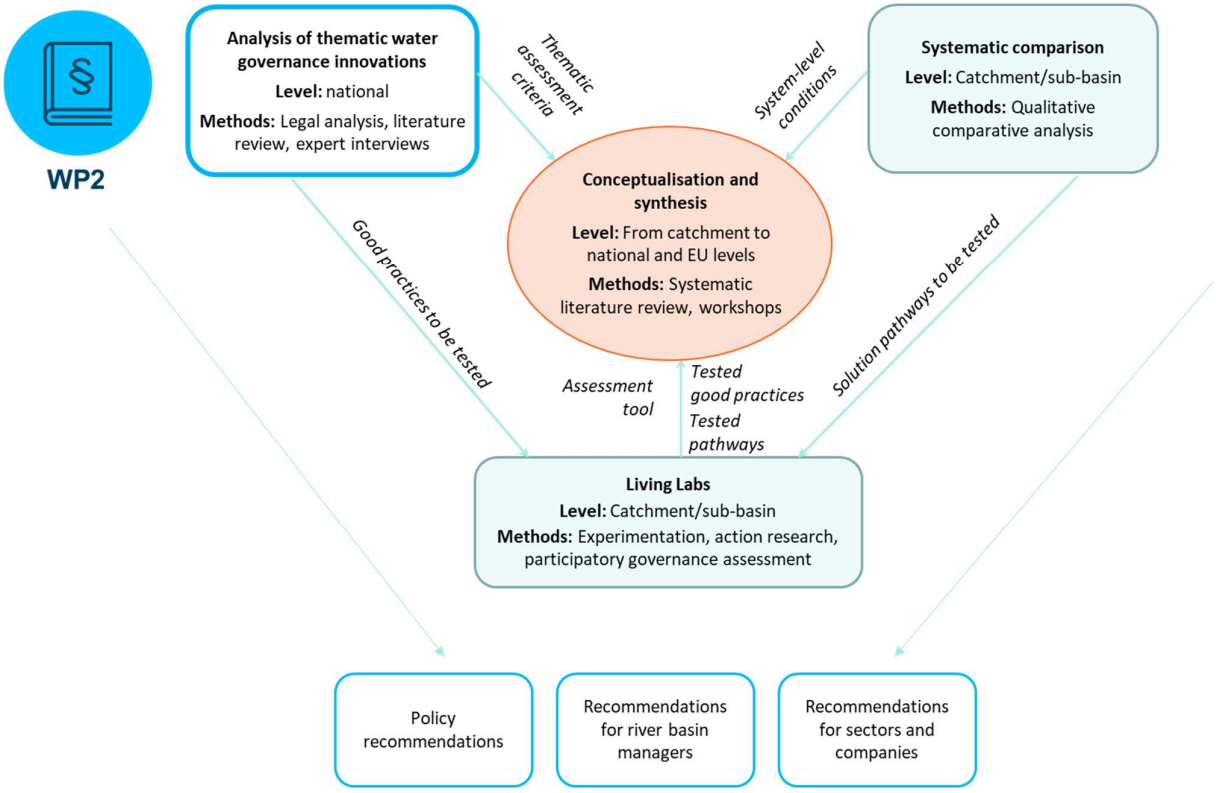


Figure 1. Positioning of the analysis of thematic water governance innovations, in WP2 the legal and policy analyses, in the overall framework of the GOVAQUA project.

References

AWS (Alliance for Water Stewardship) (2023). About the Alliance for Water Stewardship. Website. Last modified 2023. Available at: https://a4ws.org/about/. Last visited 4 July 2024.

Bair, J. (2008). Global Commodity Chains: Genealogy and Review, in Frontiers of Commodity Chain Research. Stanford University Press, pp. 1–34.

EC (2019). REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC): Second River Basin Management Plans; First Flood Risk Management Plans.

EC (2023). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Commission work programme 2024. Delivering today and preparing for tomorrow. COM/2023/638 final.

EEA (2024) State of Water Report. EEA report 07/2024. doi: 10.2800/02236

Gleick, P. H. (2000). A look at twenty-first century water resources development. Water International, 25(1), 127-138.

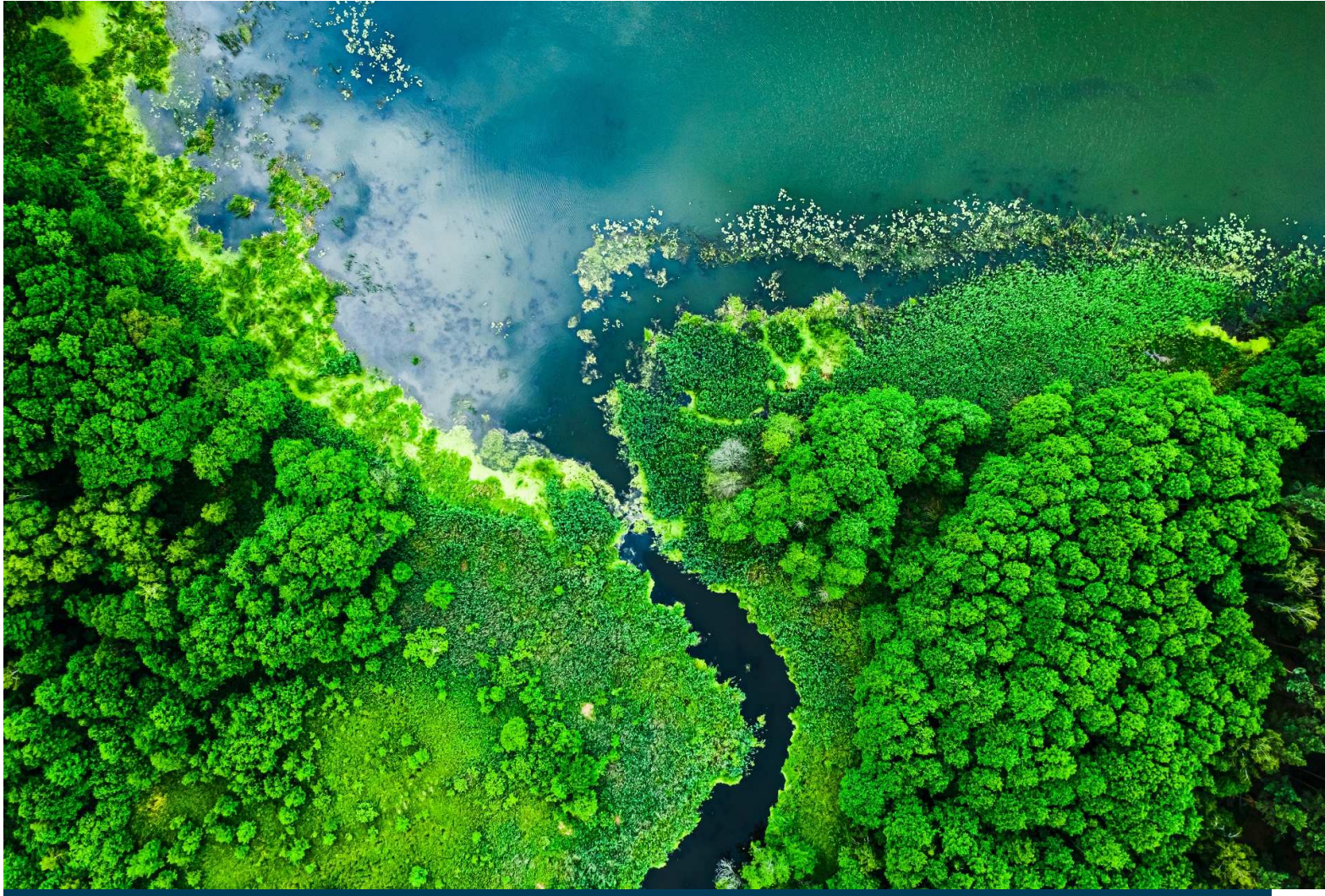
OECD (2015). Water Resources Allocation: Sharing Risks and Opportunities, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264229631-en

Pedersen, T., Devinney, T., Tihanyi, L., and Camufflo, A. (eds) (2017). Editors' Introduction, in Breaking up the Global Value Chain: Opportunities and Consequences. Emerald Publishing.Salminen, J. and Rajavuori, M. (2019). Transnational sustainability laws and the regulation of global value chains: comparison and a framework for analysis. Maastricht Journal of European and Comparative Law, 26(5), p. 602. Available at: https://doi.org/10.1177/1023263X19871025.Savourey, E. and Brabant, S. (2021). The French Law on the Duty of Vigilance: Theoretical and Practical Challenges Since Its Adoption. Business and Human Rights Journal 6 (1): 141–52. https://doi.org/10.1017/bhj.2020.30.

Speed, R., Yuanyuan, L., Le Quesne, T., Pegram, G., Zhiwei, Z. (2013). Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning. UNESCO, Paris.

Tharme, R.E. (2003). A global perspective on environmental flow assessment: Emerging trends in the development and application of environmental flow methodologies for rivers. River Research and Applications 19(5-6): 397-441.

Van der Leyen (2024). Europe's choice. Political guidelines for the next European Commission 2024-2029. Strasbourg, France. Available at: Towards a new European Commission 2024-2029 - European Commission



GOVAQUA policy matrix Part A – Review of national water allocation policies in six European countries

GOVAQUA Deliverable 2.1

Rouillard, J., Tarpey, J., Kampa, E., Penttilä, O., Belinskij, A., Díaz, E., Berbel, J., Junjan, V., Molle, F., Ionescu, C.

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1.2	03.06.2024	Josselin Rouillard	Ready for internal review
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1.3	29.07.2024	Josselin Rouillard	Revisions made based on the internal reviewers' comments and suggestions.

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List of Abbreviations

Abbreviation	Explanation
ASB	Abstraction Sensitivity Band (England)
CAMS	Catchment Abstraction Management Strategies (England)
CAP	Common Agricultural Policy
DMP	Drought Management Plan
EA	Environment Agency
EC	European Commission
EFI	Environmental Flow Indicator
EU	European Union
HMWB	Heavily Modified Water Bodies
MS	Member States
NGO	Non-Governmental Organization
NbS	Nature-based solution
OUGC	Organisme Unique de Gestion Collective (Agricultural Water User Associations) (France)
PTGE	Plan Territorial de Gestion de l'Eau (Quantitative Water Management Plans) (France)
RBA	River Basin Authority (Spain)
RBD	River Basin District
RBMP	River Basin Management Plan
SEL	Sustainable Extraction Limit (France)
WFD	Water Framework Directive

Introduction

Allocation mechanisms can be defined as the combination of institutions which enable water users and water uses to take or to receive water for beneficial use according to a recognised system of rights and priorities (Taylor, 2002). These mechanisms define who is allowed to access water, how much may be taken and when, how it must be returned, and the conditions attached to the use of the water (OECD, 2015). In the context of the European Water Framework Directive (WFD), allocations must account for the range of uses needing specific flows or levels of water in rivers and lakes such as the environment, navigation, recreational users including anglers, water-based tourism and fisheries (Rouillard and Schmidt, 2024).

Reforming water allocation regimes to support the environmental objectives of the EU Water Framework Directive and the environmental and climate agenda of the European Union (EU) was one of seven policy options highlighted in the European Commission (EC)'s 2007 communication on water scarcity and drought (EC, 2012). However, no specific EU activity has supported further work on the topic. More recently, a new impetus was given under the European Green Deal which identifies water resources allocation as an integral part of its broader sustainability agenda. In particular, the EU Climate Change Adaptation Strategy (EC, 2021a) specifically points towards the need to improve the use of water-permitting and allocation systems to mitigate climate driven water scarcity and droughts impacts. The EU Biodiversity Strategy for 2030 (EC, 2021b) calls for reviews of water abstraction and impoundment permits to implement ecological flows to achieve WFD good status. The topic is now covered by the ad-hoc task group on water scarcity and drought, with a specific activity on drought management and on water allocation.

The WFD does not explicitly regulate water allocations, but several elements of the WFD are relevant to the design and operation of water allocations. Under the WFD, Member States must achieve good status for all water bodies, which as a result obliges Member States to consider ecological needs when allocating water in the form of ecological flow requirements (EC, 2015). This may be expressed in terms of specific flow regime and volumetric allowances in surface water and groundwater that can support well-functioning and healthy freshwater ecosystems.

River Basin Management Plans (RBMPs) must support the implementation of measures addressing unsustainable abstraction, hydromorphological and pollution pressures on water bodies, in order to reach the WFD environmental objectives. With the WFD, emphasis has been put on consolidating demand management and better regulatory control of abstractions (EC, 2006). Measures taken in RBMPs are nevertheless very varied across Member States, and include actions such as water saving campaigns, water losses and efficiency measures, the development of alternative water sources (e.g. reclaimed water, rainwater harvesting), new storage schemes, land-use or cropping-pattern changes, natural water retention measures, water pricing and limits to the quantity and timing of abstraction (Buchanan et al., 2019).

The WFD requires Member States to implement permitting and licensing regimes to regulate water abstraction and discharge activities. Water users, including industrial, agricultural, and domestic sectors, are required to obtain permits or licenses to abstract, divert or modify water flow from surface water bodies or groundwater sources and to discharge treated or untreated wastewater. The Commission's assessment of the 2nd cycle RBMPs (EC, 2019) notes that registration, permitting and metering of water uses are now well established in the majority of Member States, but reports sometimes widespread cases of illegal abstraction and lack of metering, as well as concerns surrounding exemptions from controls and permitting requirements for small abstraction. Concerns have also been raised that permitting regimes may only regulate water abstraction and not sufficiently water 'consumption'. Water consumption is an important consideration as it relates to the share of water that is abstracted but is not returned to the freshwater environment in the form of direct discharges or return flows following infiltration in soils (GWP, 2019).

The Common Implementation Strategy of the WFD differentiates between water scarcity conditions and drought conditions. Water scarcity can be defined as a situation where insufficient water resources are

available to satisfy long-term average requirements. It refers to long-term water imbalances, where water demand exceeds the average water resources exploitable under sustainable conditions (EC, 2006). Droughts refer to important deviations from the average levels of natural water availability and are considered natural phenomena (EC, 2008). In addition to measures addressing abstraction pressures and water scarcity in RBMPs, the European Commission recommends establishing Drought Management Plans (DMPs).

DMPs consists of three key elements: using indicators and thresholds that trigger the onset, ending and severity levels of prolonged drought conditions, measures to be taken in each drought phase to prevent deterioration of water status and to mitigate drought effects and a framework for making decisions during droughts and subsequent updating of the DMPs (CIS, 2006; Schmidt et al., 2023). DMPs are in place in 12 Member States, and in development in eight additional Member States (Schmidt et al., 2023). Beyond preparedness and mitigation measures, Member States may set limits on the quantity and timing of abstraction during droughts, including a pre-defined prioritisation of water allocation between water uses. Such a hierarchy of water uses exists in 15 Member States, with the primary use usually being critical infrastructures (e.g. dykes, hospitals, nuclear power stations, fire protection), followed by drinking water and public water supply (which therefore can include not only domestic users but also smaller industries and livestock production) and the environment (EC, 2023c).

Research Objectives

This report focuses on the challenges to design and implement water allocation regimes. It aims to contribute to the ongoing policy discussions on the role of water allocation in sustainable water management and the implementation of the WFD. Its specific objectives are:

- To provide insights into how water allocation regimes are designed and implemented in Europe
- To discuss current challenges with the implementation of water allocation regimes that support sustainable water management in line with the requirements of the WFD
- To identify opportunities for innovative solutions to implement sustainable water allocation regimes in Europe

The focus of the analysis is on the six case studies forming the network of Living Labs of the EU project GOVAQUA, including five EU countries (Spain, France, Romania, Finland, Sweden) and England. Although England is not part of the EU, water policy and management remains highly structured around the WFD.

This report is one of three parts composing Deliverable 2.1 of the GOVAQUA project. Part B addresses in more detail the legal and regulatory approaches in relation to ecological flows and Part C focuses on the regulation of value chains to support sustainable water management.

Methodology

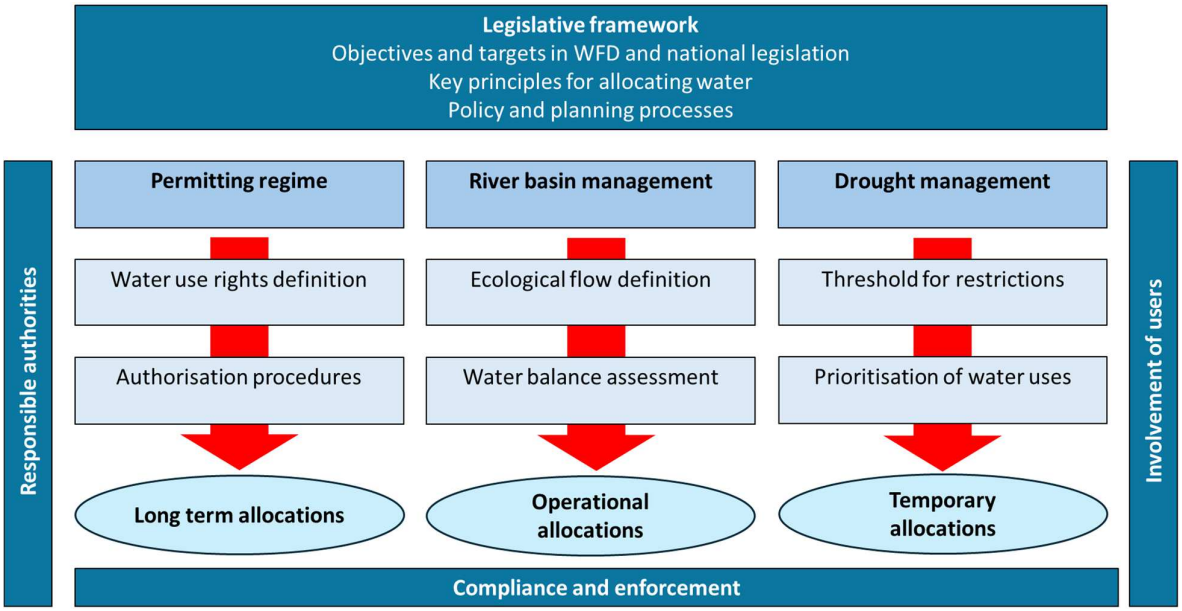
Building on a review of European legislation on water management and existing guidance on water allocation, key building blocks of an allocation framework in the context of the implementation of the WFD were developed to guide the data collection in the six countries (Figure 1). This is structured around the characterisation of key institutions, including the legislative and regulatory framework, the responsibilities and powers of authorities and involvement of users in allocation decision-making, and compliance and enforcement arrangements. Three ‘Pillars’ of European water management planning influence water allocation:

- The permitting regime, which consolidates and formalises water use rights through permits, and establishes a process for authorising, modifying and revoking permits. This supports the definition of ‘long term’ allocations, or, in other words, entitlements of a share of the available resource

- River basin management planning (RBMP) under the WFD, which consolidates the implementation of ecological flow requirements and lead to the definition of an allocable pool through a water balance assessment. This supports the definition of 'operational' allocations that meet the priorities of river basin planning, and may be further adapted annually and seasonally according to recharge of surface water and groundwater storage
- Drought management that applies during water shortages, which includes the definition of indicators and thresholds for restricting water uses, and the prioritisation of water uses. Restrictions result in temporary changes in water use rights as defined in permits (i.e. long term allocations/entitlements described above) or in 'operational' allocations where river basin planning already alter water use rights defined in permits.

Figure 1 below shows how water users' rights to use water are influenced by these three sources of regulatory and planning interventions (permitting, river basin planning and drought management).

Figure 1 Building blocks for reviewing national allocation arrangements in the context of the WFD



Based on this framework, a template for collecting data at national level was developed (Annex 1). This template was filled in by national experts of the GOVAQUA project through desk based review of documentation. Interviews with nine national experts from governmental bodies and agencies were carried out to complement the data collection (Annex 2). They lasted between one and two hours and were carried out by video conference or in person. Interview questions were tailored to each national context.

Outline of the report

This report is structured into five chapters. It starts by characterizing the overarching legal, regulatory and institutional settings of water allocation regimes in the six countries, followed by an examination of the organizational responsibilities and stakeholder engagement process relevant for water allocation. The national permitting regimes are also described. Attention is then turned onto the boundary conditions for identifying the allocable pool (amount available for human uses) and the rules regulating and influencing allocation and reallocation including during droughts. Elements on compliance and enforcement are finally examined. Based on these more descriptive chapters, the discussion highlights key challenges in implementing water allocation regimes for sustainable water management in Europe and concludes with

avenues for further work on innovations and solutions that can facilitate future implementation of water allocation policies.

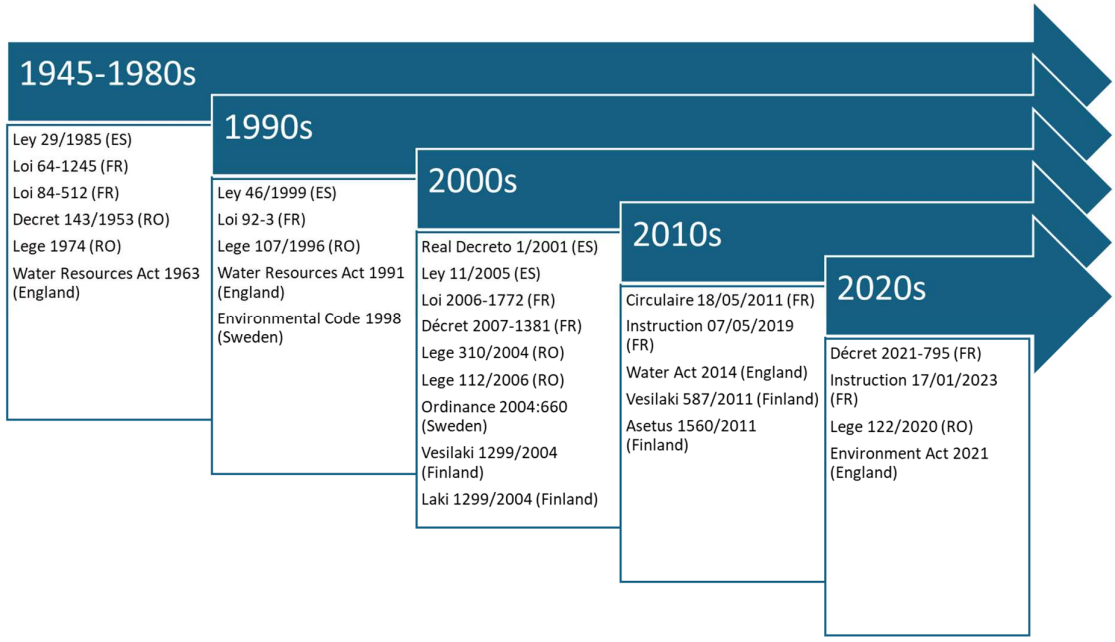
Overarching legal, regulatory and policy framework

Allocations are governed by a combination of national laws, regulations, and policies, as well as international agreements and conventions where applicable, which provide clarity on the principles governing the rights to use water and establish planning processes and guidelines for allocating water in various circumstances. In Europe, the WFD has a central role in current water management planning. However, each country has unique institutional contexts and histories. They are examined below, while more specific descriptions of powers and responsibilities of authorities and stakeholders are presented in the next chapter.

Legislation and regulation addressing water allocation

The WFD provides a common regulatory basis for water management in the five countries reviewed. However, the legal framework relevant for water allocation – including the nature of water rights, the permitting system and drought management – dates back in most countries from before the WFD (Figure 2). Permitting regimes have been progressively consolidated at national level in the post-war period, while arrangements for river basin and drought management were consolidated in the 1980s and 1990s. Substantial revisions occurred with the enactment of the WFD and the strengthening of ecological flow requirements, and increasingly so, to address water scarcity and droughts.

Figure 2 Chronology of key legislative instruments for allocation in the six reviewed countries



Spain first formalized a dual model of water rights through the Water Laws of 1866 and 1879, whereby surface water is public and governed by a 'concessionary' regime, while groundwater remained outside public control (Sanchis-Ibor et al., 2021). The 1985 Water Law (SG, 1985) repealed the 1879 Water Law, consolidating the concessionary regime for surface water. Groundwater abstractors obtained a period to either register their historical right as public (concession) for 50 years (Registry of public waters) or keep it

as private in perpetuity (Catalogue of private waters). If held privately, the right cannot be modified. Hence, a request to deepen the well or increase the volume extracted would transform the private right into a concession under the public regime (Llamas et al., 2015). The 1985 Water Law also first established the concept of environmental flow and drought management procedures. Following the adoption of the WFD, Spain adopted a Royal Decree 1159/2001 (SG, 2001) to consolidate the legal basis for drought management, and the water Law 11/2005 (SG, 2005) and Water Planning Instructions of 2008 (SG, 2008) to consolidate the implementation of environmental flows (Sanchis-Ibor et al., 2021). Exchanges of water rights between users are possible in Spain under the 1999 Water Law (SG, 1999).

In France, navigable waters have been under royal control since the middle ages, and access to all forms of surface water and groundwater has gradually been restricted following the adoption of the Civil Code of 1804 (Rouillard and Rinaudo, 2021). The 1964 Water Law (RF, 1964) formalised the creation of a national permitting regime on all abstraction, storage or diversion of surface water and groundwater. The 1992 Water Law consolidated the notion that water is a common good subject only to rights of use regulated by the State. Since then, France progressively formalized a dual system for managing droughts and water scarcity (RF, 2011; Figureau, 2012). On the one hand, the 1992 Water Law (RF, 1992) established the legal basis for the use of drought restrictions, which led to the adoption of various decrees specifying drought management procedures. On the other hand, procedures for reducing long term quantitative deficits at the level of river basins, including groundwater, were formalized following the transposition of the WFD under the 2006 Water Law followed by decree 24 sept. 2007. In parallel, France formalised a national approach to ecological flows under the 1984 Water Law (RF, 1984), consolidated progressively through the 1992 Water Law and 2006 Water Law (RF, 2006), as well as various decrees and circulars. More recently, Décret no 2021-795 (RF, 2021) further specified procedures for 'structural' water management and drought management.

In Sweden, landowners own the right to control (rådighet) both surface and groundwater within their properties. In addition, a permitting regime regulates water use. Furthermore, land ownership is not always necessary, and water use rights can be obtained via application to the permitting regime. The 1998 Environmental Code establishes the current legal basis for permitting water operations. It also provides the legal basis for environmental aspects of abstraction and other waterworks (Swedish Parliament, 1998a). The Ordinance 2004:660 delegates authority to adopt a set of environmental quality standards to be respected through permitting (Swedish Parliament, 2004).

In Finland, water and land areas are privately owned. However, according to the Water Act 587/2011 (Finnish Parliament, 2011), the owner of water or land area can only administer surface water or groundwater as a resource. This means that the owner needs a permit for any significant use of water, and that non-owners also have the possibility to apply for such a permit. Water in spring and water in artificial storage is directly owned. Water uses are also moderated through river basin management established through Act 1299/2004 (Finnish Parliament, 2004) transposing the WFD, and the consolidation of the permitting regime under the Water Act and Water Decree 1560/2011 (Finnish Government, 2011). No legislation or regulations establish drought management in the country.

In Romania, the 20th century saw the enactment of several water law, starting in 1924 with the first Water Law and the 1953 Decree 143 (RG, 1953) regarding the rational use and protection of waters. The adoption of the 1965 Constitution and the second Water Law 1974 (RG, 1974) firmly established surface water and groundwater as public goods owned by the state (Platon and Constantinescu, 2018). This was restated following the adoption of the new constitution in 1991 and the adoption of the National Water Law in 1997 (RG, 1996). This law provides the general framework for water management, including the overarching rules for authorising the right to use surface water and groundwater, environmental protection and the legal basis for drought management restrictions. Romania progressively adopted EU water legislation in the process of joining the EU in 2007 with major modification transposing the WFD in 2004 (RG, 2004) and 2006 (RG, 2006a). An Order (RG, 2006b) was adopted in 2006 specifying the methodology for restrictions during droughts. More recently, the Water Law 122/2020 amends the 1996 Water Law to consolidate the registration of water rights, reinforce restrictions on unreasonable use of water resource and improve the

protection of groundwater, in particular by restricting groundwater use by irrigation (Pascu and Savastre, 2020).

In England, riparian rights are historically the main legal principle governing the use of surface water, while groundwater has not been governed by a clear set of principles. Under English common law, riparian rights pertain to the use of surface water by landowners over whose property the water flows, entitling them to use the water for domestic or agricultural purposes. However, absolute ownership of surface water or riparian rights to percolating water has never existed under common law. Governmental action and national controls emerged as pressure over water resources increased over the 19th and 20th century. The current legal framework regulates access to water but does not define ownership. The Water Resources Act 1963 (UK Parliament, 1963) consolidated a nation-wide system of water abstraction licensing and regional planning of water management. The Water Resources Act 1991 (UK Parliament, 1991) established the current institutional and organisational arrangements for water management, while more recently, the Water Act 2003 (UK Parliament, 2003) transposed the WFD. Further reforms were adopted following the 2011 government white paper Water for Life (Defra, 2011) and formalised in the Water Act 2014 (UK Parliament, 2014). This aimed largely at restoring sustainable abstraction in the UK, and removed, for example, the ability of abstractors to claim compensation for losses resulting from modified or revoked permits. It also harmonises requirements related to abstraction with England's environmental permitting regime (UK Parliament, 2016). Further reforms and adjustments to processes surrounding licenses are also detailed in the Environment Act 2021 (UK Parliament, 2021), for example modernising the process for license modifications and adjusting the requirements related to water companies' Water Resource Management Plans.

Principles enshrined in law or guidance for allocating water

Under the WFD, all reviewed countries have the overarching objective to achieve good status in surface water and groundwater bodies – an objective still implemented in England since Brexit. In theory therefore, governments should ensure that allocation decisions do not hinder but rather contribute to the preservation and improvement of water ecosystems.

The WFD under Alinea (11) also aims "*to contribute […] to the rational utilisation of natural resources"* and places a strong emphasis on the polluter pays principle. All reviewed countries also encourage the principle of promoting the conservation and efficient use of water resources. This can in theory result in specific criteria guiding allocation decisions to favour or incentivize more water efficient uses. The efficient use of water resources however is only started in general terms in the legislative framework of the reviewed countries. In national policies, only France has recently adopted overarching targets for water savings (i.e. reduction of 10% of abstracted water) in its new Action Plan for Resilient and Concerted Water Management (RF, 2023). In other countries, such as Spain, the efficient use of resources is recognized to the same degree as the importance of satisfying demand from sectors: "*achieve the good ecological state of the public hydraulic domain and the satisfaction of water demands, the balance and harmonization of regional and sectoral development, increasing the availability of the resource, protecting its quality, economizing its use and rationalizing its uses in harmony with the environment and other natural resources*" (SG, 1985).

The WFD promotes the idea that "*water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such*". In the reviewed countries, the principle regarding the equitable sharing of water resources does not usually appear as is any reference to a human right to water, although recognized by the UN General Assembly and the Human Rights Council as part of binding international law in 2010 (UN, 2010). In Sweden nevertheless, groundwater shared between several properties using the water for domestic consumption should be shared according to what is "*reasonable*".

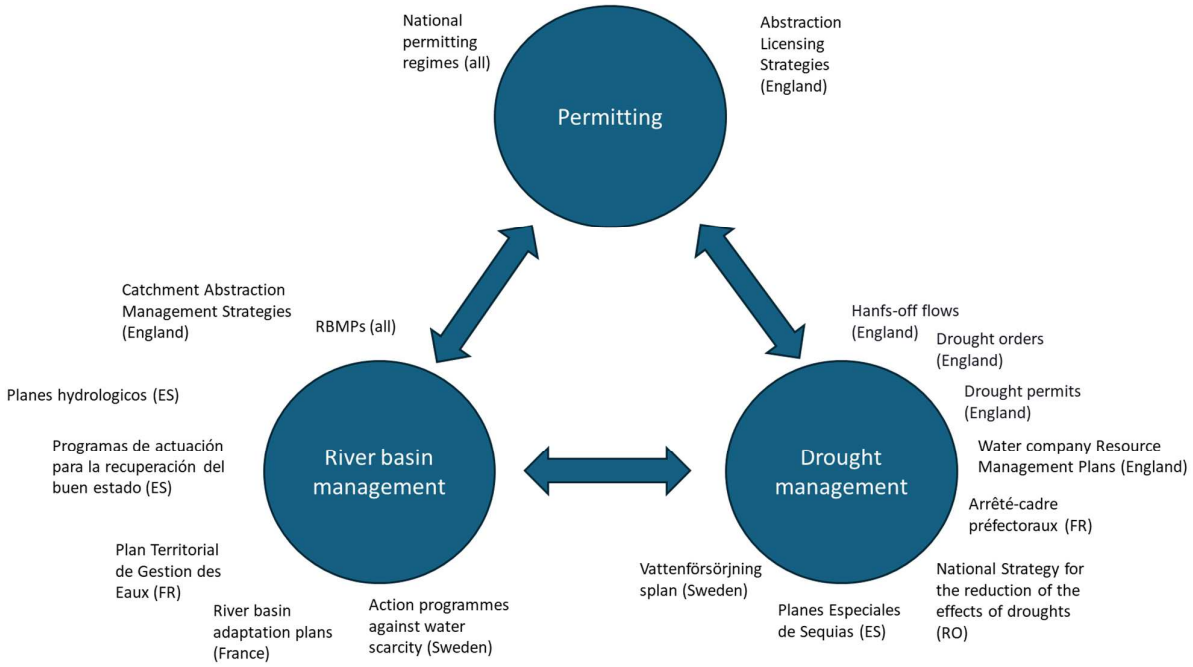
The protection of indigenous rights only appears as a general principle in the Finnish and Swedish legislative frameworks. In Finland, the law stipulates that a project that is located or that has impacts on the Sami homeland must be implemented so that the possibilities of the Sami to exercise their constitutional rights

as an indigenous group to maintain and develop their culture and practice their traditional livelihoods are not undermined to *'no more than a minor extent'* (Finnish Parliament, 2011). In Sweden reference is made to reindeer husbandry (which is only practiced by Sami people), stipulating that: '*land and water areas that are important for reindeer husbandry or commercial fishing or for aquaculture must be protected as far as possible against measures that can make their use for such purposes significantly more difficult*" (Swedish Parliament, 1998a).

Policies addressing water allocation

An identification was carried out of the various policy instruments used by Member States that can affect water allocation through the permitting regime, river basin management and drought management (Figure 3). The permitting regime is elaborated in the Chapter on Permitting regimes. Below the instruments on river basin management and drought management are described. In addition, some instruments are sector-specific, for instance drought management in water supply utilities.

Figure 3 Instruments identified in the reviewed countries that are relevant for water allocation



River basin management

Under the WFD, Member States must prepare RBMPs to achieve good status of water bodies. Where abstraction is a pressure, RBMPs may include measures such as monitoring programmes for water levels and abstraction, water saving measures, nature-based solutions (NbS) and Natural Water Retention Measures (www.nwrm.eu), or economic instruments, such as volumetric fees for abstraction. More broadly, RBMPs should define ecological flows that preserve the natural flows of rivers and mitigate pressures from abstraction, storage and diversion of water. The implementation of ecological flows is usually associated with obligations in permits and restrictions on water uses during droughts. The setting of ecological flows, obligations in permits and restrictions during droughts are examined in later chapters of this report. Part B of this deliverable examines in more detail the regulatory aspects of ecological flows.

France and Spain have integrated more formal allocation mechanisms to address water scarcity, i.e. long term imbalances between water availability and demand in catchments and groundwater basins. By addressing term water imbalances through for instance, a reduction in water consumption or an increase in the availability of resources, the objective is to reduce the risk of frequent drought restrictions on water

abstraction. In Spain, River Basin Plans provide an official forecast of allocation of surface water between uses based on water availability. When groundwater basins are declared overexploited by River Basin Authorities, an action programme for the recovery of the good state of the groundwater body must be prepared (see Textbox 1). As a pilot initiative to enhance groundwater management, the Duero Basin Authority has made Groundwater User Associations mandatory in the latest RBMP (2021-2027).

Textbox 1 Programme for recovery of good state of groundwater body in Spain

The groundwater management plan may outline measures aimed at annually reducing individual extraction limits linked to concessions and private rights, aiming to reach a sustainable extractable volume in cases where the aquifer is deemed overexploited or when water bodies are at risk of failing to meet Water Framework Directive (WFD) objectives. A comprehensive program incorporating initiatives for restoring the water body's good status must be endorsed and integrated into the River Basin Management Plans' program of measures. This action plan will dictate the extraction regime to promote a sustainable utilization of resources, striving for the attainment of a favorable status for groundwater bodies and the enhancement of associated ecosystems. Possible measures may encompass prohibiting the drilling of new wells (enhanced control over access rights), halting the issuance of new concessions (heightened scrutiny over extraction rights), or imposing temporary volumetric constraints on individual wells.

Source: Llamas et al (2015)

In France, procedures are also in place to address long term overallocation. At river basin level, water agencies have set target management flows (debit d'objectif d'étiage), taking into account ecological flows and user needs. In sub-basins deemed to have a long term, structural imbalance between water demand and availability (called 'Zone de Restriction des Eaux'), an overarching plan for quantitative water management (Plan Territorial de Gestion des Eaux, see Textbox 2) is required, setting out various measures to address imbalances (RF, 2019; 2023). Measures may include resource mobilization and water saving measures, as well as an allocation plan, which specifies volumetric abstraction allowances between the three main consumptive sectors (public water supply, industry, agriculture) (MTECT, 2023).

Textbox 2 Plans for quantitative water management in France

In priority basins for quantitative water management, a program of action must be established to revise abstraction authorizations, aiming to align with targeted abstraction volumes established by the water balance assessment. This program necessitates engagement and collaboration with all relevant stakeholders. Typically, it is structured around a set of measures intended to promote water conservation, encourage the cultivation of less water-intensive crops, and, under specific circumstances, facilitate the construction of new reservoirs.

If the implementation of this action program requires financial support from the water agency for reservoir construction, it must adhere to the framework of a "territorial project" (referred to as PGRE or PTGE). The guidelines for territorial projects emphasize the following main elements:

- Striving for balanced resource management without compromising water quality.
- Ensuring that consultation involving all stakeholders within the region, encompassing all water usage domains, is integral to the project.
- Establishing coherent demarcations based on hydrological or hydrogeological considerations.
- Incorporating measures aimed at reducing overall abstraction and exploring alternatives to reservoir construction.
- Defining a schedule for reinstating quantitative equilibrium.

Moreover, contractual agreements formalize the commitments made by the involved parties.

Source: RF (2024)

In Sweden, there are partial action programmes against water scarcity 2022-2027, with measures mainly providing information and advice on water efficiency. No specific measures are applied on managing permits, but guidance and legislative review is planned on how merits would be modified in areas of scarcity where many stakeholders are involved in water resources (see e.g. Vattenmyndigheten i Södra Östersjöns vattendistrikt, 2022).

In England, the WFD has largely determined the current structure for water management and allocations. RBMPs are developed for the eight river basins in England and were last updated in 2022. They include measures to address pressures that affect surface waters natural flow conditions and groundwater quantitative status. The Water Abstraction Plan 2017 (Defra, 2017) sets out how water abstraction management will reform over the coming years. It states how this will protect the environment and improve access to water in line with the RBMPs. The plan has 3 main parts to: address unsustainable abstraction; develop a stronger catchment focus and modernise regulation. The key implementing measure in relation to water quantity is Catchment Abstraction Management Strategies (CAMS).

Introduced in 2001, CAMS assess water availability in each catchment and identify where demand affects the water balance. CAMS supports river basin planning by providing an indication of whether there are sufficient water resources to support a healthy ecology and sustainable abstraction, and information on how much water is available for future licensing whilst protecting the environment. It also helps to identify water bodies that are failing or are at risk of failing to meet GES by 2027 due to water resource pressure. CAMS is complemented by Abstraction Licensing Strategies (ALS) which are produced for each catchment based on CAMS assessments. They in turn determine abstraction licensing within the catchment boundaries (Benson et al., 2022).

In addition, the 2020 National Framework for Water Resources requires that regional plans are developed to outline how a sustainable water supply for people, business, industry, and agriculture will be achieved (EA, 2020). In 2023, Defra introduced its Plan for Water (Defra, 2023), covering both water quality and quantity issues. This includes the improvement of water supply infrastructure, increasing resilience to drought, securing water supply for farmers, and sustainable abstraction management. Attention is now given to ensure the sustainability of water permits by considering future changes in natural flows due to climate change. It involves providing abstractors with information to invest in new technologies or storage solutions to maintain sustainable water businesses.

In Romania, the National Strategy for Water Management Romania 2023-2035 (SNGA) outlines as objectives the achievement of the level of “zero pollution” and energy independence until 2050, strengthening of the adaptation capacity and limiting of the vulnerability to climate change and ensuring the access to water through a socially equitable transition and in a financially efficient manner (RG, 2023).

Drought management plans

Under the WFD, DMPs aim to address exceptional circumstances of temporary water shortages, while RBMPs focus on addressing water scarcity (long term imbalances between demand and supply). DMPs should set out indicators and thresholds defining drought conditions and a list of pre-defined preparatory, emergency and recovery actions for the different impacted water uses to minimise losses, damages and fatalities. Although the WFD strongly encourage their preparation, not all of the reviewed countries yet have any, such as Finland and Sweden – although their legal framework provides powers to authorities to prioritise certain uses during water shortages. The situation in each country is described below.

In France, drought management establishes thresholds for water levels in rivers, wetlands and groundwater (taking into account the needs of ecosystems, in particular protected ones). Different threshold levels are established to account for the level of urgency/crisis: vigilance, alert, reinforced alert and crisis levels – with increasing use restrictions attached to each level. A priority use scale is applied that prioritises certain uses and guarantees certain levels of supplies during drought conditions (MTE, 2021). Furthermore, some "arrêté-cadre" may adopt exceptional measures to preserve drinking water supply or aquatic ecosystems when implementing the pre-defined set of restrictions will not achieve so.

In Spain, drought management ("Planes Especiales de Sequias") do not have a compartmentalised sectoral focus but an integrated one, providing a joint response to all sectors and to the environmental needs through both RBMPs and DMPs, according to the legal priorities for water resource allocation (SG, 2024a). It must be noted that these planning tools do not take into account drought impacts outside the scope of the use of water (e.g. rainfed agriculture, forest management or heat waves). The risk management scheme is articulated through preparedness (RBMP for drought risk management measures and DMPs protocolizing the management of water systems during drought episodes), mitigation (phased measures in the DMPs to mitigate social, economic, and environmental impacts), relief and restoration measures that must be established as mandatory content of the DMPs. The hazard / exposure / vulnerability scheme is not explicitly applied but the elements for its characterization are included (meteorological and hydrological variability, detailed knowledge of uses and demands, exposed population and economic activity, vulnerability reflected in non-compliance with desirable supply guarantees).

In Sweden, there is currently no official protocol for drought management, though the Act (1998:812) Containing Special Provisions concerning Water Operations provides powers to County Administrative Boards to implement restrictions to preserve public water supply or other general causes (Swedish Parliament, 1998b). No legislation unequivocally regulates the prioritisation of e.g. drinking water in an emergency water situation. There is also no law that prevents prioritisation on a general level, however prioritisation could in some cases involve conflicts between different legislations. Developments for future work to combat drought in the MS are proposed as part of the water authorities' work with the Sub-Management Plan against drought and water scarcity.

In Finland, a guide for preparing DMPs, targeted to local governments, was prepared in 2020 (Parjanne, Ahopelto and Parkkila, 2020a). Preparing a DMP is not compulsory in Finland; however, at a regional level, such a plan has been prepared for the river basin of Sirppujoki, located in South-Western Finland as part of a pilot project in 2020 (Parjanne, Ahopelto and Parkkila, 2020b). A national DMP is being developed (Ahopelto, 2024). The Water Act enables the permit authority to restrict during drought abstraction by less essential uses to secure public water supply (Finnish Parliament, 2011).

In Romania, the National Strategy for the reduction of the effects of droughts on short-, medium-, and long-term is the framework document promoting the preparation and adoption of measures aiming to reduce the impact of droughts (RG, 2007). Water allocation in case of drought is done according to the plans for restrictions and water use during droughts elaborated and updated when necessary and/or in case of emergencies by the River Basin Administrations. The regulation sets three characteristic sizes of water scarcity: normal phase, attention/waring phase and restriction phase. Specific actions and measures are defined by the regulation for each of these phases. The characteristic sizes for ensuring the water requirements of different uses are set by the plans of restrictions and use of water in dry periods.

In England, a drought response framework (EA, 2017) outlines roles and responsibilities between regions, water companies, and the Environment Agency. The National Framework highlights drought orders and drought permits as two legal mechanisms allowing for flexibility in water management during dry periods. Drought orders are issued by the Secretary of State for the Environment and involve more significant interventions. Drought orders go beyond Hand-off-Flows (see Chapter on Ecological flows), further restricting abstraction, require reservoir releases to support ecological flows, and directly restrict water usage, potentially leading to measures like water rationing and restrictions on non-essential water usage

activities. As drought severity increases, the government becomes more involved in managing the crisis, treating it as a civil emergency. More details on drought permits can be found in the Chapter on Permitting.

Sectoral plans

In addition to river basin planning, the reviewed countries have adopted sectoral plans that affect sectoral water demand and allocation. These usually prepare the sector for drought situations or, increasingly so, support water saving measures.

In Finland, water services are identified as part of the pool of critical infrastructure and operators have duties to draw up a plan to prepare for incidents such as water shortages. In Sweden, some regions have put together water supply plans (vattenförsörjningsplan). The purpose of a water supply plan is to ensure the availability of water resources for drinking water supply in an area in the long term. Water supply plan as a concept appears in the national environmental goals on groundwater of good quality and living lakes and watercourses, where the introduction of a water supply plan is encouraged. A set of guidelines for such plans were published to support and respond to the need the county administrations may have when they have to produce and update regional water supply plans in 2020 (Blad, Maxe and Källgården, 2009).

Although the Swedish guidance was not to provide any support for distribution/prioritisation between different interests and competing water uses, it also recognised that drinking water supply is related to other water uses. If the regional water supply plan clearly describes the various water needs that exist in the region, both now and in the future, the plan can form a good basis for making well-balanced permit decisions. However, the plan is not binding and there is no mandate to formally allocate shares of the available water resources between different interests.

According to French legislation, drinking water operators must contribute to reduce water stress by preparing plans to reduce water losses in distribution networks to achieve 85% efficiency (RF, 2010). Public water supply operators are also targeted by DMPs, but each operator must also have a specific plan for their distribution network. In the industrial sector, water saving plans and drought plans usually apply to the large industrial plants regulated under the Industrial Emission Directive and each adapted to their specific production process. For energy, including hydroelectricity and nuclear power, specific drought management approaches are negotiated between the State and infrastructure operators (mostly national electricity provider).

In England, water companies must prepare Water Resource Management Plans to reduce demand, halve leakage rates by 2050, develop new supplies, move water to where it's needed, and reduce the use of drought measures. These plans need to follow regional plans prepared regionally under the 2020 National Framework for Water Resources (EA, 2020). In addition, water companies must prepare their own drought plans, which are short-term plans outlining how the water supply will be secured and how the environment will be protected in the case of a drought. These are prepared in line with Environment Agency guidance, as well as following the requirements of the Water Industry Action 1991 (UK Parliament, 1991b), Drought Plan Regulations 2005 (UK Parliament, 2005) and Drought Framework (EA, 2017).

Regarding agriculture, drought restrictions are usually set in DMPs. Regarding water efficiency, national governments may establish specific programmes such as the Spanish Programme for the Modernisation of Irrigation Infrastructures Berbel and Gutierrez-Martin, 2017; Caixa Bank Research, 2024). At the EU level, conditionalities set on agricultural subsidies distributed under the Common Agricultural Policy (CAP) require abstracting farmers to have a valid permit and meter the volume extracted (EC, 2023). The CAP Strategic Plan also supports investments and agri-environment schemes (mainly through rural development) into measures that strengthen the resilience of farms to droughts and water scarcity, through water saving and efficiency measures or changes in crop systems. In England, much focus is now on supporting agriculture to adapt to restrictions on water use. Initiatives with government include supporting farmers to implement water resource planning projects and local resource options such as smaller reservoirs, effluent reuse, and rainwater harvesting.

Other plans

All reviewed countries have national adaptation policies (Climate-Adapt, 2024). However, these plans do not address the issue of allocation specifically, but focus on other measures for mitigating water scarcity and droughts. In France for instance, the National Adaptation plan (RF, 2018) promotes primarily water efficiency and saving measures, such as climate resilient production systems in agriculture, and NbS such as enhancing soil quality for increased water storage in soils and groundwater. Adaptation plans are also developed by each region (sub-national administrative unit), several (but not all) "départements" and by water agencies as a strategic planning document complementing their RBMP (e.g. Rhin-Meuse river basin adaptation plan). All these plans focus on the management of water scarcity rather than droughts and focus more on water efficiency and sector adaptation than guiding water allocation policies.

Responsibilities and involvement of actors

In managing allocations for water resources, state authorities and stakeholders play crucial roles in ensuring effective and equitable distribution. State authorities, including government agencies and regulatory bodies, are responsible for developing and implementing policies, laws, and regulations that govern water allocation. They oversee the allocation process, establish water rights frameworks, and manage infrastructure projects to facilitate the distribution of water resources. Additionally, stakeholders such as water users, communities, and non-governmental organizations (NGOs) contribute through perspectives, expertise, and feedback to the decision-making process. Collaboration between state authorities and stakeholders is essential to address diverse interests, balance competing demands, and promote sustainable management of water resources.

Responsible authorities

Each reviewed country has established unique organisational settings to manage water. We differentiate three main functions regarding water allocation decision-making:

- Long term water resource planning – linked with RBMPs and catchment management plans, for the definition of ecological flows and managing long term imbalances between demand and supply
- Issuance and management of permits, including enforcement of permit requirements
- Drought planning and management including prioritization between uses during droughts and enforcement of drought restrictions

In France, water resource planning is delegated to water agencies at the level of river basin. In addition, where local actors agreed to develop one, catchment management plans have been adopted and managed by local public water agencies (EPCI/EPTB) for sub-basins. They may also be quantitative water managements plans (PTGE), also where catchment management plans have not been adopted. A range of local and regional organisation can be in charge of the PTGE.

Water agencies are independent national administrations under the supervision of the Ministry of Environment and governed by a partnership between the State, regional administrations (regions, departments, local councils) and users. Catchment management is also supervised by similar partnerships. Responsibilities for water resource planning are separated from responsibilities to issue and manage permits and those for drought planning and management. These powers are entrusted to the State through its regional and departmental services (DDT(M)). In addition, a national independent agency under the supervision of the Ministry of Environment (the Office Francais pour la Biodiversité, OFB) can support for the processing of requests for authorization or declaration relating to the water law, and carry out together with State Services inspections to ensure compliance with regulations.

In Spain, river basin authorities play an important role as they regroup responsibilities for water resource and drought planning, permitting, enforcement of permit requirements and drought restrictions. River basin authorities are under the supervision of the Ministry of Environment, except for river basins and groundwater bodies which are not shared between several regional governments, in which they are under the supervision of regional governments (occurs in Andalucia and Catalonia as well as the Balearic and Canary Islands). Decisions of river basin authorities are governed by a council of state and regional government and user representatives. Through the national Hydrological Plan, the Ministry of Environment is also responsible for managing inter-basin transfers to balance demand and supply, and may impose national drought restrictions.

Sweden presents a regionalized approach to river basin planning, drought planning and enforcement of drought restrictions, whereby counties are the primary authorities. Permitting, however, is the duty of the Land and Environment Court, while the Swedish Agency for Marine and Water Management (SwAM) is tasked to ensure that water resource planning leads to the protection, restoration and sustainable use of freshwater resources and seas, mainly by providing (binding) guidance.

In Finland, the regional state administrative agencies serve as the permit authorities, while supervisory responsibilities (monitoring and enforcement) are shared between the Centres for economic development, transport and the environment (state supervisory authorities) and municipal environmental protection authorities (local supervisory authorities). While the Water Act empowers the state supervisory authority to undertake certain tasks and supervise municipal actors, the powers of the state and local supervisory authorities are largely overlapping. The Centres for economic development, transport and the environment are responsible for making RBMPs. Drought management planning is not required in legislation in Finland; however, the existing regional plan was prepared by the Centre for economic development, transport and the environment of that region and the 2020 guide is directed at the actors (e.g. water suppliers) and the Centres for economic development, transport and the environment (Parjanne, Ahopelto and Parkkila, 2020a).

In Romania, the Ministry of Environment together with Agriculture and Rural Development elaborates, coordinates and implement the national strategy for reduction of the effects of droughts and, coordinates, substantiates, elaborates and updates the National Action Plan for the reduction of the effects of droughts and desertification. The Committee is responsible for the elaboration of drought strategies and action plans necessary for combating land degradation and desertification in Romania. There are 46 members of this committee, state secretaries from the ministries with responsibilities in drought management, representatives of national authorities for water, forests, land improvements, academia and research institutions. The lead authority for all matter of water management (RBMP, drought management) at national level is the National Administration “Romanian Waters”. It is responsible for monitoring, enforcement and compliance with allocation.

In England, the lead authority setting policy priorities for river basin planning and drought management at national level is the Department for Environment, Food and Rural Affairs (Defra). The authority responsible for implementation, including permitting, river basin management, CAMS (see Chapter on Policies) and enforcement of drought orders is the Environment Agency. The issuance of Drought Orders, however, is the responsibility of the Secretary of State for the Environment.

Involvement of users and stakeholders

The approach to stakeholder engagement varies between countries. Some countries such as France and Spain have established river basin authorities governed collegially by authorities, users and civil society – though each country have unique arrangements with regards to representation and role of stakeholders in decision making. In Finland, Sweden and England, stakeholders do not have co-decision powers but are consulted during the preparation of planning documents. Arrangements also vary depending for river basin planning, drought management, and decisions on permitting. The situation in each country is described below.

In France, representatives of users and civil organisations participate in decisions over river basin management. By law, it must concern 20% of the decision-making power of the river basin committees, and must include representatives of various interests, including agriculture, industry, energy, environment, fisheries, and consumer rights. Similar set up in terms of stakeholder representation exists for catchment planning committees. Thus, there is a strong involvement of local and regional interests in decision making on river basin and catchment management targets and broad allocations. Similarly, quantitative water management plans must include local and regional stakeholders (MTCET, 2023).

Different fora have been established for drought management. Stakeholders are involved in drought management committees and have a consultative role on the specification of priority uses during droughts, the definition of thresholds and measures, as well as a role to inform decision making during the drought. Drought committees have a large role in the design and operation of the DMPs, but they officially only have a consultative role, and decision-making is in the hand of the Préfet (MTE, 2021). They meet at least 1) at the end of the winter to assess the hydrological situation, 2) during the summer period when needed, and 3) at the end of the summer period to assess the past year.

The issuance or renewal of permits are primarily a State decision, and no specific stakeholder consultation is required, unless the requested permit requires an Environmental Impact Assessment, in which case third parties may be consulted. With the Water Law 2006, agricultural abstractors situated in basins classified in structural imbalances no longer obtain an individual permit from the State. Instead, an agricultural user associated (called 'OUGC') is created: it holds a collective permit for all irrigators situated in the basin and is responsible for issuing yearly allocations to each irrigator (RF, 2007). The participation of users in the issuance of yearly allowance this case is therefore much stronger (Textbox 3).

Textbox 3 Agricultural user associations in France

The OUGC is responsible for managing the bulk volume that can be abstracted for agricultural use in a given sub-basin/territory. The aim is to build, on a geographical scale that is consistent with the resource, a collective management system that allows a better distribution between irrigators of an available but limited resource. For the State it is also a recognition that it does not have the power to operate and monitor use at this scale, delegation to users being a necessity painted as a virtue (devolution; participation). In this context, the OUGC's compulsory tasks include:

- To submit the application for a Single Multiannual Irrigation Abstraction Authorisation (AUP). The aim of this procedure is to draw up impact documents covering all the abstractions in the area covered by the OUGC, rather than carrying out a piecemeal study of the impact of each individual abstraction. This authorisation replaces all previous individual authorisations;
- To propose each year a plan for allocating the authorised volume of water between irrigators. This plan must take into account the impact of the proposed allocation;
- To define rules for adapting the allocation in the event of the temporary limitation or suspension of water use during a crisis. These rules are specified in the OUGC's internal regulations.

In some places, agricultural water user associations such as the OUGC, are more pro-active, and take preventive measures before drought restrictions, to delay or avoid the drought restriction orders.

Source: CGEDD-CGAAER (2020)

In Spain, river basin authorities are governed by a river basin council composed of authorities from central government and the Autonomous Regions as well as representatives of users. Various collegial committees, largely dominated by authorities and consumptive users such as agriculture, drinking water supply operators and industry, exist for planning and managing water (Estrella and Sancho, 2016). A forecast of surface water allocations is included in the River Basin Management Plan, which works as a framework document that guide yearly allocation decisions by the 'Comisiones de Desembalse' (i.e. water allocation

commissions, see Sanchis-Ibor et al., 2022). These Commissions have oversight over the filling and emptying of surface water reserves (reservoirs) and groundwater reserves at river basin level, respecting concessions and water use rights. They usually meet three meetings a year (October, February, May) and are composed of the main users (irrigation, drinking water, energy). In addition, Juntas de Explotación manage sub-systems, taking into account decisions of the Comisiones de Desembalse. When the aquifer has been declared overexploited or where groundwater bodies are at risk of not meeting WFD objectives, its management is delegated to a groundwater user association. The groundwater user organization supervises the implementation and effective control of the extraction plan prepared with supervision from RBAs. In 2024, about 50 groundwater user associations exist in Spain (Berbel, personal communication).

Regarding permitting, the Spanish system follows a series of 13 pre-defined steps (SG, 2024b) which involves other (potential) users and interests. In the initial stages, any new application for a concession usually goes through an open competition with other proposals. In later stages, any interested party has the opportunity to raise comments and concerns regarding applications for concession. Regarding drought management, users are involved during the preparation of the DMP and its implementation during droughts through Permanent Drought Commissions (Estrella and Sancho, 2016).

In Sweden, the counties consult with the authorities, municipalities, organisations, operators and individuals affected by the decision during the preparation of the RBMPs. According to the Ordinance (2017:872) on water delegations, the countries shall establish reference groups with various stakeholders to enable this cooperation (Swedish Parliament, 2017). In the case of the river basin Västerhavet, for instance, the consultation resulted in circa 800 comments that were taken into account when further developing the plan (Vattenmyndigheten Västerhavet, 2022). The partial drought action programmes against drought and water shortages are also prepared in consultation with stakeholders. For instance, the measures included in the programme for the Södra Östersjön river basin district were developed in consultation with stakeholders and in dialogue with the respective central authority (Vattenmyndigheten Södra Östersjön, 2022). Regarding permitting, the Land and Environment Courts publicly announce the permit application and invite stakeholders to submit comments regarding the permissibility and the conditions for the permit (Swedish Parliament, 1998a, Chapter 22, Section 3; SEPA report 2017, p. 26). When the claims and opinion have been presented, the permit authority will schedule a public hearing. Parties to the proceedings and certain stakeholders may also file an appeal concerning the permit authority's decision (Swedish Parliament, 1998a, Chapter 16, Section 12). As per 1 January 2024, a non-profit association or another legal entity whose main purpose is the safeguarding of nature conservation or environmental protection interests, that is non-profit, that has existed in Sweden for at least three years, and that has at least 100 members or otherwise shows that it has public support also has the right to appeal permit decisions (Swedish Parliament, 1998a, Chapter 16, Section 13).

In Finland, stakeholders are consulted in the preparation of the RBMPs in accordance with the Act on the Organisation of River Basin Management and the Marine Strategy (Finnish Parliament, 2004). As part of the consultation, stakeholders have a right to examine the preparation and background documents and state their opinions in writing or electronically. As in Sweden, any parties are invited to comment on any permit application. The Centre for economic development, transport and the environment that prepares the RBMP needs to arrange sufficient cooperation and interaction with the different authorities and other parties in its operating area at the different stages of preparation of the plan and set up a cooperation group. The Water Act differentiates stakeholders, with an interest in the application due to the impact of the application on their rights, benefits or obligations, and third parties who do not have a specific interest in the application (Finnish Parliament, 2011). Stakeholders can lodge an objection while third parties can express opinions. The permit authority must respond to the individual requirements set out in statements and objections in its decisions. It does not need to respond to the opinions expressed by other parties. To note, a registered NGO "whose purpose is to promote the protection of the environment, human health or nature conservation or a pleasant residential environment and in whose operating area, as specified in the applicable rules, the environmental impacts in question arise" is entitled to object and appeal in the permitting process.

In Romania, water users in River Basin Committees are consulted for the preparation of the RBMPs and of the plans for drought restrictions. Final decisions are made by the National Administration Romanian Waters.

In England, stakeholders are consulted in the preparation of RBMPs. These consultations are led by the Environment Agency, as well as Defra, Natural England, and the UK Water Framework Directive Technical Advisory Group (UKTAG). In its most recent consultation on the update of RBMPs, the Environment Agency received 270 responses. In 2019, UKTAG carried out a consultation on Proposed Biological and Environmental Quality elements, including on river flow standards. The Water Leaders Group assembles representatives from key sectors and organizations in the water system to work closely with the Environment Agency on the development and implementation of RBMPs (EA, 2022).

Additionally, a number of collaborative frameworks exist in England that aim to bring a diversity of actors together around abstraction issues (Benson et al., 2020). Defra established the Catchment Based Approach (CaBA) in 2013 as community-led partnerships to promote sustainable water use. CaBA is at the center of the government strategy to build compromise and consensus, leading to co-development and co-implementation of catchment actions. The 2017 Water Abstraction Plan established 10 Water Resources Priority Catchments at the catchment level bringing together farmers, local councils, NGOs and other interested stakeholders to promote sustainable abstraction. Water Abstractor Groups are another collaborative approach centered on farmers in eastern England who aim to protect their water rights while working with government agencies (Benson et al., 2022).

The permitting regime

A permitting regime refers to a system or framework established by regulatory authorities to control and regulate the extraction, use, and allocation of water resources within a given jurisdiction. Under this regime, individuals, businesses, or other entities are required to obtain permits or licenses to abstract, divert, consume, discharge, or otherwise utilize water from surface water and groundwater bodies. In other words, a permit formalises the right of an individual or organisation to use water according to rules set by the public. Permits typically outline the terms, conditions, and limitations of water use, including the quantity of water allowed to be withdrawn, the purpose of use, the location of extraction or discharge, and any environmental safeguards or mitigation measures.

Type of permits

The reviewed countries establish a variety of permit types that are typically based on the risk posed to the water environment. Different permit types (e.g. notification instead of authorisation) or even exemptions are established for domestic users (including domestic vegetable gardening) and smaller abstraction capacities (Table 1). As a water scarce country, Spain applies the strictest threshold below which no permit is required. Although abundant with rain, England also apply low thresholds – a situation possibly related to the small size of English catchments combined with high population density (high water demand for public water supply) and high level of pressure in some catchments due to irrigation. France has higher pumping thresholds but requires a minima notification of any pumping facilities and abstraction. Faced with lower risks of water scarcity, Sweden and Finland have the highest thresholds.

Permits usually presents information such as the location of the abstraction point, the authorised pumping, the nature of the use which the permit is associated with, and various conditions attached to the use of water. None of the reviewed countries include standard requirements for return flows; hence only abstraction is regulated and not consumption. Some public water utilities may however have discharge permits with specific requirements for discharge volumes, thereby indirectly regulating net consumption in the associated water supply network.

Some details are provided for each country below.

Table 1 Thresholds for obligation to obtain abstraction permits

Country	No permit required	Notification	Authorisation
France	See table below		
Spain	In water bodies in good status, below 7000 m^3/year (equivalent to 19m^3/day)	-	All abstraction in the public domain above 7000 m^3/year All water bodies in less than good status
Sweden	According to Law, water operations where public or private interests are manifestly not going to be harmed and water abstraction for the personal consumption or heat supply of a one- or two-family property or agricultural and forestry property, gardening water, commercial activities on a smaller scale (e.g. small crafts)	Below 600 m^3/day, and up to 100,000 m^3/year	Above 600 m^3/day and 100,000 m^3/year
Finland	Below 100 m^3/day According to Law: use that is temporary and for "personal needs" within a "reasonable" quantity, e.g. household use or small-scale commercial use	Above 100 m^3/day and below 250 m^3/day	Any permanent abstraction above 250 m^3/day Projects under 250 m^3/day where negative impact is possible
England	Below 20 m^3/day	-	Above 20m^3/day
Romania	Below 0,2 litres/second (equivalent to 17m^3/day), intended exclusively to satisfy the needs of the own household	-	Above 0,2 litres/second for household needs All other users

In France, prospective abstractors must obtain permits for creating or installing the infrastructure (e.g. a weir and intake, a pump, a well) and one for abstracting the water. Different types of permits – a simple declaration and a more complex authorization – are required depending on the characteristic of the infrastructure and scale of abstraction (Table 2) (RF, 2024). The authorization requires pre-approval from State authorities, while the declaration procedure allows users to carry out the infrastructure development or abstraction, following submission of the required paperwork. The State can still oppose a 'declaration' within 2 months. Thresholds above which an authorization is required are stricter when the resource has been designated part of sub-basin or aquifer in structural water imbalance, in ecologically sensitive areas, and in areas protected for drinking water production.

An abstraction permit in France defines the nature of the use, point of abstraction, the maximum pumping flow rate, and a maximum annual volume sometimes broken down seasonally or monthly for groundwater. No return flows obligations are included.

Table 2 Declaration and permitting requirements in France

Priority area	Type of resource	Significance of extraction (volume based on pumping capacity use over one year)	Administrative procedure for well or borehole	Administrative procedure for abstraction permit
Outside sensitive areas	Groundwater	Groundwater: annual extraction < 1 000 m^3/yr. (domestic use)	Local council declaration	No declaration
		Groundwater: annual extraction between 1 000 m^3/yr. and 10 000 m^3/yr.	Declaration to state	No declaration
		Annual extraction between 10 000 m^3/yr. and 200 000 m^3/yr.	Declaration to state	Declaration to state
		Annual extraction > 200 000 m^3/yr.	Application for authorisation (state)	Application for authorisation (state)
	Surface (including alluvial aquifer)	Below 400m^3/h or below 2 % of river flow (QMNA5)	-	Local council declaration
		Between 400m^3/h and 1 000m^3/h or between 2 % and 5 % of river flow (QMNA5)	-	Declaration to state
		Above 1 000m^3/h or above 5 % of river flow (QMNA5)		Application for authorisation (state)
In sensitive areas	Surface water and groundwater	Below 8 m^3/hr.	Declaration to state	
		Above 8 m^3/hr.	Application for authorisation (state)	

In Spain, the regime of concession applies to all public water, while private waters do not require a permit but should be registered in the Catalogue of Private rights (see also Chapter on Legislation). Any change to the characteristics of a private groundwater right would transfer the right into the public domain, requiring application for a concession. Concessions include the following information: a) nature of use (urban/industry/agriculture/…); b) point of abstraction; c) maximum total / seasonal volume; d) guarantee level (i.e. for urban uses: 99,8% guarantee; irrigation in regulated rivers: 90% guarantee; irrigation in non-regulated rivers: no guarantee).

In Sweden, the permit conditions for abstraction activities cover the amount that can be taken out at certain time. Conditions on measuring the impacts and water levels are also common, as are conditions to ensure that the activity does not jeopardise achievement of environmental quality standard and deteriorate the water environment. From 2029 onwards, permits will be legally required to list e.g. the duration of the permission, the purpose, location, scope, safety of the activity and technical design in general, and supervision. Certain water activities may require a declaration rather than an authorisation, although authorities may issue an obligation to apply for an authorization in certain circumstances. In all cases, certain measures or restrictions may be in place to meet environmental requirements (Swedish Parliament, 1998a).

In Finland, the permit includes the purpose of the water abstraction, its location, and the maximum quantity of water to be abstracted.

In England, abstractors require an abstraction licence in the case where abstractions will exceed 20 cubic meters of water per day. Temporary licenses for abstraction above 20 m^3/day for a maximum of 28 consecutive days are also possible. The construction and extension of boreholes, wells, or related works (springs, quarries, mineral workings) require also consent based on an assessment of the potential impact of the groundwater abstraction. An abstraction licence specifies the abstraction point, the authorised

quantities, what you can use the water for and any conditions to protect other water users and the water environment (EA, 2014).

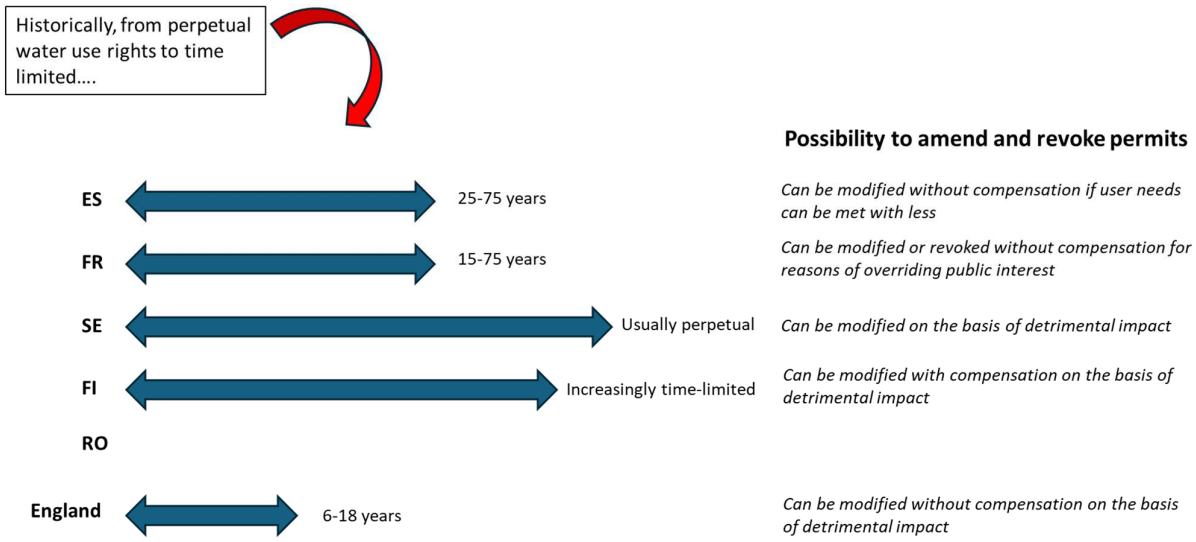
England also has established drought permits which take precedence over normal licenses when drought conditions are officially recognized through a drought order issued by the Secretary of State. The drought permit allows changes to the abstraction conditions of the water company (e.g. where, how much). These permits aim to mitigate water supply issues caused by deficient rainfall, with checks in place to ensure minimal environmental impact. Typically lasting up to six months, they provide flexibility for water companies to maintain drinking water supplies during droughts (EA, 2017; Interview English experts, 2024).

In Romania, no information was available.

Duration of permits

A large variety of permit duration can be observed, depending on whether it is attached to the infrastructure and abstraction activity, but also for abstraction permits (Figure 4). Countries such as Sweden and Finland still use non time limited permits. However, recent decades have generally seen a shortening of the duration of permits, going down to 12 years in England and 15 years for certain abstraction permits in France. Changes in permit duration for new permits is not systematically associated with a revision of existing permits, resulting in significant heterogeneity of permit conditions between authorised users. In all cases, authorities have powers to change permit conditions during its period of validity, with or without due compensation, pending justification such as water conservation efforts (e.g. Spain), reasons of overriding public interest (France), unforeseen detrimental impact (Finland) or if adopting new processes or technologies could notably enhance human health or the environment (Sweden). Violations to permit conditions can also result in changes to permits. Specific information is provided below for each country.

Figure 4 Duration of permits and conditions attached to their modification



In France, historically, permits for infrastructures had a set time horizon of 75 years. Nowadays, a time horizon of 25-50 years now generally applies for new permits or permit renewal (Kampa et al., 2017). For abstraction, no specific time limits were historically set out in abstraction permits – though restrictions have increasingly been included in the last 20 years to new or renewed permits. For example, new collective permits for agricultural user associations (OUGC) in priority areas for quantitative water management (see Chapter on Policies) generally last for 15 years (Rouillard and Rinaudo, 2020). The State can revoke any permit without compensation when justified for reasons of overriding public interest.

In Spain, during the transition phase of the 1985 Water Law, permits (concessions) were issued for a period of up to 75 years, though they tend to be of a duration of 25 years now. Concessions can be revoked by authorities with or without compensation, according to specific rules (Sanchis-Ibor et al., 2022). For example, concessions are subject to legal reassessment and potential reduction if it can be demonstrated that the concession holder's needs can be met with a lesser allocation or through more efficient resource utilization, thereby aiding in water conservation efforts. RBAs may conduct audits and inspections of concessions to assess the effectiveness of water resource management and utilization under the concession agreement.

In Finland and Sweden, there were, historically, no time limit on abstraction or infrastructure permits unless there were reasons for doing otherwise. Nowadays, in Finland, infrastructure permits are usually perpetual while abstraction permits are time limited. In Sweden although not used extensively, the current Environmental Code allows for time-limited permits. In the two countries, authorities can alter or revoke the permit when they have detrimental effect on environmental quality according to specific rules which differ slightly between the two countries:

- In Finland, permit regulation review or new regulations are feasible under certain conditions such as unforeseen detrimental impacts, changes in conditions, or safety concerns, within 10 years of project completion. Changes to permits can be initiated by public authorities in response to applications from various stakeholders including those with private benefits facing detrimental impacts, municipalities, supervisory authorities, or those supervising public interests. Such a review or new permit regulation may not "significantly reduce the benefit gained from the project" and the applicant will be ordered to compensate for the losses that are not deemed minor. Furthermore, temporary measures can be ordered by permit authorities in cases of natural disasters posing hazards. This framework, although primarily applicable to water regulation projects, extends to other water uses regulated by permits (Finnish Parliament, 2011).
- In Sweden, the Environmental Code allows for alterations or revocation of permits, particularly if the activity significantly violates environmental standards or if adopting new processes or technologies could notably enhance human health or the environment (Swedish Parliament, 1998a). However, amendments must not impact the activity so far that it cannot be conducted or excessively complex. Applications for review can be made by various authorities including the land and environmental court, the Swedish Environmental Protection Agency, and others.

In England, there has been a transition (about 20 years ago) from permanent licenses to time-limited licenses. The shift to time-limited licenses allows for periodic reassessment and adjustment to ensure sustainability. All new abstraction licences are now time limited, and are tied to the "common end date" (CED) of the area's Catchment Abstraction Management System, which are planned every 12 years. Depending on when the application is submitted, this means that license durations can range from anywhere between 6-18 years but will generally be 12 years. Discussions are currently ongoing to extend this duration for abstraction linked to new large investments such as those planned for new large reservoirs and transfer infrastructure for public water supply in view of increased drought risks under climate change (Interview English experts, 2024).

In Romania, no information was available.

Defining an allocable pool

The allocable pool is the amount of water that can be used by sectors. Defining the allocable pool is a key step supported under the WFD through the definition of water balances (Schmidt, 2024). According to the EC (2015), a water balance should be holistic, integrating long term water availability including climate change, short term temporal (interannual variability) and spatial fluctuations in water availability, storage capacities of reservoirs and aquifers, the role of groundwater in sustaining river baseflow, and groundwater recharge rates, among others. It should provide information on how much can be extracted for different time steps (e.g. daily, monthly, seasonal, annual) and where. It must also consider both needs of consumptive users, such as public water supply, irrigated agriculture and thermal power plants, and the needs of non-consumptive sectors such as navigation, tourism and fisheries.

When establishing an allocable flow and volume of water, several factors must be accounted for. It must accommodate ecological needs through the definition of ecological flows, considering impacts on habitats and species in rivers, lakes and coastal waters, and safeguarding crucial groundwater-dependent ecosystems. Other specific requirements must be accounted for, such as e.g. water quality, the interdependence of downstream and upstream users on flows, etc.

Ecological flows

In France, the regulatory framework requires the setting of minimum biological flows guaranteeing the life, reproduction and circulation of water species downstream of infrastructures affecting river flow (RF, 1984). These minimum biological flows are servitudes on the operators of the infrastructures (also called 'Débit Réservé"), and are gradually adopted as they only apply to new authorisations, renewal of existing authorisations, or of existing ones upon request of the State. They are established based on studies focused on local hydrological statistics and considering the linkages between hydraulic and ecological conditions (RF, 2011). In all cases, minimum flows cannot be set below 1/10 of average natural annual flow, or 1/20 for rivers with an average natural annual flow above 80 m3/s. The average flow rate should be based on all the data years available, with a strict minimum of 5 years, and should remove recreate an estimate natural flow removing the impact of extraction, discharges and water transfers. The 1/20 also applies as a minimum servitude for infrastructure used to produce peak time electric production.

In addition, a set of river flow targets are established for major river nodes in RBMPs and in catchment management plans. They represent objectives guiding operational management decisions. Called "target low flows" (in French, i.e. "Débit Objectif d'Etiage" or DOE), they represent the monthly average flow above which authorities consider that downstream water demand can be satisfied without impacting good ecological status under the WFD. Target low flows must include minimum biological flows so they guarantee the life, reproduction and circulation of water species across the river basin. Target flows can vary between seasons. Target low flows are set in a nested manner, at the most downstream point of each hydrological sub-units of the river basin, i.e. individual catchments, sub-catchment and other management units. Targets groundwater piezometric levels are also set for aquifers connected to surface water bodies, to avoid that drop in aquifer levels impairs the achievement of minimum biological flows. The flow targets are considered achieved if it is observed a posteriori that the lowest 10-days average flow (or aquifer levels) was maintained above 80% of its value. Flow targets must be met on average 8 years out of every 10 year-period. These target low flows are used to calculate the sustainable extraction cap.

Spain has established ecological flows at water body level. It is not considered as a use, but as a restriction prior to water use under the Water Planning Instruction (Sanchiz-Ibor et al., 2021). The ecological flows set requirements for different flow parameters, including minimum flows, maximum flows, generating flows (ordinary and natural flood that conditions the morphology and structure of the channel and river habitats) and rates of change. Reservoir releases and water flows are strictly regulated to meet agreed targets for ecological flows and water allocation to users.

In Finland, ecological flows are not defined in regulations, though RBMPs define it as the adequate flow to ensure the functioning of the river ecosystem and achieve good ecological status. No clear concept defines the type of flows that should be included in ecological flows. There may be minimum and maximum flow requirements in permits. No specific programme exists for revising old permits according to ecological flow requirements.

In Sweden, ecological flows are not defined in regulations, though environmental quality standards are used to set 'sufficient flows to maintain basic ecological functions' for good ecological status and ensure connectivity (Swedish Parliament, 2004). A programme for revising hydropower permits is now set to support the achievement of ecological flows (Swedish Government, 2020; Michanek and Zetterberg, 2021).

In Romania, ecological flows are not defined in regulations, but are used following guidance HG 148/2020[1]. A temporary reduction of the ecological flows is allowed during prolonged droughts, with a maximum of up to 50% of the minimum flow rate.

In England, ecological flows are defined by the Environmental Flow Indicator (EFI) methodology, which establishes the percentage deviation from the natural flow in a water body. When defining environmental flows, besides hydrology, other key elements are taken into account, including 'Abstraction Sensitivity Bands' (ASB). The ASB helps determines the EFI, defining the quantity of water needed to protect the ecology of the river, and thus also the amount of water that can be abstracted (see Chapter on Water Balances). They are determined on the basis of physical habitat characteristics of the river, fish monitoring data, and invertebrate monitoring data. There are three ASB levels (1 to 3, 3 being the highest sensitivity). Typically, upper reaches of catchments are the most sensitive, followed by middle reaches and lower reaches being the least sensitive. While water quality criteria are not directly used, the focus remains on species sensitivity to natural flow changes, ensuring a comprehensive approach to environmental flow management (EA, 2020b; Interview English experts, 2024).

Alert flows and drought indicators triggering restrictions

In Spain, the drought plans usually set three threshold levels (pre-alert, alert, and emergency) to trigger water demand and supply measures when entering a drought period. Thresholds are based on basin-specific 'temporary water scarcity indexes' computed as weighted average of relevant observed variables at selected control points, for example precipitation, streamflow, piezometric series, contribution of non-conventional sources, water demands and returns of the different uses, ecological flows, characteristics of reservoirs, canals, and other infrastructures (SG, 2018). Thresholds are established by matching water stored with the volume of allocated demands and environmental needs in the coming months, under pessimistic inflow hypotheses (percentiles 1 to 5 or historical minimums of the hydrological series). The index is normalized to bound between 0 and 1 and significant threshold are set at 0.50 (pre-alert), 0.30 (alert) and 0.15 (emergency). The alert threshold should correspond to the impossibility of the natural regime to provide the ecological minimum flows established in the RBMP. Once the index falls below each threshold, specific measures are proposed (restrictions, extraordinary supplies…) designed to overcome extreme episodes. It also uses the Territorial Drought Unit (UTS) to trigger derogations under the prolonged drought procedure. When the standardized indicator falls below the value of 0.3, the actions foreseen for situations of prolonged drought may be applied, provided that the rest of the legal conditions are met: less demanding ecological flows and justified admission of the temporary deterioration of the status or potential of the water bodies.

In France, triggers in drought emergency are defined as average daily river flow and aquifer levels (in particular alluvial aquifers and aquifers connected to surface water) (MTE, 2021). Regulations require water authorities to establish two levels of restrictions, i.e. "alert" and "crisis" flows below which restrictions on

[1] H.G. 148/2020; The Method of Determining and Calculating the Ecological Flow. The Government of Romania: Bucharest, Romania, 2020.

water extractions and uses apply so that essential water uses and the environment are prioritised in the event of droughts:

- "Alert" level is the average daily flow and aquifer level that indicates that water demand for all water uses downstream may not be met without impacting the aquatic environment. First restrictions on non-priority uses apply.
- "Crisis" low flow is the average daily flow and aquifer level below which top priority uses (e.g. essential drinking water provision for humans and animals, and good functioning of freshwater species) are endangered. All non-priority uses are not allowed to extract water.

Experience has shown that they are not sufficient to prepare users to restrictions and provide a more progressive approach to implementing restrictions. Hence, two additional levels (not required under the law but commonly used) have been established. A "vigilance" level is set before the "alert" level, which does not lead to any restrictions but encourages water uses to save water. A "reinforced alert" level is set before the "crisis" level in order to smooth the implementation of the alert level (some restrictions) to a crisis situation (full restrictions).

Specific restrictions on water uses apply at each level. An equivalent system based on groundwater levels applies to unconfined aquifers. These targets are set considering the interaction between surface and groundwater, based on studies conducted during the planning process (SDAGE or SAGE).

In England, the Environment Agency has a non-statutory drought framework (EA, 2017) that sets out drought planning and management (see Chapter on Drought management plans). A range of different triggers for drought orders are used to identify if a drought is happening, including rainfall, river levels and flows, reservoir storage and groundwater levels, and environmental indicators such as water quality and ecology.

In Finland, the Water Act refers to "long-tern drought or another similar reason" (Finnish Parliament, 2011). These terms are not explained in the Act, and no indicators are available. Similarly, in Sweden, the Act (1998:812) Containing Special Provisions concerning Water Operations mentions the possibility of water shortages by drought, but no indicators are defined (Swedish Parliament, 1998b).

In Romania, restrictions are also based on river flow and aquifer levels.

Water balance assessments

A water balance is a calculation of the water quantity available during a specific time period (such as a month or a year) in a river basin, considering water abstraction, use and consumption. This calculation can be used to maintain sufficient water levels in water bodies, to ensure their good status/potential, to allocate water to the different users, to avoid overexploitation of natural water resources, and to build resilience against climate change. According to the Blueprint, water accounts (or balances) "tell water managers how much water flows in and out of a river basin and how much water can realistically be expected to be available before allocation.

In Spain, water balances are part of the operations to be carried out in Spanish hydrological planning. They are compulsory, as stated in the Water Law and in the Hydrological Planning Regulation (SG, 2001). They are carried out at a national and basin scale. They are based on the use of two tools. The SIMPA model is a rainfall-runoff model, considering the dynamics of water storage in soils and aquifers and simulating hydrological processes at monthly and annual intervals, and providing averages with short and long time series (Schmidt, 2024). This is complemented with the AQUATOOL decision support tool which uses the SIMPA output (natural flow timeseries) together with resources management data and requirements (e.g. water demand units including abstraction characteristics, reservoirs, diversion infrastructure, ecological flows) to provide information on the expected levels of water supply guarantees, non-compliance risk with minimum ecological flow regimes and contribution of planned measures. Water balances are regularly

updated. A minima, they are re-calibrated for each RBMP cycle), integrating the latest data on climate change impacts.

In France, a risk assessment helps identify which subbasins and aquifers may suffer from an imbalance between water supply and demand. These aquifers, or sub-basins and connected groundwaters follow a regulatory procedure to classify them as priority zones for quantitative management ZRE) under the 1992 Water Law. The 1992 Water Law conferred the state powers to more strictly regulated permits issued in these zones (see Chapter on Legislation). Since 2006, authorities together with stakeholders must carry out detailed water balances in these priority basins and aquifers and quantify the Sustainable Extraction Limit (SEL).

The SEL is legally defined as the volume of water that can be extracted without impairing the environmental objectives of the WFD, i.e. good ecological, chemical and quantitative status of water bodies. Operationally, the SEL is set to ensure that the low flow targets adopted in the basin plans (see Chapter on Policies) can be met 8 years out of 10. If the basin is fully allocated within the SEL, allocations will still need to be curtailed on average 2 years out of 10 (drought years). In other words, the SEL is the quantity of water that can be withdrawn with an 80% reliability. The SEL ultimately takes the form of an annual volume of water that can be abstracted from specific management units (RF, 2006). Management units can be sub-catchment, parts of a sub-catchment or different aquifers (connected or not connected to surface water). The volume is also subdivided in seasonal (e.g. summer/winter), sometimes monthly and weekly steps.

SEL studies are directed by a steering committee appointed by the river basin authorities (or catchment management organisation where existent) (see Chapter on Responsibilities) and including all stakeholders potentially affected by the SEL. Methodologies for assessing the SEL vary greatly, ranging from simple statistical analysis to sophisticated integrated surface-groundwater models. The Rhone-Mediterranean basin conducted a series of studies (Etude des Volumes Prélevables) to define available water resources and inform quantitative water management (PGRE, now called PTGE, see Chapter on Policies). Similarly, the Loire-Bretagne Agency provided guidance to carry out studies crossing information on Hydrology Habitats Uses and Climate (analyses Hydrologie Milieux Usage Climat – analyses HMUC) as a diagnostic for the development of PTGE (AELB, 2022).

In Sweden, water balances are carried out at different scales, but primarily on local scales in selected areas (Schmidt et al., 2023). Water balances are used in permit applications for water abstraction, to assess impacts at water body level. Only in selected areas of regional importance, the entire catchment area has been studied/modelled with regard to water balances (Schmidt et al., 2023). Some areas have been more thoroughly studied because they have experienced water shortages. The absence of a unified register of water abstraction makes it difficult to get accurate information for water balance calculations, with the exception of water diversion for power production, where knowledge of abstraction and discharges is collected. For surface water and mapped groundwater bodies, Sweden has good knowledge of integrated water flows. In permit applications, information about interactions needs to be produced if they are deemed necessary for the water balance calculation in the area. New modelling / calculations regarding groundwater supply to water bodies are ongoing (Schmidt et al., 2023).

In Finland, water balances are at the stage of research, though water balances are discussed in permits and environmental impact assessments for specific sites. No nationwide water balances are in place. The national hydrological model calculates GW and SW interaction to some extent, but not used for water balance assessments (Schmidt et al., 2023).

In England, water balances are carried at the catchment level through the Catchment Abstraction Management Strategy (CAMS). As part of CAMS, a resource assessment is made of water available for future human use while protecting the environment and maintaining good ecological status.

The resource assessment results in limits expressed as Hands Off Flows which are then set as conditions in licenses. Surface water bodies are classified according to their susceptibility to certain effects through ASBs (see Chapter on Ecological flows). The amount of water available for abstraction is calculated at specific reference points of a river basins. Different amounts of abstraction are possible according to different flow regimes as percentage of natural flow regime (e.g. 10% of Q95). Four different flow parameters are used: Q95 (the flow of a river which is exceeded on average for 95% of the time i.e., low flow), Q70, Q50, and Q30 (higher flow). For a highly sensitive river (ASB3), at Q95, 10% abstraction of the flow is permitted upstream of the reference point. For a less sensitive river (ASB1), 20% abstraction of the flow is permitted at Q95. In theory, the sum of permitted abstraction flow upstream of the reference point should match that abstraction limit. In practice, there are challenges to adapt existing permit conditions accordingly (see Chapter on Allocation) (EA, 2020b; Interview English experts, 2024).

Abstraction limits for groundwater are based on target groundwater levels and a volumetric mass balance to meet good quantitative status. Limits are based on groundwater recharge, impact on connected surface waters, saline or other intrusions occurring within the unit because of groundwater abstraction, and impact on groundwater dependent ecosystems such as wetlands fed by the groundwater unit. Textbox 4 below presents an extract of a licensing strategy showing the outcomes of the assessment and how the Environment Agency communicates the availability of water resources to users.

In Romania, no information was available.

Textbox 4 Extract from the Kent Abstraction Licensing Strategy

Surface water

If you want to abstract water, you need to know what water resources are available within a catchment and where abstraction for consumptive purposes is allowed. To show this we have developed a classification system which indicates:

- *the relative balance between the environmental requirements for water and how much is licensed for abstraction;*
- *whether water is available for further abstraction;*
- *areas where abstraction may need to be reduced.*

The availability of water for abstraction is determined by the relationship between the fully licensed and recent actual flows in relation to the EFI. The results mapped onto these water bodies are represented by different water resource availability colours showing the availability of water resource for further abstraction. The water resource availability colours are explained in Table 1. In addition to these water resource availability colours we"ve classified some surface water bodies as „high hydrological status" which are coloured blue on the maps. In these water bodies very little actual abstraction occurs and they show virtually undisturbed, or close to natural, flow conditions.

Another category of water body are Heavily Modified Water Bodies (HMWB). These can be classified for many reasons but for water resources they are classified if they contain a lake and/or reservoir that influences the downstream flow regime of the river. The downstream „flow modified" water bodies are also classified as heavily modified.

We will add any conditions necessary to protect flows to a new licence during the licence determination procedure. We will base licence conditions on the water resource availability at different flows (high to low). Table 1 lists the implications for licensing for each water resource availability colour.

In cases where there is a flow deficit (RA is below the EFI) or risk of a flow deficit (FL below the EFI), there may be water available for abstraction at higher flows. This means that water may be scarce at low flows, but may be available to abstract at medium or high flows. A licence may still be granted but with conditions which protect the low flows. This usually takes the form of a Hands-off Flow (HOF) condition on a licence which requires abstraction to stop when the river flow falls below a certain amount. A river

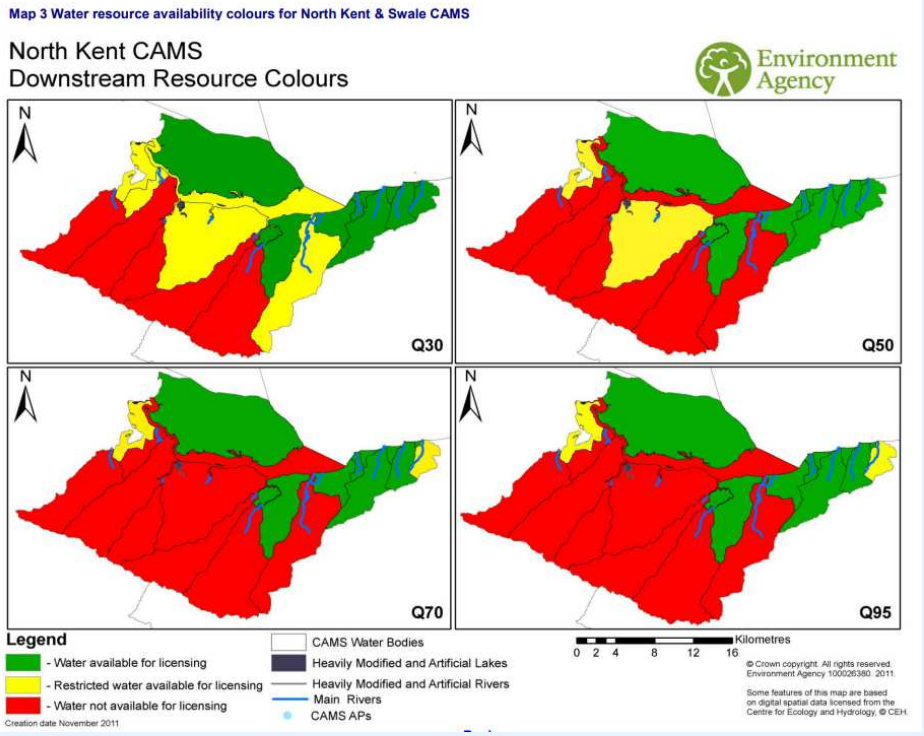
may also be heavily supported by flows from a reservoir and may have unnaturally high „low" flows which means that the river environment is most vulnerable at medium flows.

Water resource availability colour	Implication for licensing
High hydrological regime	There is more water than required to meet the needs of the environment. However, due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
Water available for licensing	There is more water than required to meet the needs of the environment. New licences can be considered depending on local and downstream impacts.
Restricted water available for licensing	Full Licensed flows fall below the EFIs. If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available if you can 'buy' (known as licence trading) the entitlement to abstract water from an existing licence holder.
Water not available for licensing	Recent actual flows are below the EFI. This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status (as required by the Water Framework Directive Note : we are currently investigating water bodies that are not supporting GES / GEP). No further consumptive licences will be granted. Water may be available if you can buy (known as licence trading) the amount equivalent to recently abstracted from an existing licence holder.
HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. These are often known as 'regulated rivers'. They may be managed through an operating agreement, often held by a water company. The availability of water is dependent on these operating agreements. More detail if applicable can be found in section 4.2.1 Surface Water There may be water available for abstraction in discharge rich catchments, you need to contact the Environment Agency to find out more.

<u>Groundwater</u>

Groundwater availability is guided by the surface water resource availability colours unless we have better information on principal aquifers or are aware of local issues we need to protect.

The map below shows the water resource availability colours in the North Kent & Swale area. The same availability is applied to groundwater and surface water."



Source: EA, 2013

Allocating and reallocating water

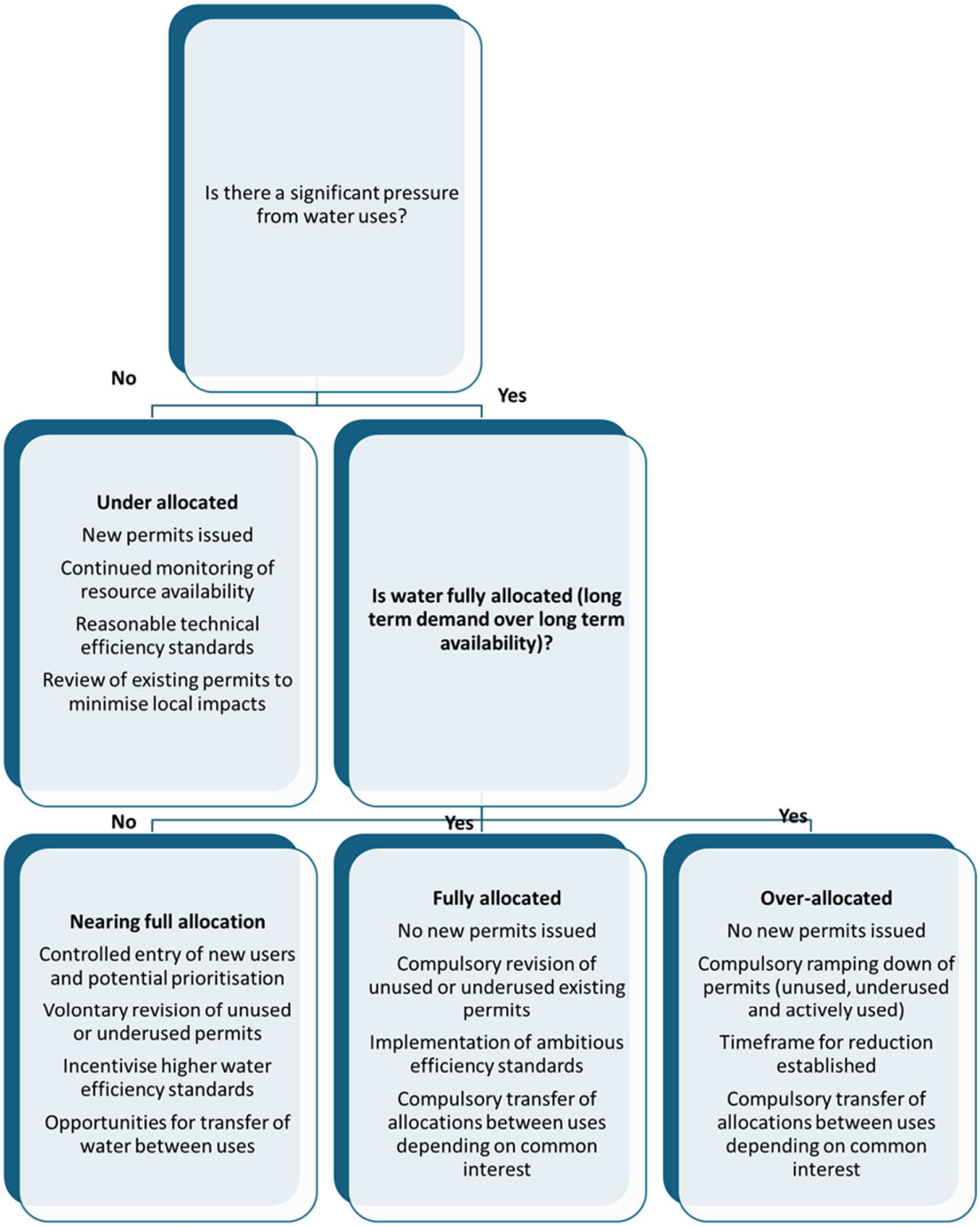
Allocation refers to the set of criteria and procedures used to determine how water resources are shared among existing and prospective users (claimants). Several aspects are relevant, such as the rules regulating the integration of new users (i.e. regulating abstraction / access to water), and those that regulate the sharing of water between authorised users. Of particular interest are the situations when the water body, catchment or aquifer is identified as full or overallocated (i.e. there is a long-term imbalance between demand and supply) (Figure 5). In these situations, obtaining an authorisation to abstract water will typically be more difficult. Some cases may involve reducing water use rights of existing users to match demand with water availability. Attention is also given to the rules that are used during periods of limited supply due to meteorological drought conditions. These rules are applied only during these exceptional (temporary) circumstances, as opposed to rules addressing long term imbalances (i.e. water scarcity). Finally, rules may facilitate the exchange of allocations between users through monetary and non-monetary mechanisms.

Integrating new users

All the reviewed countries have set specific checks to issue new permit for abstracting water, thereby limiting access to water resources. These may take the form of an assessment of third-party impacts or an environmental impact assessment. A range of hydrological and ecosystem impacts may be considered. These can include, for example, impacts on ecological or minimum flows, groundwater recharge, associated surface water (for groundwater permits), groundwater dependent terrestrial ecosystems, and downstream flows. Authorities in all reviewed countries can alter or refuse permit applications on the basis that the abstraction impact other users or hinder ecological flows. In Sweden, Finland and Spain, a public inquiry is also mandatory whereby stakeholders other than the prospective user can raise concerns with regards to the permit application. Further discussion on each case is developed below.

In France, the assessments required during permitting differs for each type of permits (see Chapter on the Permitting regime). For declarations to the local council, only information on the characteristics of the abstraction and its associated use is required. For declarations to the State, a study of “incidence” (“étude d’incidence”) is required. For authorisations, an impact assessment – which is more detailed and must be mandated to external experts – is required. The study must include impacts on fauna and flora, impacts on Natura 2000 areas, third party impacts (other uses), cumulative impacts and other nuisances. The study must also include compensatory measures and substitution solutions. Permit applications must not hinder the achievement of ecological–flows below the infrastructure. In addition to these checks, the State will not issue any new pumping permit if the basin is declared fully allocated (ZRE, see Chapter on Policies). In these priority basins, agricultural user associations holding a collecting permit on behalf of all irrigators (see Chapter on Involvement of users and stakeholders), can craft specific rules to allow new claimants while complying with overarching collective permit conditions (see Rouillard and Rinaudo, 2020).

Figure 5 Potential decision tree of a water allocation model (adapted from: LWF, 2012)



In England, the Environment Agency evaluates permit application using rules agreed in the Abstraction Licensing Strategy, which is based on the catchment resource assessment and part of CAMS (see Chapter on Policies). Any new license will include Hand-Off Flow conditions in the license to account for ecological flows and groundwater level targets. When establishing the abstraction limits through CAMS over the last 20 years, the Environment Agency approach has been to maintain existing users ('grandfathering') and issue new licenses in a queueing system: first come, first served. As the basin gets fully allocated, hand-off

flows tend to be stricter, i.e. restrictions come at higher flow levels, which therefore reduce the security of supply of new users. It does not issue any new licenses where the water unit has been identified as fully allocated, unless the abstractor can show that the abstraction will not impact good status (Interview English experts, 2024).

Beyond the assessment of water resource availability, applications are evaluated against their impact on river habitats and species using the Environmental Flow Indicator and Abstraction Sensitivity Bands (see Chapter on the Allocable pool). Depending on the scale of the abstractions, the Environment Agency defines the supporting information required during the application process, such as an environmental impact assessment. Application may require public notice, although this is not systematic (EA, 2014). A hydrogeological impact appraisal is required for applications planning to use groundwater to assess the impact of groundwater abstractions on groundwater level and groundwater dependent features (EA, 2007).

In Sweden, the impact of abstraction from permit applications are assessed against the quality standards set for each water body. Environmental quality standards include limit and target values, and indicators that guide and bind authorities and courts, for example, in permit review, supervision and physical planning (Swedish Parliament, 1998a, Chapter 5, Section 2). When applying, prospective users must include certain documents, e.g. relevant drawings and technical descriptions with information on the conditions on the site, an environmental impact statement when required, a proposal on protective measures or other precautionary measures, and a proposal for monitoring and control of the activity. For water operations, the application must also contain information on whether or not there are properties affected by the water operations and on the compensation amounts that the applicant offers to each owner, if such information should not be appropriate due to the scope of the business. The permit procedure includes a compulsory hearing of the public (Swedish Parliament, 1998a, Chapter 22, Sections 1 and 3).

In Finland, the permit application shall include the information sufficient for deciding on the matter regarding the purpose of the project and the impacts of the project on public interests, private interests, and the environment. This does not, however, mean that an official Environmental Impact Assessment is needed for all applications. The Water Decree specifies the information that must be provided for each water resources management project type. For instance, for water abstraction, the applicant must present an assessment of the purpose of abstraction, its quantity and the fluctuation of abstraction at different times; a report of the other alternatives for acquiring the necessary water; and a report of the other wells and abstraction sites in the areas, the impact the planned activity will have on them, the information on the quantity of water abstracted from such sites, their permit decisions and a plan for guaranteeing the availability of water (Finnish Government, 2011). The permit procedure requires that the application is announced by public notice. As explained, a right must be reserved to the stakeholders and other parties to express their objections and opinions.

In Romania, no information was available.

Adjusting existing rights to match available resources

The process of adjusting existing rights to match available resources remain rare in the reviewed countries. In Finland and Sweden, no processes are in place to permanently change permit conditions according to volumetric water balances – though, in Sweden, a process of permit revision for hydropower is ongoing. France, Spain and the UK have set up a process for revising or adjusting permits according to long term volumetric resources available annually and seasonally (see also Chapter on Water balances). However, progress has been slow and mainly focused so far on ramping down on unused permits. Adjustments have also been made to permits associated with uses engaged in water efficiency programmes. Details on the approaches taken in France, Spain and England are presented below.

In France, subbasins and aquifers identified as priority zones for quantitative water management can undergo a State-led process of permit modification and reallocation to match results of available annual and seasonal volumetric water balances. Withdrawal permits granted to users must be adjusted to meet

that limit. However, in practice, this remains rare and processes have so far focused on revising agricultural permits. In these cases, the agricultural user associations play an important role to define the rules for ramping down individual irrigators' allowances (see textbox 5). More frequently, the State revises permits following state-funded initiatives improving water efficiency in public and private water facilities.

Textbox 5 Reducing allowances of individual irrigators in agricultural water user association in France

When formalising water use rights of individual irrigators following the transfer of individual permits into a collective one (see Chapter on Policies), agriculture water user associations (OUGC) have employed a form of grandfathering, wherein the bulk volume is allocated proportionally based on past withdrawals. This may involve averaging or setting a maximum use over a reference period, or aligning it with the authorized flow rate specified in the original individual pumping permit, particularly in cases where accurate data on past extraction volumes for each farmer were unavailable. Such an approach establishes a consistent allocation for each irrigator, enhancing security for existing claimants and safeguarding the value of irrigated land. However, this practice has often led to overallocation, prompting agriculture water user associations to devise strategies to scale back individual allocations to align with Sustainable Extraction Limits. To facilitate this reduction process, initial bulk permits typically permit agriculture water user associations to allocate more water than their share of the Sustainable Extraction Limit during the initial years, with subsequent adjustments mandated over a period typically spanning 3 to 5 years.

Three primary strategies were used for reducing individual allocations to ensure they do not exceed the Sustainable Extraction Limit for agriculture beyond the permitted timeframe: the 'use it or lose it' approach, applying uniform reductions across all allocations with protective measures for smaller allocations, and maintaining initial allocation levels while implementing an annual reduction coefficient reflective of resource availability. While many agriculture water user associations have successfully reduced allocations, few have significantly curtailed water extractions. The implemented ramp-down regulations have primarily targeted dormant allocations—volumes systematically allocated but largely unused.

Source: Rouillard and Rinaudo, 2020

In Spain, there are few cases where authorities have reduced concessions permanently and they have usually been associated with unused permits or where efficiency gains have been achieved (Sanchis-Ibor et al., 2022). Instead, surface water rights undergo a permanent process of temporary adjustments, first through the hydrological plans of the RBMP and then annually in water commissions. For groundwater, when an aquifer is declared 'overallocated', temporary reduction of existing use rights is implemented annually according to available resources. Reductions are decided by groundwater user associations created for that purpose, in conjunction with river basin authorities (Chapter on Policies). In some cases, the reduction is proportional while in others it is not. For example, in La Puebla-Fuencaliente, after declaration of overexploitation, the same limit has been defined for all users (Berbel et al.; 2018).

In England, many existing licenses did not initially include Hand-Off Flows and some uses have historically been exempt from licensing (see Chapter on permitting regime). For instance, groundwater abstraction primarily used for farming often do not include hands-off flow conditions and are less controlled than surface water sources.

In areas where abstraction was deemed unsustainable, the Environment Agency implemented the Restoring Sustainable Abstraction (RSA) programme from 2008 to 2018. This initiative empowered the Agency to assess, modify, and revoke abstraction licenses that were deemed environmentally harmful. The focus has been on addressing acute over-abstraction issues, particularly prioritizing habitats directive sites. Now nearly completed, the program has changed over 300 abstraction licenses – with a volume of 37 million m^3 of water returned to the environment so far. 80% of the license changes since 2008 have been

voluntary, while the remaining 20% involved some form of financial repayment (Interview English experts, 2024).

In parallel, the Environment Agency has also revoked unused or underused licenses and reviewed time-limited license renewals, 'releasing' 100 million m^3 of water since 2015. Further catchment permit reviews (especially of permanent licenses) are planned from 2028 onwards with a focus on catchment scale sustainability. At that stage, the Environment Agency will have been granted new powers which do not require any financial compensation for revoking licences (Interview English experts, 2024).

Allocations during exceptional circumstances (e.g. droughts)

As discussed in Chapter on Drought management plans, some of the reviewed countries (ES, FR, UK, RO) have adopted DMPs which sets out pre-defined responses to drought situations together with a list of priority uses. SE and FI do not yet have formal DMPs, but their legal framework provides powers to authorities to prioritise certain uses at water shortages. All the reviewed countries except England presents a legal framework with a clear prioritisation of environmental protection and domestic uses such as drinking water, over economic uses (Table 3). The situation in each country is presented below.

Table 3 Order of priority in the event of restrictions due to droughts

Use	FR	England*	SE	FI	ES	RO
Environment	2	1			1	No information available
Domestic water supply	1	2	1	1	1	
Civil safety (hygiene, fire, cooling of nuclear power plants)	1	3	1	2	2	
Energy production (hydropower, cooling water)	3	3	1	3	3	
Agriculture	3	4		3	3	
Industrial	3	4		3	3	

** Not predefined in law or regulations*

In Spain, restrictions from drought management protocols are supplementary to the decisions by water commissions and groundwater user associations (see Chapter on Responsibilities), responding dynamically to meteorological conditions during a drought. The Law also pre-defines which uses take priority over others. Urban water should be fully supplied, so that reservoirs keep a volume equal to three years urban demand 'as safety reserve'. The rest can be used by economic uses (e.g. agriculture, industry). During drought period, economic uses are first restricted, while domestic use and ecological flows are managed and balanced during the drought as first priority uses.

In France, priority allocations between uses are set in the Environmental Code, according to the following: health-related issues and public health first as well as civil safety (including nuclear power stations), then biological functioning of water systems, and finally needs of sectors including agriculture and industry. This prioritisation is further specified in DMPs at the level of each 'departement'. Each of these documents may set out a specific order of priority, but they should be coherent with the principles set nationally and regionally. The prioritisation must indicate which uses are restricted at which crisis level and how. Because drinking water, health and civil safety civil are of the highest priority, restriction over water use may result in not prioritizing ecological flows when reaching the highest crisis levels.

In Sweden, the priority water use is public water supply and any other public needs. The Act Containing Special Provisions concerning Water Operations mandates withholding water for public supply during severe shortages caused by drought or similar circumstances, enforced by fines if necessary (Swedish Parliament, 1998b). This provision, aimed at safeguarding public water supply during disasters, has not

undergone judicial scrutiny. While Sweden historically has not faced water scarcity issues, plans for drought management primarily focus on improving water efficiency through information dissemination.

In Finland, the Water Act places priority on household and community water supply during droughts (Finnish Parliament, 2011; see Textbox 6). Restrictions are decided by the permit authority based on an application filed by the entity that needs water. Legislation specifies the priority order and enables modifying the permits to better respect the circumstances of flooding and droughts. The restrictions that concern existing permits always require a new decision made by the permit authority. If the restriction causes unreasonable loss of a benefit to the owner of the water facility, the permit authority may order the applicant requesting the restriction and others gaining an essential benefit from the restriction to compensate for the loss of benefit.

Textbox 6 Prioritisation of uses during droughts in Finland

In Finland, prioritization of water uses in the Water Act in the following manner:

1) abstraction of water for use in the proximity of the abstraction site for ordinary household use of real estates;
2) abstraction of water for the water supply of the local community;
3) abstraction of water for the use of local industry or otherwise for use in the locality and abstraction of water serving the water supply of a community outside the locality;
4) abstraction of water to be conducted or transported for use elsewhere for a purpose other than supplying water to a community.

The preparatory works explain that this order of precedence was selected to ensure the priority of local water use over water transports (Finnish Government, 2009, p. 81). This order of precedence applies not only to new permits but also to the modification of old permits (Finnish Government, 2009, p. 82).

In England, priority uses are established through Drought Plans and are prioritized according to the magnitude of their environmental impact, water resources benefit, and ease of implementation. There does not appear to be a pre-defined priority order established by legislation or the Environment Agency for different uses of water. Interviewees mentioned that environmental needs usually take precedence, followed by domestic water supply, critical infrastructure like power plants, and then industrial and agricultural uses. However, the allocation may vary based on the specific context of each situation. Restrictions on abstraction are first based on 'hands-off flows', which are usually added as a condition on a license to allow a certain amount of abstraction. For example, the hands-off flow at Q95 means that 10% can be abstracted ("take"). During more severe droughts, drought orders may be issued to establish stricter restrictions during which only drought permits – usually reserved for essential uses such as drinking water – are allowed to abstract (Interview English experts, 2024).

In Romania, no information was available.

Re-allocating between existing users

In the reviewed countries, the exchange of permits between users with or without monetary retribution is not possible. In particular, the trading of water allocations is not possible in France, Sweden, Finland and Romania. Instead, authorities regulate the transfer of water use rights through the issuance, amendments and cancellation of permits, individually with each user.

The right to use water is nevertheless associated with land ownership in most of the reviewed countries (see Chapter on Legislation and Regulation). Hence a change in land ownership is usually associated with an automatic transfer of the abstraction permit. However, this is not necessarily automatic in some countries such as France, where transfer of water permit with a change in land ownership is at the discretion of authorities. Therefore, it is also possible for authorities to annul the permit associated with land ownership.

To facilitate exchange of water between irrigators, and optimise the use of the new collective licence imposed on agricultural water users (Chapter on Policies), French authorities authorise Agricultural Water User Associations (OUGC) to annually transfer allowances between single claimants as long as they collectively meet permit requirements (see Textbox 7).

Textbox 7 Re-allocation between existing claimants in agricultural user associations in France

Irrigators are prohibited from transferring volumes among themselves without obtaining authorization from the Organized User Group for Groundwater Consumption (OUGC). Nevertheless, OUGCs have established protocols for temporarily reallocating water among users. During the irrigation season, if the OUGC anticipates that one or more irrigators will not fully utilize their allocation, it may opt to transfer it to other users. This transfer process is rigorously overseen by the OUGC, following internal regulations, to prevent the emergence of informal water markets. Internal regulations may specify, for example, that unused volume will be prioritized for reallocation to cattle breeders or small-scale farmers. Such regulations are ratified by OUGC members during plenary assemblies.

In Spain, local exchanges of water have historically been possible, albeit with limited transparency and understanding of their impacts. Since the Water Law reform in 1999 (SG, 1999), two legal avenues have been introduced for temporary transfer of water rights. These instruments include the Leasing of Water-use Rights (LWR) for temporary cessions and Centres for Water-use Rights Exchange (CWRE), commonly known as water banks, managed by River Basin Authorities. These mechanisms, primarily utilized during droughts, allow for the temporary or permanent exchange of water rights, facilitating transfers between concessionaires within basins or across demarcations.

Despite their implementation, transactions have been limited, with exchanges typically representing a small fraction of total water use. Most notably, during drought periods, the majority of transactions have been directed towards environmental purposes, indicating a prioritization of mitigating drought impacts on natural ecosystems.

In England, trading of water licenses is possible within the same catchment or groundwater unit (EA, 2014). Rules attached to trading are usually defined by the Environment Agency in the abstraction licensing strategies at the catchment level. Rules may address, for example, the location of abstraction, season, quantity, rate, and purpose. They must ensure that no deterioration to the water body occurs through trading. It has been observed that trading in England has usually occurred within the same surface water body and during the same season, with the same purpose and effect on the water body (Benson et al., 2022). Trading of licenses has never materialized at a large scale in England (Interview English experts, 2024). Trading is most useful during drought periods, to allow a transfer of water from one user with surplus to another user in need. However, the strict constraints on where and how much can be abstracted makes it difficult to change abstraction patterns in a catchment, especially during a drought when restrictions usually affect the whole catchment (Interview English experts, 2024).

Compliance and enforcement

A fair and effective enforcement of collective rules are key in natural resource management (Ostrom, 1990). In addition to who is involved (see Chapter on Responsibilities and involvement of actors), important dimensions include monitoring, reporting and control activities, as well as the penalties used to dissuade non-compliance.

Monitoring, reporting and controls

In France, under the 1992 Water Law, users are required to keep a record of monthly abstraction. Monitoring of other parameters may be required such as the number of pumping hours, use and condition of use, conditions for discharging water and incidents that may have occurred during the pumping operations. Reporting to the regional and departmental services and to river basin authorities is required at the end of each civil year or abstraction season if the nature of abstraction are seasonal (e.g. irrigation). However, many wells and abstraction points are not known. Controls by the Water Police are carried out as a priority on watersheds where flows are low and subject to significant anthropogenic pressure. Despite information and awareness-raising actions, violations of the law or regulations may be noted and give rise to administrative or legal action. Controls concerning quantitative water management ensure in particular: compliance with restrictive measures; holding a pumping authorization; meter equipment allowing samples to be monitored; compliance with e-flows downstream of the reservoirs.

In Spain, concession holders and holders of private water rights are required to monitor their use, but reporting of use to authorities is not required except by large users. Some arrangements may require reporting by all users, for instance when a groundwater user association is established. River basin authorities hold extensive real-time surveillance programmes of river flows and groundwater levels, monitoring the releases, diversions and abstraction of water across river basins. However, there remains a significant amount of illegal abstraction, in particular in groundwater bodies, where users do not register or monitor adequately their water use, or do not abide to the conditions of their concessions or private right (Schmidt et al., 2020). Nevertheless, endeavors are underway to enhance monitoring capabilities, including the allocation of funds from the Next Generation EU program for this purpose (Interview Spanish expert, 2024).

In Sweden, there are various compilations of water abstraction, both statistically registers can be available at national, water district, and county levels (SCB), but information is also available based on, for example, land use, and locally in water extraction permits. The operators of water operations such as hydropower, are obliged to conduct self-monitoring of abstraction and the risk posed to human health and the environment. Based on the self-monitoring obligation, the operator needs to continually and systematically investigate, assess and document the risks of the activity from a health and environmental point of view. If an operational disruption or similar event occurs in the activity that may lead to nuisance human health or the environment, the operator shall immediately inform the supervisory authority of this (Swedish Parliament, 1998c).

In Finland, the permit decision contains a monitoring obligation, which obliges the permit holder to monitor the implementation of the project and its impacts. Under the permit, the permit holder may be obliged to present a monitoring plan concerning the organization of monitoring, and the authority that accepts the plan may amend it regardless of the validity of the permit (Finnish Parliament, 2011). Water abstraction data is reported by waterworks managers and industries to national databases, but often only annual data is available. Data on small scale irrigation is not available (no permits required when the individual impact of the scheme is not significant). No knowledge or data on return flows.

In England, flows and abstraction are not monitored in every water body. Rather, government agencies have gauging stations at certain points in river basins (Assessment Points) and use hydrological models to interpret what is taking place between these stations. These models can cover an entire catchment and

identify where there is a depleted reach or where e-flows are not being met, and decide how to address the situation. Similarly, groundwater levels are also monitored and compared against abstraction licenses to identify where e.g. over-abstraction may be occurring. Moreover, active environmental groups (Rivers Trust, WWF, etc.) provide valuable feedback, contributing to effective monitoring and management practices. Emphasis now is on developing on smart metering and real-time telemetry, in particular in agricultural catchments, to improve compliance monitoring (Interview English experts, 2024).

In Romania, no information was available.

Sanctions for non-compliance

In France, the State is in charge of enforcing fines when users do not comply with their allocation. Most sanctions fall under the administrative sanction, and rarely do sanctions proceed to penal cases. Some agricultural water user associations have started to implement sanctions on irrigators failing to report water use information.

In Spain, RBAs can apply sanctions and even the cancelation of permit. Water Agency initiates administrative process but usually it ends in Courts. Normally sanctions are administrative fines, but they become penal, including imprisonment, in cases where the volume of the violation is high, the user is engaging in repeated offenses or there is a serious environmental impact.

In Sweden, according to the Environment Code, authorities may issue an injunction if a permit holder disregards a condition set out in the permit or otherwise breaches environmental legislation (Swedish Parliament, 1998a). Injunctions may differ, e.g. ordering the permit holder to follow the permit conditions, to submit information for supervisory purposes or to prepare an investigative report concerning the activity and its environmental impact. An injunction may also order the permit holder to cease operations or to prohibit an operator from starting a specific operation. Supervisory authority may also attach a fine to an injunction to enhance compliance with it. The authority can then submit an application to the Land and Environment Court to impose the fine through its ruling.

The fine is a special environmental sanction charge to the operator. Such a charge must amount to a minimum of SEK 1,000 and a maximum of SEK 1,000,000. The permit authority may also withdraw the permit either entirely or partially and prohibit further activity or revise it. When a crime has occurred, environmental penal provisions are also possible in the Environmental Code. The penalties range from fines to imprisonment for up to six years.

The SEPA report (SEPA, 2017) explains the relationship between administrative sanctions (e.g. injunction and environmental sanction charges) and criminal offences by noting that the former relate to operators of activities as natural/legal persons and the latter always to natural persons “either in the capacity of direct offender or as the representative of a legal person within whose operations the offence has occurred.

In Finland, a difference is made between administrative enforcement proceedings and criminal offences. Administrative enforcement proceedings focus on stopping the prohibited activity, order the user to fulfil its obligations or rectify it. Criminal offences are conducted on users who, intentionally or through gross negligence, degrade the environment. They consist in a fine or imprisonment up to six years. Illegal abstractions are generally sanctioned through a fine.

In England, violations of permits may lead to enforcement measures, with the Environment Agency pursuing an approach of ‘outcome-focused enforcement’ (EA, 2019). The array of enforcement interventions begins with (i) providing advice and guidance to suspected violators to encourage behavioural change, progressing to (ii) issuing warnings, (iii) serving enforcement notices, (iv) applying civil sanctions, and ultimately (v) initiating criminal proceedings. For minor breaches, fixed monetary penalties may be imposed, while more serious offenses could result in variable monetary penalties. Severe infringements may lead to criminal proceedings, potentially culminating in fines or imprisonment. Additionally,

compliance can be reinforced through alignment with other government policies, such as cross-compliance conditions for accessing government funding (Benson et al., 2022).

In Romania, no information was available.

Discussion

Despite the unifying WFD, approaches to water allocation differ widely in Europe, with countries presenting more or less advanced frameworks for regulating access, use and sharing of water. The previous chapters provided a descriptive account of national approaches. The following paragraphs aim to highlight a number of national implementation challenges observed in the reviewed countries as well as some reflection on the priorities that could be sought at European level to support the consolidation of allocation regimes across the continent.

National level challenges

The following discussion presents a series of challenges identified, classified according five aggregated themes: the level of institutional development around rules for water allocations, the scope of regulatory powers entrusted to public authorities over water allocation decisions, the role of stakeholder engagement and of wider social factors, compliance and enforcement arrangements and remaining scientific and technical barriers to water allocation. The points highlighted do not aim to be exhaustive but aim to reveal the most salient points identified in the review of the GOVAQUA participating countries.

Institutional development

At the policy level, **the development of a comprehensive regulatory and planning framework is essential for effective water allocation**. From the six reviewed countries, a clear progression in institutional development is evident across Europe. Countries with a longer history of water scarcity and droughts, like Spain and France, or with high abstraction pressure due to population density such as England, have institutionalized more formal practices for water allocation. They include various aspects such as permitting regimes to regulate access to and use of water resources, drought planning and preparedness, and more importantly river basin planning approaches to establish environmental flows and sectoral priorities, assess water balances and strategies that aim to address overallocation. In these three countries, river basin allocation planning (Speed et al., 2013) is a central instrument to reduce abstraction pressures and improve hydrological and morphological quality elements in view of achieving the WFD targets.

In contrast, countries like Finland and Sweden primarily rely on the permitting regime to control water abstraction, with limited consideration of basin-wide needs. Environmental requirements may be defined when issuing the permit, but a formal process for reviewing permits according to e.g. updated water balances or revised water use priorities is lacking. Drought procedures focus on emergency decisions and preparedness, and are not as formalized (planned) as in Spain, France and England. Overall, Finland and Sweden lack a supporting policy and regulatory framework for basin wide allocation planning and drought restrictions. This can represent a barrier for further implementation of water allocation policies supporting the achievement of the WFD.

Progress in regulating surface water and groundwater allocations holistically is mixed. All the reviewed countries do consider, when issuing groundwater permits, the impact of abstraction on connected surface waters (e.g. alluvial aquifers and rivers, groundwater levels and wetlands). Furthermore, pilots and projects on managed aquifer recharge (where 'excess' surface water is used to recharge groundwater) exist in several reviewed countries. Few examples exist however on more active coordinated use of surface water and groundwater, optimizing allocations according to water availability with the intention to increase

security of supply of all users while minimizing environmental impact (e.g. in a form of 'conjunctive' use, see UNESCO, 2019). Examples include the protection of aquifers of strategic importance in France and Germany which involves substituting groundwater abstraction to surface water to preserve groundwater for emergency crisis or future generations (Hérivaux and Rinaudo, 2016), and, increasingly so, collective efforts in agriculture user associations to adapt to environmental constraints (Rouillard and Rinaudo, 2020). Establishing such unified allocation regime across surface and groundwater can challenging due to physical, technical, economic, political and legal constraints (Lund, 2020).

Finally, **the reviewed countries only regulate water abstraction and not water consumption** (i.e. net water use after water losses are accounted for). This can be an issue when water losses are addressed through water efficiency programmes, thereby reducing water lost to the environment through leakage or evapotranspiration (e.g. in irrigated agriculture). Although beneficial in terms of promoting a rational use of water, reducing water losses can unintendedly reduce soil infiltration, groundwater recharge and return flows to surface water bodies (Dumont et al., 2013). More robust allocation systems should therefore not only establish controls on water abstraction levels, but also on discharge quantities, water consumption and water losses (GWP, 2019).

Regulatory powers

When countries move to 'closing' access to water resources due to issues of overallocation, this has usually resulted in 'grandfathering' existing water uses and limiting the issuance of new permits – thereby benefiting historical water users (see also Rouillard et al., 2021). However, with growing scarcity and drought impacts, there are challenges with balancing water needs of a broad range of public and private interests and societal priorities around water. **A key challenge therefore lies in the capacity of authorities to modify or revoke water permits, or facilitate their reallocation**, in order to adapt to new knowledge, conditions, and societal priorities.

In the reviewed countries, the timespan of permits ranges from 12 years (England), 20-75 years (France, Spain), and even broadly unlimited (Sweden). Unlimited or very long permits can lock the system into unsustainable practices, while short permits offer greater adaptability but could discourage investments with longer time horizons, such as hydroelectric and water supply infrastructure or other means of economic production (e.g. development of water dependent industries) (OECD, 2015; GWP, 2019). The key challenge is therefore to set a permit duration that offers a sufficient security of tenure by users to enable private investments, while providing sufficient powers to authorities to amend or revoke permits in case of needs.

Authorities in the six countries reviewed have very different powers to review and modify existing permits. In some countries, such as England, France and to a more limited extent Spain, the State has extensive powers to amend or even revoke running permits without compensation. However, it has proved challenging to execute these powers due to strong opposition of water users. To date, most changes to permits in these three countries have focused on revoking unused permits and amending used permits according to actual use or an improvement in the rational use of water. In England, the government has introduced new regulations in 2017 to strengthen the ability of the Environment Agency to adjust and revoke licenses according to ecological flow requirements.

The transfer of allocation between users is primarily orchestrated by authorities through permitting. However, this creates a heavy administrative burden on authorities especially in catchments where hundreds if not thousands of permits must be managed. This can lead to a lack of flexibility in water reallocations, lack of attention to local contexts and needs, potentially resulting in outcomes that are suboptimal or inequitable (Berbel, 2018a; 2018b). Some of the reviewed countries have adopted other forms of reallocations, such as water trading in Spain and the UK, and user-based reallocations in France – with varying degrees of success (see Benson et al., 2022; Rouillard and Rinaudo, 2022; Sanchis-Ibor et al., 2022).

Another challenge regarding regulatory powers relate to exemptions to permitting. The reviewed countries all present exemptions to permitting. For instance, in England, certain historical abstractions have until recently been lawfully exempt from licensing control, meaning that these users could abstract unlimited supplies of water even in areas that are water stressed. More frequently, exempt users include domestic users and small water users. The reason for exempting smaller users relates to the excessive administrative burden that would result from regulating all abstractions. However, interviews indicate the exemptions have disadvantages. They can limit the effectiveness of permitting in protecting freshwater ecosystems, hinder the legitimacy of allocation regimes, and create inequalities between users. To overcome the administrative burden of licensing all abstraction while keeping track of small and domestic abstraction, France has established two types of permits – a notification whereby the user is allowed to abstract once it notifies the local authority of its domestic or small abstraction, and an authorization which requires approval by state authorities.

Stakeholder engagement and social dimension

A key challenge accompanying water allocation reform is entrenched habits in water use and the belief of unlimited supply (e.g. through the possibility to increase supply through technology and infrastructure). As a result, there is a significant lack of attention by economic sectors and investment policies to existing patterns of water availability and security of supply in catchments and river basins. This is particularly important, but not limited, to northern countries. For instance, in England, public awareness about water conservation and sustainability remains relatively low, highlighting the need for increased education and awareness campaigns (Interview English experts, 2024). Reforming water allocations ultimately requires changing cultural and social norms and promoting a 'water saving and sharing' culture.

Addressing these challenges requires attention on how to communicate and raise awareness of the social value of preserving water resources and the negative long-term impacts of uncontrolled use and free-riding. It also requires providing the right signals, through permits and eventually prices, on the scarcity and variability of the availability of water resources. In addition, it requires a strong link between investment and economic sector development policies and water allocation policies. In none of the reviewed countries were such approaches strongly promoted.

Aligning long term allocations (permits) with societal goals requires procedures to support legitimate and transparent decisions over water reallocations. This should involve assessing the impact and trade-offs of reallocating water between different uses, considering not just the economic costs, but also the broader social and environmental benefits of various allocation options. **In the reviewed countries, stakeholder engagement on water (re)allocation is either inexistant or very limited**. Sweden, Finland and England currently lack formal procedures for stakeholder involvement in allocations, while France has nascent ones and Spain presents a very institutionalized approach. In Spain, the composition of existing participatory fora strongly favour representation of irrigation and other major water users, to the detriment of environmental interests, fisheries, tourism (bathing, watersports) and navigation. This situation reflects the situation in other European countries (Rouillard and Schmidt, 2024).

Efforts in some countries are ongoing to broaden the range of users involved in quantitative water management. In England, a second round of regional plans are being developed aimed at long-term water demand assessment across five regions. Unlike the previous plans focusing solely on public water supply and environmental needs, the new approach includes considerations for aquaculture and energy sectors as well. This shift aims to promote cross-sectoral planning, ensuring that water infrastructure projects like desalination plants or reservoirs cater to multiple sectors' needs such as public water supply and energy production. The regional planning approach involves forecasting future demands, considering factors like population growth, leakage in distribution networks, climate, etc., to guide infrastructure investments over a 50 to 80-year timeline.

Compliance and enforcement

The reviewed countries commonly report major challenges regarding the monitoring water allocations. Metering of abstraction is compulsory under the WFD, and the legal and policy standards of the reviewed countries usually place a responsibility on the user to appropriately monitor and record its water use, including any incident that may have occurred, and have it available during inspections by the regulator. Countries report challenges in adequately resourcing regulatory authorities to monitor all abstraction points and follow up cases of illegal water use. This issue was strongly shared in Spain where illegal groundwater abstraction is a major challenge (Interview Spanish expert, 2024). The problem is exacerbated by the limited use of available technologies, such as ICT and satellite technologies, which could enhance compliance monitoring but are not fully utilized (Schmidt et al., 2020).

Although pilots exist, none of the countries have yet systematised the use of real-time metering of abstraction. Spain and France have programmes to consolidate approaches to monitoring water use. In France, the recent national policy strategy aims to generalise the use of tele-metering which automatically shares abstraction data in real time.

Many Member States also struggle with implementing appropriate compliance mechanisms, particularly regarding permit conditions. Penalties for non-compliance are often inadequate and fail to deter illegal activities effectively. In many cases, the benefits of transgression outweigh the penalties imposed. Strengthening penalties is deemed necessary in several Member States, including France, Spain, and England, to improve compliance. In Spain, illegal abstraction is controlled and prosecuted in certain "hot spots," but overall monitoring remains inadequate due to authorities' lack of resources and capacity (Schmidt et al, 2020).

Scientific and technical challenges

Reforming water allocations involves addressing significant scientific challenges, particularly in defining global extraction limits and assessing their impacts on water resources. There are considerable uncertainties associated with the spatial and temporal variability of climatic and environmental conditions and the complexity of interactions between surface and groundwater resources (Molle, 2023). Consequently, controversies arise among stakeholders who contest scientific assumptions that may serve their own interests. Transparency and participation are essential to ensure that the extraction limit imposed on users is perceived as technically and scientifically sound, despite remaining uncertainties.

Water balance methods vary greatly between countries, despite EU guidance. Authorities may lack the necessary decision-support tools, knowledge, information, and data to assess the impact of different allocation scenarios on river basin and catchment water balances, as well as reaching e-flows and maintaining the good status of individual water bodies. For example, in some countries like Sweden and Finland, there is incomplete scientific knowledge about the allocable pool, with insufficient information on total allocable resources and the impacts of certain water abstractions. Similarly, in Spain and England, there is a lack of adequate decision-making support tools and monitoring systems, particularly for groundwater management.

EU level challenges

With growing scarcity and droughts across the continent, European countries will need to develop a level playing field with regards to the exploitation of their water resources and addressing impacts of abstraction on ecosystems. The WFD provides a starting point for developing a common baseline and requirements, but a lack of attention to the issue of water scarcity and drought in policy development and expert exchange in the Common Implementation Strategy since the enactment of the WFD means that current approaches remain heterogenous. The following presents, on the one hand, areas which would require

further development to establish common standards and harmonise approaches, and on the other, areas for which good practice can be shared.

Developing common standards

Common standards are essential to ensure European countries implement a coherent protection of their freshwater resources, ensure a rational and socially just exploitation of water, and establish an equitable and fair level playing field for their water-using industry (e.g. energy production, irrigated agriculture). Although not exhaustive, the list below aims to highlight areas where countries may benefit from a more common understanding and where possible more comparable regulatory approach. These include:

- To further develop a common understanding and definitions of key terms including e.g. allocations, water 'use' rights, entitlements, water scarcity, droughts, overallocation, over abstraction, consumptive and non-consumptive use
- To clarify the role and scope of permitting, river basin allocation planning and drought planning in the implementation of the environmental objectives of the WFD and building resilience for water uses
- To further harmonise thresholds for hydrological quality elements for surface water and groundwater, and define criteria and targets for the definition of comparable e-flows standards
- To homogenise approaches to permitting of water uses - including the assessments and mitigation of the impacts of abstraction, storage and diversion infrastructure; the permitting of small abstraction; etc
- To establish comparable triggers for drought restrictions, comparable drought restrictions and rules for prioritisation and exemptions

Exploring good practices

Beyond the importance of having common standards to ensure an equitable implementation of EU law, much can be learned from national experiences in the implementation of water allocation regimes and shared for mutual learning in the European fora.

Based on the common challenges identified above, the list below is an attempt at identifying areas where such an exchange could be beneficial:

- Methodologies for holistic water balances and set targets for quantitative water management
- Approaches to just, fair and meaningful stakeholder engagement in different stages of water allocation (permitting stage, river basin planning, drought planning)
- Mechanisms to facilitate the transfer of water allocations in a socially equitable, economically sound and environmental effective way
- Strategies to modify permit conditions, including justifications and legal ground for state intervention on amending and revoking permits
- Strategies to enhance sustainability of water using sectors, reducing water demand to match available resources, adapting practices and the transformation of economic sectors
- Plans and policies to enhance the integrated management of surface water and groundwater resources, including through groundwater recharge, to minimise environmental impacts and increase security of supply and water resilience of society and economic sectors
- Technological, social and regulatory strategies for effective monitoring and enforcement of water allocation policies and permit conditions

Conclusions

European countries present varying degrees of complexity and formalisation with regards to institutions for water allocation. While permitting regimes and drought management planning are advanced across all studied countries, river basin planning of water allocation is non-existent in Finland and Sweden, nascent in France and England, and more formalised in Spain. There are shared weaknesses in the coordination of responses to water scarcity vs. drought conditions, and incomplete provisions for an integrated management of surface water and groundwater. The reviewed countries also present limited powers to modify permits according to water availability conditions, and to facilitate the transfer of water use rights to limit the social and economic impact of a stricter regulation of water abstraction. Major challenges exist in transforming society and economic sectors towards a water saving culture, especially in the countries and regions with higher water scarcity or exposure to droughts. Stakeholder engagement could be further institutionalised in different steps of the regulatory framework for permitting, planning and enforcing water allocations. Monitoring programmes need to be further supported as well as processes for sanctions and compliance control, as well as scientific knowledge and tools for water allocation planning.

The description and assessment of key characteristics of legal and regulatory frameworks of water allocation in six European countries in this report will be used as a starting point to extract research questions for more in-depth analysis of policy instruments for the design and implementation of water allocation in the GOVAQUA good practice inventory. Potential questions for the next steps of research on legal and regulatory instruments for water allocation include the following, with indications of potential good practice approaches from the countries studied:

- How can water use rights be made more flexible to deal with climate variability and change , while providing sufficient visibility to water users?
  - Changes in regulatory powers were adopted in England to facilitate adoption of changes to permit conditions
  - In Spain, specific conditions exist for revising concessions. More could be learned on the exercise of these powers
  - In France, the adoption of water balances usually leads to a revision of permit conditions. More could be learned from these initiatives
- How can allocation regimes support conjunctive management of surface and groundwater resources?
  - Spain and France have developed groundwater recharge programmes. More could be learned from their governance
- What strategies exist for reducing the impacts of implementing restrictions on water use of economic sectors and reallocating water to the environment?
  - In Spain, water banks have been adopted to help authorities buy concessions for environmental purposes
  - In France, plans and strategies for quantitative water management have been adopted, taking a holistic approach between demand and supply. More could be learned from the governance and planning of these strategies
  - In France, agricultural user associations can reallocate water as long as the requirements of the collective permit is met. More could be learned from the strategies for reallocating water within these organisations
- What arrangements support a more effective enforcement of water allocation decisions?
  - In Spain, several programmes have been put in place to reduce illegal abstraction. A review of these programmes and lessons learned could be carried out
  - In France, agricultural user associations may have established a system of recording and control in the use of water by individual irrigators

Further work in WP2 of GOVAQUA will explore, document and assess selected good practice approaches.

References

AELB (2022). Analyses Hydrologie-Milieux-Usages-Climat (HMUC) – Guide et recommandations méthodologiques. Agence de l'Eau Loire Bretagne, 64pp.

Ahopelto, L. (2024). Kuivuusriskien hallinnan kansalliset suuntaviivat. Lausuntoluonnos 13.5.2024. Maa- ja metsätalousministeriö. Available at: https://www.lausuntopalvelu.fi/FI/Proposal/Participation?proposalId=9402de00-687f-431c-9f77-c3c71864c076&proposalLanguage=da4408c3-39e4-4f5a-84db-84481bafc744 (3.6.2024)

Benson, D., Cook, H., Ak, M. Y., Demirbilek, B. (2022). England and Wales: countering 'unsustainable abstraction' with the catchment based approach. In Rouillard, J., Babbitt, C., Challies, E., Rinaudo, J. (Eds.) Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access. London: IWA Publishing. ISBN: 9781789062793

Berbel, J. & Gutiérrez-Martín, C. (2017). Efectos de la modernización de regadíos en España. Cajamar Caja Rural, Almería

Berbel, J., Expósito, A., & Borrego-Marín, M. M. (2018). Conciliation of competing uses and stakeholder rights to groundwater: an evaluation of Fuencaliente Aquifer (Spain). International Journal of Water Resources Development.

Berbel, J., Schellekens, J., Expósito, A., Borrego, M.M., Montilla-López, N. (2018a). Review of alternative water allocation options. Deliverable to Task A4B of the BLUE2 project "Study on EU integrated policy assessment for the freshwater and marine environment, on the economic benefits of EU water policy and on the costs of its non-implementation". Report to Directorate General for the Environment of the European Commission.

Berbel, J., Schellekens, J., Expósito, A., Borrego, M.M., Montilla-López, N. (2018b). Review of alternative water allocation options – Annex Report. Task A4B of the BLUE2 project "Study on EU integrated policy assessment for the freshwater and marine environment, on the economic benefits of EU water policy and on the costs of its non- implementation. Report to Directorate General for the Environment of the European Commission.

Buchanan, L., Cherrier, V., Whiting, R., Whitfield, G., Roy, S., Strosser, P., de Paoli, G., van Duinen, R., Delacámara, G., Psomas, A., Sorensen, M.M., Farmer, A. (2019). Integrated Assessment of the 2nd River Basin Management Plans: EU-wide storyline report. European Commission. Doi :10.2779/640259

Caixa Bank Research (2024). The use of water in agriculture: making progress in modernising irrigation and efficient water management (caixabankresearch.com). Visited 11/06/2024.

CGEDD-CGAAER (2020). Bilan du dispositif des organismes uniques de gestion collective (OUGC) des prélèvements d'eau pour l'irrigation. Mission CGEDD n° 13017-01 – CGAAER n° 19089. MTE-MAA (Ministère de la Transition Écologique et Ministère de l'Agriculture et de l'Alimentation)

Climate-Adapt (2024). Country Profiles (europa.eu) . Visited 11/06/2024

CIS (2006). Water scarcity management in the context of the WFD. MED Joint Process WFD /EUWI.

Defra (2011). Water for Life. ISBN 9780101823029. Available at: https://assets.publishing.service.gov.uk/media/5a7c7b64e5274a559005a299/8230.pdf

Defra (2017). Water Abstraction Plan. Available at: https://www.gov.uk/government/publications/water-abstraction-plan-2017

Defra (2023). Plan for Water. Available at: https://www.gov.uk/government/publications/plan-for-water-our-integrated-plan-for-delivering-clean-and-plentiful-water/plan-for-water-our-integrated-plan-for-delivering-clean-and-plentiful-water

Dumont, A., et al., 2013, 'Is the rebound effect or Jevons Paradox a useful concept for better management of water resources? Insights from the irrigation 48odernization process in Spain', Aquatic Procedia 1, pp. 64-76 (DOI: https://doi.org/10.1016/j.aqpro.2013.07.006).

EA (Environment Agency) (2007). Hydrogeological impact appraisal for groundwater abstractions. Available at: https://assets.publishing.service.gov.uk/media/5a7c4eade5274a2041cf31ec/scho0407bmah-e-e.pdf

EA (Environment Agency) (2013). North Kent % Swale Abstraction Licensing Strategy. Available at: https://assets.publishing.service.gov.uk/media/5a7c18dae5274a1f5cc75c3b/LIT_1815_765a21.pdf

EA (Environment Agency) (2014). Guidance: Apply for a water abstraction or impounding license. Available at: https://www.gov.uk/guidance/water-management-apply-for-a-water-abstraction-or-impoundment-licence

EA (Environment Agency) (2017). Drought response: our framework for England. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625006/LIT_10104.pdf

EA (Environment Agency) (2020). Meeting our Future Water Needs: a National Framework for Water Resources. Available at:

https://assets.publishing.service.gov.uk/media/5e70c2c4e90e070acfef5077/National_Framework_for_water_resources_summary.pdf
EA (Environment Agency) (2020b). Water resources national framework. Appendix 4: Longer term environmental water needs. Available at: https://assets.publishing.service.gov.uk/media/5e6a5f6086650c727adb438f/Appendix_4_Longer_term_environmental_water_needs.pdf
EA (Environment Agency) (2022). River basin management plans, updated 2022: record of consultation and engagement. Available at: https://www.gov.uk/government/publications/river-basin-management-plans-updated-2022-record-of-consultation-and-engagement/river-basin-management-plans-updated-2022-record-of-consultation-and-engagement
EA (Environment Agency). (2019). Environment Agency Enforcement and Sanctions Policy. Environment Agency, Bristol, UK.
EC (2006). Water scarcity management in the context of the EU WFD. Water scarcity drafting group, Common Implementation Strategy, MED Joint Process WFD/EUWI. SCG agenda point 8b, WGB/15160506/25d.
EC (2008). Drought management plan report. Water Scarcity and Drought Expert Network. Technical report 2008 - 023
EC (2012). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Report on the Review of the European Water Scarcity and Droughts Policy.
EC (2015). Ecological flows in the implementation of the Water Framework Directive. Guidance Document No. 31. European Commission. doi: 10.2779/775712
EC (2019). REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC): Second River Basin Management Plans; First Flood Risk Management Plans.
EC (2021a). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change.
EC (2021b). EU biodiversity strategy for 2030 : bringing nature back into our lives, Publications Office of the European Union. https://data.europa.eu/doi/10.2779/677548EC (2023). Mapping and analysis of CAP Strategic Plans. Assessment of Joint Efforts 2023-2027. doi: 10.2762/71556
Estrela, T., and Sancho, T. A. (2016). Drought management policies in Spain and the European Union: From traditional emergency actions to Drought Management Plans. Water Policy, 18(S2), 153-176.
Figureau, 2012 Gestion quantitative de l'eau d'irrigation en France : bilan de l'application de la loi sur l'eau et les milieux aquatiques de 2006. Avec la collaboration de Montginoul, M. et Rinaudo JD. BRGM/RP-61626-FR
Finnish Government (2009). Government proposal to Parliament concerning new water legislation. Hallituksen esitys Eduskunnalle vesilainsäädännön uudistamiseksi, HE 277/2009 vp.
Finnish Government (2011). Water Decree. Valtioneuvoston asetus vesitalousasioista (1560/2011).
Finnish Parliament (2011). Water Act. Vesilaki (587/2011).
Finnish Parliament (2004). Act on the Organisation of River Basin Management and the Marine Strategy. Laki vesienhoidon ja merenhoidon järjestämisestä (1299/2004).
GWP (Global Water Partnership) (2019). Sharing water: The role of robust water-sharing arrangements in integrated water resources management. Perspectives paper.
Hérivaux, C., and Rinaudo, J.D., 2016, *Pourquoi et comment préserver les eaux souterraines pour leur rôle d'assurance? Tour d'horizon de l'expérience française*, Rapport final. BRGM/RP-65631-FR, pp. 60
Interview English experts (2024). Two national civil servants on water regulation and eflows. Interview carried out in first half of 2024. P
Interview Spanish expert (2024). One national expert on water regulation and management. Interview carried out in first half 2024.
Kampa, E. Tarpey, J., Rouillard, J., Bakken, T. H., Stein, U., Godinho, F. N., Leitão, A. E., Portela, M. M., Courret, D., Sanz-Ronda, F.J., Boes, R., and A. Odelberg (2017). Technical Deliverable 5.1. Review of policy requirements and financing instruments. H2020 project FIThydro Fishfriendly Innovative Technologies for Hydropower.
Llamas, M. R., Custodio, E., De la Hera, A., & Fornés, J. M. (2015). Groundwater in Spain: increasing role, evolution, present and future. Environmental Earth Sciences, 73, 2567-2578.
Lucavetchi, E (2007). Case study on the Right to Water and Sanitation in Romania. Workshop on equitable access to water, July 5-6, 2007, Paris
Lund, J. (2020). Conjunctive Use of Surface and Groundwaters with California Examples, 2020 presentation
Land and Water Forum (2012). Third Report of the Land and Water Forum. Managing Water Quality and Allocating Water. New Zealand, October 2012
Michanek, G. and Zetterberg, C. (2021). Den svenska miljörätten. Iustus.

Molle, F. (2023). Aquifer Recharge and Overexploitation: The Need for a New Storyline. Groundwater 61 (3). (10.1111/gwat.13299).
MTE (Ministère de la Transition Écologique) (2021). Guide de mise en œuvre des mesures de restriction des usages de l'eau en période de sècheresse
MTECT (Ministère de la Transition Ecologique et de la Cohésion des Territoires) (2023). Guide d'élaboration et de mise en œuvre des Projets de Territoire pour la Gestion de l'Eau, à destination des porteurs de projets et des acteurs de la démarche. République Française, 99p
OECD (2015). Water Resources Allocation: Sharing Risks and Opportunities, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264229631-en
Parjanne, A., Ahopelto, L., and Parkkila, P. (2020). Ohjeita kuivuusriskien hallintasuunnitelman laadintaan. Available at <https://www.ely-keskus.fi/documents/10191/46616838/Ohjeita+kuivuusriskien+hallintasuunnitelman+laadintaan_14_12_2020.pdf/ef44b6d0-bd08-a1f7-393b-48a9bfb74808?t=1651245592182>. (Parjanne, Ahopelto and Parkkila 2020a)
Parjanne, A., Ahopelto, L., and Parkkila, P. (2020). Sirppujoen vesistöalueen kuivuusriskien hallintasuunnitelma. Available at <https://vesi.fi/aineistopankki/sirppujoen-vesistoalueen-kuivuusriskien-hallintasuunnitelma/>. (Parjanne, Ahopelto and Parkkila 2020b)
Pascu, A., and Savastre, A. (2020). An overview of water recent updates in Romania. MPR partners. Available at: https://www.lexology.com/library/detail.aspx?g=a236ac80-f428-4d3b-8a91-8fc25a4f3aad
Platon, V. and Constantinescu, A. (2018) Water resources in romania during 1945-1989. Romanian Journal of Economics, 47, 20-33.
RF (République Francaise) (1964). Water law. Loi n° 64-1245 du 16 décembre 1964 relative au régime et à la répartition des eaux et à la lutte contre leur pollution
RF (République Francaise) (1984). Water law. Loi n°84-512 du 29 juin 1984 relative à la pêche en eau douce et à la gestion des ressources piscicoles
RF (République Francaise) (1992). Water law. Loi n° 92-3 du 3 janvier 1992 sur l'eau » and the « Loi n° 2006-1772 du 30 décembre 2006 sur l'eau et les milieux aquatiques
RF (République Francaise) (2006). Water law. Loi n° 2006-1772 du 30 décembre 2006 sur l'eau et les milieux aquatiques
RF (République Francaise) (2007). Décret n°2007-1381 du 24 septembre 2007 relatif à l'organisme unique chargé de la gestion collective des prélèvements d'eau pour l'irrigation et modifiant le code de l'environnement
RF (République Francaise) (2010) Loi n° 2010-788 du 12 juillet 2010 portant engagement national pour l'environnement (loi ENE, dite Loi Grenelle II.
RF (République Francaise) (2011). Circulaire du 18 mai 2011 relative aux mesures exceptionnelles de limitation ou de suspension des usages de l'eau en période de sécheresse
RF (République Francaise) (2019). Instruction du Gouvernement du 7 mai 2019 relative au projet de territoire pour la gestion de l'eau.
RF (République Francaise) (2021). Décret no 2021-795 relatif à la gestion quantitative de la ressource en eau et à la gestion des situations de crise liées à la sécheresse
RF (République Francaise) (2023). Instruction du 17 janvier 2023 portant additif à l'instruction du Gouvernement du 07 mai 2019 relative au projet de territoire pour la gestion de l'eau
RF (République Francaise) (2024). Protection de la ressource en eau.
RG (Romanian Government) (1953). Decret 143/1953 din 4 aprilie 1953 privind folosirea raţională, amenajarea şi protecţia apelor.
RG (Romanian Government) (1974). Lege 8 din 29 martie 1974 legea apelor
RG (Romanian Government) (1996). Law 107/1996
RG (Romanian Government) (2004). Law 310/2004
RG (Romanian Government) (2006a) Order no 9 from 6.01.2006.
RG (Romanian Government) (2006b). Lege 112/2006 din 4 mai 2006 pentru modificarea şi completarea Legii apelor nr. 107/1996
RG (Romanian Government) (2007). National Strategy for reduction of the effects of droughts on short-, medium-, and long-term. Bucharest, Official Gazzette no 565/2007.
RG (Romanian Government) (2020). Lege 122/2020 amending and supplementing the Water Law (No. 122/2020)
RG (Romanian Government) (2023). Strategia Națională pentru gospodarirea apelor România 2023-2035.
Rouillard, J. & Rinaudo, JD (2020) "From State to user-based water allocations: An empirical analysis of institutions developed by agricultural user associations in France," Agricultural Water Management, Elsevier, vol. 239(C).
Rouillard, J. and Rinaudo, J.D. (2022). Managing a common resource in agriculture: an overview of the French nested water allocation system. In Rouillard et al., Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access. IWA Publishing. DOI: https://doi. org/10.2166/9781789062786_0093.

Rouillard, J. and Schmidt, G. (2024). Implementation of water allocation in the EU. Developed under the Framework Contract 'Water for the Green Deal' - Implementation and development of the EU water and marine policies (09020200/2022/869340/SFRA/ENV.C.1).
Sanchis-Ibor, C., Pulido-Velazquez, M., Valero de Palma, J., García-Mollá, M. (2022). Water allocation in Spain. Legal framework, instruments and emerging debates. In Rouillard et al., Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access. IWA Publishing. DOI: https://doi.org/10.2166/9781789062786_0093.
Schmidt, 2024. Final report on the implementation of water balances in the EU. 09020200/2022/869340/SFRA/ENV.C.1. European Commission
Schmidt, G. et al. (2023). Stock-taking analysis and outlook of drought policies, planning and management in EU Member States. Final report under contract "Technical and scientific support to the European Drought Observatory (EDO) for Resilience and Adaptation - Lot 2: In-depth assessment of drought management plans and a report on climate adaptation actions against drought in different sectors" (ENV/2021/OP/0009) for the European Commission, Directorate-General for Environment
Schmidt, G., De Stefano, L., Bea, M., Carmody, E., van Dyk, G., Fernandez-Lop, A., Fuentelsaz, F., Hatcher, C., Hernandez, E., O'Donnell, E., Rouillard, J.J. (2020). How to tackle illegal water abstractions? Taking stock of experience and lessons learned. Fundacion Botin. https://www.fundacionbotin.org/89dguuytdfr276ed_uploads/Observatorio%20Tendencias/How%20to...ok_enlaces.pdf
SG (Spanish Government) (1985). Water law. Ley 29/1985, de 2 de agosto, de Aguas.
SG (Spanish Government) (1999). Water law. Ley 46/1999, de 13 de diciembre, de modificación de la Ley 29/1985, de 2 de agosto, de Aguas
SG (Spanish Government) (2001). Real Decreto Legislativo 1/2001, de 20 de julio, por el que se aprueba el texto refundido de la Ley de Aguas.
SG (Spanish Government) (2005). Ley 11/2005 de 22 de junio, por la que se modifica la Ley 10/2001, de 5 de julio, del Plan Hidrológico Nacional.
SG (Spanish Government) (2008). Orden ARM/2656/2008, de 10 de septiembre, por la que se aprueba la instrucción de planificación hidrológica
SG (Spanish Government) (2018) Instrucción técnica para la elaboración de los planes especiales de sequía y la definición del sistema global de indicadores de sequía prolongada y de escasez. Availabe at: https://www.miteco.gob.es/images/es/pp-orden-instruccion-tecnica-elaboracion-planes-especiales-sequia-nov2017_tcm30-434700.pdf
SG (Spanish Government) (2024a) https://www.miteco.gob.es/es/agua/temas/observatorio-nacional-de-la-sequia/planificacion-gestion-sequias/
SG (Spanish Government) (2024b). https://www.miteco.gob.es/es/agua/temas/concesiones-y-autorizaciones/regulacion-usos-aprovechamiento/concesiones.html
Speed, R., Yuanyuan, L., Le Quesne, T., Pegram, G., Zhiwei, Z. (2013). Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning. UNESCO, Paris.
Swedish Government (2020). Government decision on the National Plan for Modern Environmental Conditions for Hydropower. Regeringsbeslut, Nationell Plan för Moderna Miljövillkor. Available at https://www.havochvatten.se/download/18.1bd43926172bdc4d64881cc0/1708959747462/regeringsbeslut-nationell-plan-moderna-miljovillkor.pdf; for the text, https://www.havochvatten.se/download/18.1bd43926172bdc4d64881cc1/1684753165617/bilaga-2-nationell-plan-moderna-miljovillkor.pdf.
Swedish Parliament (1998a). Environmental Code 1998:808. Miljöbalk 1998:808.
Swedish Parliament (1998b). Act Containing Special Provisions concerning Water Operations 1998:812. Lag (1998:812) med särskilda bestämmelser om vattenverksamhet.
Swedish Parliament (1998c). Decree concerning self-reporting 1998:901. Förordning (1998:901) om verksamhetsutövares egenkontroll.
Swedish Parliament (2004). Decree on the management of the aquatic environment quality. Vattenförvaltningsförordning (2004:660).
Swedish Parliament (2017). Regulation on Water Delegated Committees (2017:872). Förordning (2017:872) om vattendelegationer.
UK Parliament (1963). Water Resources Act 1963, c. 38.
UK Parliament (1991). Water Resources Act 1991, c. 57.
UK Parliament (1991b). Water Industry Act 1991, c. 56.
UK Parliament (2003). Water Act 2003, c. 37.
UK Parliament (2005). The Drought Plan Regulations 2005, No. 1905.

UK Parliament (2014). Water Act 2014, c. 21.
UK Parliament (2016). The Environmental Permitting (England and Wales) Regulations 2016, No. 1154.
UK Parliament (2021). Environment Act 2021, c. 30.
UN (2010). Resolution A/RES/64/292. United Nations General Assembly, July 2010
UNESCO (2019). Conjunctive Management – An Introduction. International Hydrological Programme.
Vattenmyndigheten Södra Östersjön (2022). Delåtgärdsprogram mot torka och vattenbrist 2022—2027: Södra Östersjöns vattendistrikt. Available at: https://www.vattenmyndigheterna.se/download/18.47dc7e74182e92fe269baec/1662097861637/Del%C3%A5tg%C3%A4rdsprogram%20mot%20torka%20och%20vattenbrist%202022-2027%20S%C3%B6dra%20%C3%96stersj%C3%B6n.pdf.
Vattenmyndigheten Västerhavet (2022). Förvaltningsplan för vatten 2022–2027: Västerhavets vattendistrikt. Available at: https://www.vattenmyndigheterna.se/download/18.47dc7e74182e92fe269b943/1662094813588/F%C3%B6rvaltningsplan%20f%C3%B6r%20vatten%202022%E2%80%932027%20V%C3%A4sterhavets%20vattendistrikt.pdf.

Annex I – Analysis template (Regulating water use and water allocation)

Enabling institutions for water allocation

Question 1a – How are key requirements set for water allocation set in your country? *Multiple options are possible* *Describe their main role (e.g. establishing ownership over water, the permitting regime, drought management, etc.) Depending on the type of response chosen, provide detailed information on the requirements set. E.g. in case of specific national legislation, please provide law number, articles, and content of requirements. Provide key references of relevant documents.*
☐ In national legislation (clearly explain if it is national water law/water act; or a decree; or a regulation; or a specific regulation): ☐ In regional legislation: ☐ In national guidelines or non-binding standards: ☐ In regional guidelines or non-binding standards: ☐ In sector-specific guidelines (e.g. water allocation within the agricultural sector): ☐ Case-by-case requirements (no overarching legislation or guidelines): Please explain:
Question 1b – Which policies and plans address water allocation? *Multiple options are possible* *Describe the role of e.g. River Basin Management Plans, Drought Management Plans, Climate Adaptation Strategies, economic and sector plans. They may establish allocation plans, priority use rules, restrict access and extraction of water, etc.*
☐ RBMP ☐ Drought management plans ☐ Climate adaptation strategies ☐ Sectoral policies ☐ Other Please explain:
Question 2 – Does your legal and policy framework clearly differentiate entitlements in the form of permits and temporary modification of these permits in the form of allowances?
☐ We allocate water through permits and permits cannot be modified temporarily (e.g. through drought orders) ☐ We allocate water through permits, and the state can restrict water use rights temporarily through e.g. drought orders ☐ We allocate water through permits and droughts orders, but we also implement seasonal/monthly allowances that modify permits conditions (e.g. anticipation of a drought, reduction of structural imbalance between issued permits and available resources) ☐ Other Please describe:
Question 3a – Which public authorities are responsible for water allocation and which role do they have? *Please describe the role of ministries, state agencies, river basin organization, etc.* *Describe their role, i.e. are they responsible for policy, planning, issuing entitlements vs allowances, monitoring, enforcement*

Note that there may be different organizations responsible for permitting as opposed to setting specific allowances (see glossary in introduction for definitions)

a) Who is the lead authority on water allocation?
Explain (please specify if different for entitlements vs allowances):

b) Who is responsible for defining water allocations to each user?
Explain (please specify if different organisations are responsible at river basin level, catchment levels or within sectors; please specific if different for entitlements vs allowances):

c) Who is responsible for monitoring, enforcement and compliance with allocations?
Explain (please specify if different for entitlements vs allowances):

Question 3b – What users and stakeholders are involved in decisions over water allocation, and which role do they have?
Multiple options are possible
Describe their role, i.e. are they responsible for policy, planning, issuing entitlements, monitoring, enforcement

☐ Farmers
☐ Fisheries
☐ Water utilities
☐ Hydropower
☐ Navigation
☐ Tourism
☐ Environmental NGOs
☐ Other citizen groups

Please describe their role:

Question 3c – What level of influence would you say stakeholders have in the decision making over water allocation?

☐ They are only informed of decisions
☐ They are consulted. They can comment on proposals
☐ They are involved. They have a seat at the table, but authorities decide at the end.
☐ They are in control, i.e. allocation decisions are devolved to a local association

Please explain (also if different stakeholders have different levels of influence):

Question 4a – How would you categorize the ownership of surface water resources?
Choose one option (except if different types of surface water resources have different legal standings)
Please provide the legal definition of water ownership and refer to the legal instrument(s) establishing this ownership

☐ public/state
☐ private
☐ common
☐ not clearly stated in available legal sources

Please describe:

Question 4b – How would you categorize the ownership of groundwater resources?
Choose one option
Please provide the legal definition of water ownership and refer to the legal instrument(s) establishing this ownership

☐ public/state
☐ private
☐ common

☐ not clearly stated in available legal sources

Please describe:

Question 5 – When allocating water, are any of the principles below required by law or recommended through national guidance?
Multiple options possible.
Please explain explicitly with reference to the source

☐ Conservation and protection of the country's water resources
☐ Efficient management of water resources
☐ Use of water to promote economic development
☐ Equitable division of the resource among all potential users (please provide definition in your country)
☐ Human rights to water (please provide definition in your country)
☐ Protection of indigenous communities and other marginalized groups

Please describe how authorities should take these principles into account (e.g. does it have an impact when prioritizing water uses, establishing permit condition):

Permitting regime

Question 6 – Which permits do abstractors need to obtain to extract water?
Multiple options possible

☐ Installing a pump to access surface water body (access, no extraction)
☐ Extracting surface water from an authorized pump
☐ Drilling a borehole to access groundwater and install a pump
☐ Extracting groundwater from an authorized borehole
☐ To divert and exploit wastewater
☐ Other:

Please describe:

Question 7 – What assessments are carried out to issue a new permit or change the conditions of an existing permit?
Multiple options possible
Please note if different conditions apply to issuance of new permit or changes to an existing one, and if conditions differ based on e.g. the size of the allocated amount of water

☐ An assessment of third-party impacts is obligatory
☐ An environmental impact assessment is obligatory
☐ A public inquiry is mandatory (e.g. the request to obtain a permit made to authorities must be publicly notified and the public and stakeholders are allowed to present objections to the request)
☐ Other:

Please explain:

Question 8 – What hydrological and ecosystem impacts are considered when issuing permits?
Multiple options possible

Impact on ecological flows: ☐ Yes ☐ No ☐ Somewhat
Impact on minimum flows: ☐ Yes ☐ No ☐ Somewhat

Impact on groundwater recharge (when issuing a permit for surface water): ☐ Yes ☐ No ☐ Somewhat
Impact on associated surface water (when issuing a permit for groundwater): ☐ Yes ☐ No ☐ Somewhat
Impact on groundwater dependent terrestrial ecosystems: ☐ Yes ☐ No ☐ Somewhat
Impact on downstream flows (when issuing a permit for wastewater reuse): ☐ Yes ☐ No ☐ Somewhat
Other environmental impacts (please specify): ☐ Yes ☐ No ☐ Somewhat

Please explain:

Question 9 – How are water permits defined?
Multiple options possible

☐ Permits specify a maximum flow of water to be extracted at any time (for instance, pumping capacity in m^3/s)
☐ Permits specify a maximum volume of water to be extracted over a longer period. *Specify the time step (e.g. annual, seasonal, monthly, weekly, daily):*
☐ Permits do not specific a maximum flow or volume of water, but is defined as a share of the available resource
☐ Permits specify the use for which the extracted water can be used for
☐ Permits specify a maximum amount that can be consumed or a return flow obligation
☐ Other:

Question 10 – What is the duration of the permit?
Permits may be issued for a specified amount of time or in perpetuity.
Different types of uses may have different type of permit (for instance hydropower may have a 50 years permit or more, while agricultural users may have 10 years permits)s. Please describe the different cases, also if types of permits differ according to other criteria

a) Are permits issued for a specified amount of time or in perpetuity? Explain, indicating also the typical durations):

b) Does the duration differ for different water uses?
☐ Yes, duration differ according to type of water uses (please describe)
☐ No
Please describe:

c) Does the duration differ for new permits and existing permits?
☐ Yes, the duration differs between existing permit conditions and new permit conditions (e.g. due to a reform in the policies setting permit characteristics)
☐ No
Please explain:

d) Do permits duration differ according to other criteria?
☐ Yes, other criteria are used (please describe)
☐ No
Please explain:

Question 11 – Are there specific types of users that do not need to have a permit?
Multiple options may apply for question a)
Specific types of users or small water users below a certain threshold may not require a permit (e.g. just notification or registration).

a) Which abstracting water users need a permit?

☐ Water utilities
☐ Private households not connected to a water utility
☐ Hydropower
☐ Industry
☐ Small irrigation intakes (individual irrigator)
☐ Large irrigation intakes (collective irrigation schemes, where several irrigators share the same irrigation water supply infrastructure – please specify if individual irrigators require an individual permit in this case or whether the organisation in charge of the irrigation schemes hold the permit)
☐ Other

b) Are there exemptions of water uses below a certain volume from abstraction permits?

☐ Yes, exemptions apply (please describe)
☐ No
Please explain:

c) Are abstractions of temporary nature subject to permit?

☐ Yes (please describe)
☐ No
Please explain:

d) Any other exemptions from a permit?

☐ Yes, other exemptions exist (please describe)
☐ No
Please explain:

Question 12 – How can permits be withheld or cancelled?
Multiple options possible

☐ Public authorities can withhold or cancel the permit without compensating impacted users
☐ Public authorities can withhold or cancel the permit but they must compensate the impacted users
☐ Public authorities can withhold or cancel (part of) a permit only if the allocated amount is not fully used (i.e. the user is not extracting or not extracting the full amount allocated - application of the "use it or loose it" principle)
☐ Other

Allocable pool

Question 13 – Is there a cap on the total amount of water that can be allocated?
Multiple options possible

☐ No, there is no such cap anywhere in the country
☐ Yes, in certain catchments
☐ Yes, in certain groundwater bodies
☐ Yes, for whole RBDs
Please describe:

If yes, at what scale is this cap defined?

☐ surface water body level
☐ groundwater body level

☐ catchment level
☐ RBD level
☐ other

If yes, what is the time step of that cap?
☐ Instantaneous
☐ Daily
☐ Weekly
☐ Monthly
☐ Annual
☐ Other

Question 14 – What hydrological and ecosystem impacts are considered when setting the cap?
Multiple options possible
Note: we differentiate the impacts considered when issuing a specific permit to a user (see earlier question) to the impacts considered when setting limits to the total amount that can be allocated in a hydrological unit such as a basin, catchment or aquifer

Impact on ecological flows: ☐ Yes ☐ No ☐ Somewhat
Impact on minimum flows: ☐ Yes ☐ No ☐ Somewhat
Impact on groundwater recharge: ☐ Yes ☐ No ☐ Somewhat
Impact on surface water ecosystems dependent on groundwater inflow: ☐ Yes ☐ No ☐ Somewhat
Impact on groundwater dependent terrestrial ecosystems: ☐ Yes ☐ No ☐ Somewhat
Other environmental impacts (please specify): ☐ Yes ☐ No ☐ Somewhat

Please explain:

Rules over (re)allocations

Question 15 – Is there a process through which permit conditions are being modified to reduce abstraction, and if so how?
Choose one option
In some cases, permits may be modified permanently. In other conditions, restrictions apply each year / season on individual permits without changing the permits.

☐ No, there is no such process in the country
☐ Yes, in certain catchments
☐ Yes, across the whole country

If yes, could you describe what changes to permit conditions are being implemented?
☐ Permits are modified permanently
☐ Permits are not modified but authorities issue each year / season allowances that restrict the full use of the permit
☐ Other:

Question 16 – When the permitted flow or volume is being ramped down, how this is implemented?
Multiple options are possible

☐ All users see their permits reduced equally (proportionally)
☐ Certain users see their permits reduced more than others
☐ Other

Could you describe how it is implemented?

Question 17 – How are priority uses defined during exceptional circumstances (e.g. droughts)?
Choose one option

☐ National legislation or decree specifies the priority order
☐ National legislation or decree provides general orientation but there is room to adjust at local level
☐ Entirely decided at local level
☐ Other

Please describe:

Question 18 – How are "exceptional circumstances" defined?
Multiple options possible
Different indicators may be used such as a drought index, river flows, groundwater levels, etc.

☐ Drought indicators. Please specify:
☐ River flows. Please specify:
☐ Groundwater levels. Please specify:
☐ Other:

If specific indicators are used, could you describe the thresholds used (e.g. if different levels of emergency are defined) and what are the criteria used to defined these thresholds?

Question 19 – What is the order of priority in the event of restrictions due to droughts?

Please add a number, starting with 1 being of the highest priority

Environment:	
Domestic water supply:	
Civil safety (hygiene, fire, cooling of nuclear power plants):	
Energy production (hydropower, cooling water):	
Agriculture:	
Industrial:	
…	

Question 20 – Can water allocations be transferred or traded?
Multiple options possible

The answers below apply to ☐ permits ☐ allowances

☐ They can be transferred temporarily between two users but they cannot be traded (no financial retribution)
☐ They can be transferred permanently between two users but they cannot be traded (no financial retribution)
☐ They can be leased between two users for a specified duration (temporary transfer with financial retribution)
☐ They can be traded between two users (permanent transfer)
☐ They cannot be transferred or traded
☐ Other:

Please explain the procedures around transfers / trades, including any conditions which must be fulfilled to allow transfer/trade:

Question 21 – Who has the oversight over the exchange or trade of water allocations?
Multiple options possible

☐ Ministry. Please specify:
☐ Public agency. Please specify:
☐ River basin authority. Please specify:
☐ Water user association. Please specify:
☐ Other:

Enforcement and compliance

Question 22 – Are all abstractions monitored and reported? Describe how
Multiple options possible

☐ Metering
☐ Aerial surveillance
☐ Other

Please explain:

Question 23 – What financial or legal deterrents exist to reduce non-compliance?

Question 24 – Describe the procedures or sanctions in place for infractions and conflict resolution.

Barriers

Question 25 – Which of these barriers do you think apply most?
Multiple options possible. Barriers may vary between different places in the country. We ask for an overall judgement, but please explain in what ways your judgement should be qualified below.

On a scale of 1 (very important), 2 (important), 3 (less important) to 4 (not important)
For each of the selected options, please explain.

The implementation mechanisms set out in the legal framework **are not sufficiently precise and detailed** Explain possible reasons (use examples/mention specific cases, if applicable): …	
There is no established planning process to assess, review and modify allocations Explain possible reasons (use examples/mention specific cases, if applicable): …	
There is insufficient power given to authorities to review and modify existing permits Explain possible reasons (use examples/mention specific cases, if applicable): …	
Too many exemptions to holding a permit exist, meaning that too many users are not regulated (e.g. too many cases where only notifications apply, abstraction thresholds for permit requirement set too high) Explain which stakeholders are left out, possible reasons (use examples/mention specific cases, if applicable): …	
There is a **lack of stakeholder engagement** to discuss options for reallocations Explain possible reasons (use examples/mention specific cases, if applicable): …	

Stakeholder are engaged but **no-one is willing to compromise** due to e.g. the economic impacts of changing allocations Explain possible reasons (use examples/mention specific cases, if applicable): …	
Scientific knowledge on the allocable pool is incomplete leading to uncertainties and opposition to reform Explain possible reasons (use examples/mention specific cases, if applicable): …	
Monitoring is insufficient, for instance knowledge on who abstracts is incomplete, leading to uncertainties and opposition to reform Explain possible reasons (use examples/mention specific cases, if applicable): …	
No adequate tool or clear methodologies exists to support decision-making, for instance by modelling available resources, the impacts of reallocations, or identifying trade-offs between users Explain possible reasons (use examples/mention specific cases, if applicable): …	
Water allocation decisions/policies are not considered in sectoral policies and decisions, leading to incoherences between sector investments and incentives (e.g. CAP, tourism expansion, hydropower development) and the amount of water available in specific catchments /groundwater body area Explain possible reasons (use examples/mention specific cases, if applicable): …	
Permits and allowances cannot be exchanged leading to disproportional impacts and opposition from water users Explain possible reasons (use examples/mention specific cases, if applicable): …	
Illegal abstraction is a problem (unregistered points, overconsumption) Explain possible reasons (use examples/mention specific cases, if applicable): …	
Authorities lack resources and capacity, e.g. they are not sufficiently staffed to plan water allocation, identify cases of non-compliance, etc. Explain possible reasons: …	
Penalties for non-compliance are too low to be effective Explain possible reasons (use examples/mention specific cases, if applicable): …	
Other Explain: …	

Question 26 – Are there any steps planned to develop further the existing legal and regulatory framework for water allocation?

Good practice

Question 27 – please report here any good practice / front runners that are implementing a more successful water allocation mechanism that you may come across when filling this questionnaire *Compiling such examples will be useful for Task 2.2 on innovative governance mechanisms*

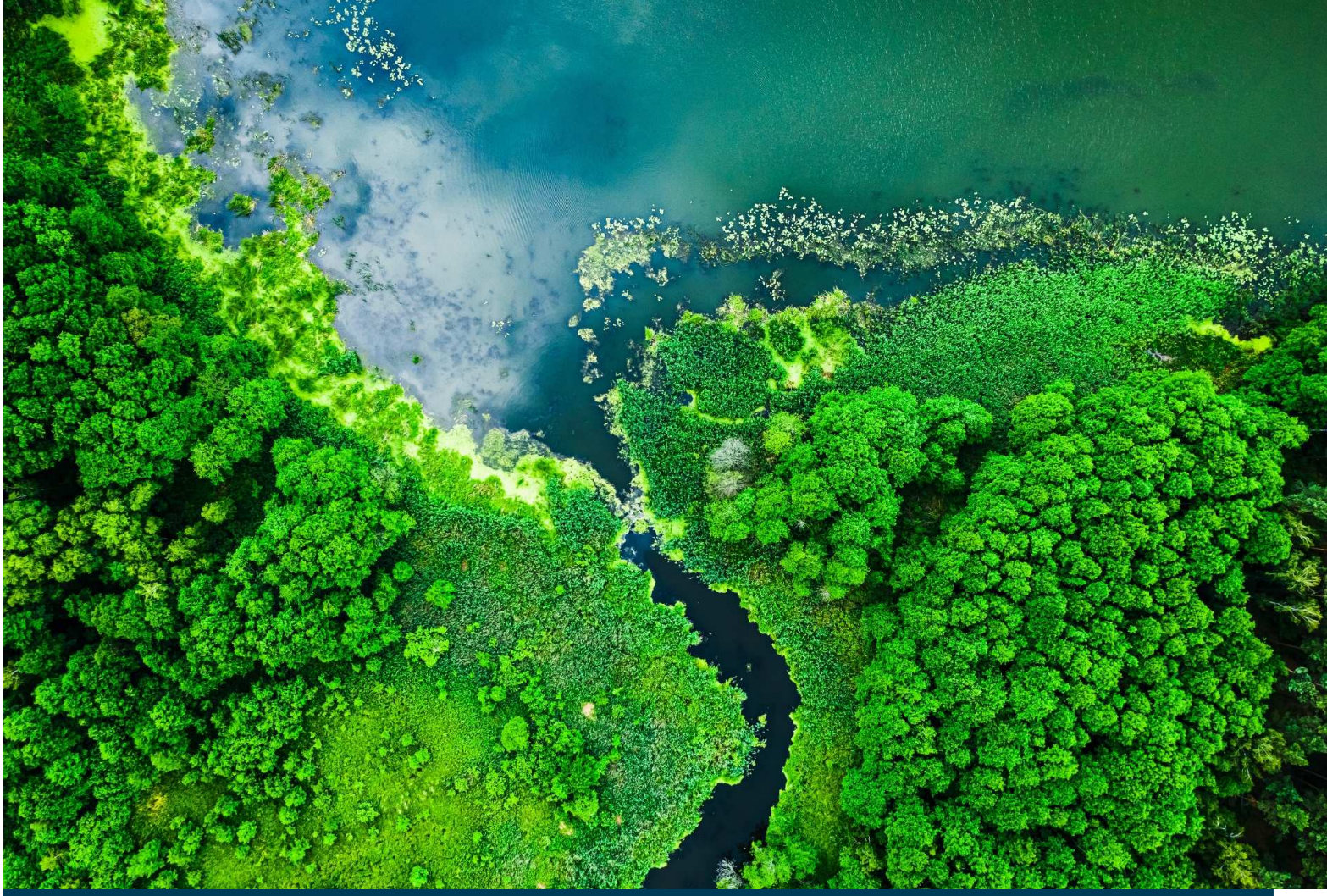
Suggestions for interviews

Please propose a national authority expert who can be interviewed on the topic of regulating water use and water allocation in your country
Interviewee:
Please list topics from this template which the interviewee can help to further clarify
List issues:

Annex II – Expert interviews

The following lists the interviews carried out with nine national experts to complement the data collection for Deliverable 2.1 concerning water allocation, eflows and water value chains regulatory regimes. The interviews that provided material for this report on water allocation are cited directly in the text.

1. Sweden, interview 1, civil servant, Ministry
2. Sweden, interview 2, judge, Land and Environment Court
3. Finland, interview 1, civil servant, Ministry
4. Finland, interview 2, judge, administrative branch
5. Spain, interview, national expert on water regulation and management
6. France, interview, one national expert on eflows & one civil servant at environmental agency
7. England, interview, two national civil servants on water regulation and eflows
8. Romania interview 1 civil servant, water administration
9. Romania, interview 2, NGO



GOVAQUA policy matrix Part B – Review of national eflows policies in six European countries

GOVAQUA Deliverable 2.1

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1.3	29.07.2024	Eleftheria Kampa	Revisions made based on the internal reviewers' comments and suggestions.

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List of Abbreviations

Abbreviation	Explanation
ASB	Abstraction Sensitivity Band
CAMS	Catchment Abstraction Management Strategy
CAP	Common Agricultural Policy
CIS	Common Implementation Strategy
DGA	Dirección General del Agua (Spain)
DMB	Débit minimum biologique (Minimum Biological Flow) (France)
DMP	Drought Management Plan
DOE	Débit d'Objectif d'étiage (low flow target) (France)
EA	Environment Agency
EC	European Commission
EFI	Environmental Flow Indicator
ETC	European Topic Centre
EU	European Union
IPH	Hydrological Planning Instruction (Spain)
IUCN	International Union for Conservation of Nature
MS	Member States
NGO	Non-Governmental Organization
QMNA5	Five-year low water flow
RBDs	River Basin Districts
RBMP	River Basin Management Plan
RPH	Hydrological Planning Regulation (Spain)
SDG	Sustainable Development Goals
WFD	Water Framework Directive

Introduction

Policy background on eflows

Human activities and interventions, such as direct water abstractions from rivers and aquifers and the construction of dams have greatly modified the natural flow regimes of many rivers in Europe. At the same time, the flow regime is of central importance in sustaining the ecological integrity of freshwater systems, and its modification leads to environmental degradation. The concept of environmental flows (eflows) was historically developed as a response to the degradation of aquatic ecosystems caused by the overuse of water (Tharme, 2002; Acreman et al., 2014; Sanchez Navarro, 2021).

Eflows aim at allocating sufficient water to ecosystems to maintain a certain level of ecological integrity based on an appropriate management vision. Moreover, eflows can support the integration of river management into the broader scope of ecological sustainability by making a delicate balance between the water needed for ecosystems and water needed for socioeconomic systems (Poff and Matthews, 2013; Gebreegziabher et al, 2023). The concept of eflow continues to evolve and is shifting from the traditional view of minimum water amounts to a more comprehensive and holistic understanding, taking into account all aspects of a flowing water system (e.g. floodplains, groundwater aquifers, wetlands), different elements of the flow regime (quantity, frequency, duration, timing, and rate of change), the dynamic nature of rivers and water quality aspects (Alexandra et al. 2023; Acreman et al., 2014; Sanchez Navarro, 2021).

Ecological flow (which is also abbreviated as eflows and is a similar term to environmental flows) is the amount of water required for the aquatic ecosystem to continue to thrive and provide the services we rely upon (Tharme, 2002). It is a key element of sustainable water use in river basins along with water balances and water allocation mechanisms. Defining an ecological flow and taking measures to maintain it is important for restoring and managing river ecosystems, to preserve the communities of biota as well as support the delivery of other ecosystem services. At the same time, the need to maintain an ecological flow in river ecosystems may lead to conflicts with other water users of the same river ecosystems because of the need to limit existing and future abstractions (Alexandra et al. 2023, Kampa & Schmidt 2023).

In the EU water policy framework, the Water Framework Directive (WFD) explicitly acknowledges the importance of the flow regime for the status of aquatic ecosystems and includes it as one of the key elements supporting biological elements in the classification of the ecological status (Acreman and Ferguson, 2010). Although the WFD does not prescribe the establishment of ecological flows, it acknowledges the critical role of water quantity and dynamics in supporting the quality of aquatic ecosystems and the achievement of environmental objectives, and thus requires taking adequate response measures, such as Article 11(3)e “controls over the abstraction”. The flow regime is explicitly included as a hydromorphological supporting quality element in the WFD definition of ecological status.

A 2012 report on the review of the European Water Scarcity and Droughts Policy pointed to the “essential” need to establish and enforce ecological flows in order to deal with water scarcity and drought challenges, reach good ecological status in line with the WFD, while providing a number of associated co-benefits (EC, 2012). The establishment and enforcement of adequate ecological flows for all water bodies in Europe is essential for dealing efficiently with water scarcity and drought issues and for achieving good ecological status as required by the WFD, as well as securing significant co-benefits for energy savings, climate change mitigation and adaptation, nature and biodiversity. It requires the adaptation of current water allocation to consider the ecological needs of water-dependent ecosystems (EC, 2012).

The implementation of ecological flows in EU countries has been under way after the publication of a WFD common implementation strategy (CIS) guidance document on ecological flows in 2015 (EC, 2015). The guidance emerged in response to the assessment of the first river basin management plans under the WFD, which highlighted the need to better address over-abstraction and other alterations to the hydro-

morphology of surface water bodies such as hydropower dam operations. This guidance recommends all Member States to "develop effective national frameworks on eflows" and works towards a common understanding of ecological flows and their implementation in the river basin management plans (RBMPs). These national frameworks should provide a clear basis for regulating water use, allocations, water rights and permits; in all cases, eflows should be included in RBMPs. The development of scientifically credible eflows national frameworks, taking into account their regional and local specificities, will be a major contribution to the resolution of conflicts over water uses and to ensure of achieving EU ecological objectives. The Integrated Assessment of the 2nd RBMPs (EC, 2019) pointed to improved methods for defining ecological flows "e.g. linking observations of river flows with biological quality elements" but notes that actual enforcement of ecological flows through permitting regulation is lagging behind.

Eight years after the publication of the 2015 CIS guidance document, the integration of eflows assessments in the RBMPs has steadily increased from the first to the third WFD planning cycle. However, also several challenges are still faced by water management institutions in implementing eflows in EU Member States (Kampa & Schmidt 2023).

In addition to the WFD and the EU policy framework for water scarcity & droughts, the EU Biodiversity Strategy 2030 reinforced the WFD's targets with relevance to quantitative water issues, setting the objective for EU Member States to "review water abstraction and impoundment permits to implement ecological flows in order to achieve good status or potential of all surface water and good status of all groundwater by 2027."

In the global environmental policy context, water flows are notably relevant to achieve Sustainable Development Goal 6 (Ensure access to water and sanitation for all), which includes targets to protect and restore water-related ecosystems including rivers, wetlands, aquifers, and lakes (SDG 6.6, SDG 15.1). Environmental water requirements are explicitly referenced and defined in SDG indicators 6.4.2 (Level of water stress) and 6.6.1 (Change in the extent of water-related ecosystems over time). Ecological flows contribute to improvements in the production of freshwater and estuarine foods such as fisheries (SDG 14.2), thereby contributing indirectly to other SDGs (Arthington et al., 2018).

Table 1 summarises the key EU and global policy objectives related to eflows.

Even though the concept of environmental flows has existed for over 60 years, there is still no unified definition for it; however, there is a clear tendency to differentiate environmental flows and ecological flows (Sanchez Navarro, 2021). In this report, we use the abbreviation "eflows" to cover both terms of ecological flows and environmental flows (see Text box 1), although in EU countries eflows usually refer to ecological flows following WFD principles. However, as the analysis of legal frameworks of eflows shows in the following sections, different terms for eflows are used in the national policy frameworks.

Text box 1. Ecological flows and environmental flows (both abbreviated as eflows)

The 2015 WFD CIS guidance no. 31 (CIS 2015) introduced the definition of the term "**ecological flow**" as "a hydrological regime consistent with the achievement of the environmental objectives of the WFD in natural surface water bodies as mentioned in Article 4(1)". These environmental objectives refer to:

- non deterioration of the existing status
- achievement of good ecological status in a natural surface water body,
- compliance with standards and objectives for protected areas, including the ones designated for the protection of habitats and species where the maintenance or improvement of the status of water is an important factor for their protection, including relevant Natura 2000 sites designated under the Birds and Habitats Directives.

The term "**environmental flow**" describes the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems (from Brisbane Declaration, International River Foundation 2007). The 2018 Brisbane

Declaration re-defined eflows to accommodate human cultures and economies as: 'eflows is the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems (including rivers, streams, springs, riparian, floodplain and other wetlands, lakes, coastal waterbodies, including lagoons and estuaries, and groundwater-dependent ecosystems) which, in turn, support human cultures, economies, sustainable livelihoods, and well-being' (Arthington et al. 2018).

Ecological flows can be considered a component of the overall environmental flow and are established to provide for the ecological values attributed to a particular water body. Thus, environmental flow is a broader term than ecological flows, which can also be used for mitigation measures on flows aimed to reach any environmental objective under the WFD (Kampa & Schmidt 2023).

Table 1 Key EU and global policy objectives related to eflows.

EU and global policy	Policy objectives and targets linked to eflows	Target year
Water Framework Directive (EC 2000)	To achieve good status or potential of surface water bodies and good quantitative status of groundwater bodies Establish and implement eflows in the River Basin Management Plans (based on CIS Guidance 2015)	2015/ Latest by 2027
Biodiversity Strategy 2030 (EC 2021)	Member State authorities should review water abstraction and impoundment permits to implement ecological flows in order to achieve good status or potential of all surface waters and good status of all groundwater by 2027 at the latest, as required by the Water Framework Directive.	2027
Water scarcity and drought communication and policy review (EC, 2007, 2012)	To address the challenge of water scarcity and droughts in the EU Resilience building; from crisis management to risk management Seven policy options: putting the right price tag on water; allocating water and water-related funding more efficiently; improving drought risk management; considering additional water supply infrastructure; fostering water-efficient technologies and practices; fostering a water-saving culture in Europe; improving knowledge and data collection.	NA
Sustainable Development Goals	Water flows are relevant to achieve SDG 6 (Ensure access to water and sanitation for all), which includes targets to protect and restore water-related ecosystems including rivers, wetlands, aquifers, and lakes (SDG6.6, SDG15.1). Environmental water requirements are explicitly referenced and defined in SDG indicators 6.4.2 (Level of water stress) and 6.6.1 (Change in the extent of water-related ecosystems over time). Ecological flows contribute to improvements in the production of freshwater and estuarine foods such as fisheries (SDG14.2), thereby contributing indirectly to other SDGs. (Arthington et al., 2018)	

Objective and outline of the report

The present report focuses on characterizing and analysing eflows policies and strategies at national levels. The report contributes to an improved understanding of national legal frameworks and practices of eflows in European countries, to support further research on the development and effective implementation of eflows policies. Its specific objectives are:

- To provide insights into how eflows regulatory frameworks are designed and implemented in selected European countries
- To discuss current challenges with the implementation of eflows regulatory frameworks
- To identify opportunities for innovative solutions to implement eflows in Europe

The analysis focuses on the six countries of the Living Labs of GOVAQUA, including five EU countries (Spain, France, Romania, Finland, Sweden) and England. Although England is not part of the EU, water policy and management remains highly structured around the WFD.

The report is structured into seven chapters. At first, the methodology for analysing national eflows legal and regulatory frameworks is outlined. The report then examines how eflows are considered in national water policy frameworks in the six studied countries. This is followed by a chapter on eflows implementation mechanisms linked to the system of permits and water rights and eflows revisions under droughts. The following chapters address the governance structure for eflows in the six countries, in terms of organizational responsibilities and stakeholder engagement. Mechanisms for eflows compliance and enforcement are finally examined. The discussion chapter highlights key challenges in implementing eflows in the six countries. The report concludes with proposals for further research on potential good practice case studies on legal/regulatory instruments, approaches or arrangements for eflows; these good practices aim to provide innovative ideas for national and basin level water managers and other decision makers in water governance.

This report is one of three parts composing Deliverable 2.1 of the GOVAQUA project. Part A addresses in more detail the legal and regulatory approaches for water allocation and Part C focuses on the regulation of value chains to support sustainable water management.

Methodology

For the characterisation and analysis of eflows regulatory frameworks in the six countries of GOVAQUA Living Labs, a structured template was developed to collect and examine information on the key elements of eflows national policies. For the development of the template, a review of international literature on eflows was carried out, in particular journal articles, book publications and consultancy reports on eflows policies and their implementation. In addition, we reviewed findings of a previous study (Kampa & Schmidt, 2023) on challenges faced by EU Member States on the design and implementation of eflows. Subsequently, key elements of eflows policies were derived, which were used to structure the characterization and analysis of the policy and regulatory frameworks on eflows in the six countries.

Based on the key policy elements derived, a template for collecting data at national level was developed (**Annex I**). This template was filled in by national experts of the GOVAQUA project through desk-based review of documentation. Interviews with national experts from governmental bodies and agencies were carried out to complement the data collected through desk research (**Annex II**). Interviewees were selected based on their work profile and expertise on the topic of eflows establishment and implementation in their respective countries. The interviews lasted between one and two hours and were carried out by video conference or in person. Interview questions were tailored to each national context.

The sections below present the review of eflows implementation challenges and the key elements of eflows legal and regulatory frameworks selected for detailed analysis.

Eflows implementation challenges

The requirements for effectively providing environmental flows depend significantly on the political, environmental, and water resource development context. Despite these variations, several central elements are likely to be essential in most efforts. These elements include having appropriate political and institutional enabling conditions, conducting necessary assessments and planning to understand the required flows for meeting environmental needs, and implementing mechanisms to achieve those flows.

Implementation of eflows is a critical part of sustainable water management and in the last two decades many countries have incorporated environmental flow provisions as they have updated water policy. Nevertheless, despite widespread recognition of the benefits and need to establish eflows, implementation has been slow, with limited examples of broad, systematic success (Wineland et al., 2022). A number of review studies exist on critical factors and challenges related to the implementation of eflows mainly drawing from experience gained in case studies outside Europe (US, Mexico, Australia, Asia).

Harwood et al. (2018) identified the following enabling factors that support successful eflows implementation: Legislation & regulation, collaboration & leadership, resources & capacity and monitoring & adaptive management. Harwood et al. conclude that the fundamental enabling factor that underpins most, if not all, cases of successful eflows implementation is the existence of conducive legislation and regulation. The type of legislation and regulation behind the implementation of eflows varies greatly; however, long-term protection or restoration of flows for the environment is dependent on there being a legislated framework within which to act. Jurisdictions that have eflows written into their laws and regulations have demonstrated at least some consideration of the ecosystem services and values that rivers provide. Although fundamental, legislation alone is rarely sufficient, and needs to be supported by additional policy measures. The precise mechanisms set out in legal frameworks need to be defined according to local context and in light of the nature of eflows implementation challenges.

Wineland et al. (2022) provided a review of the following main barriers to eflows implementation: Lack of authority to implement eflows in water governance structures, complex water governance structures, declining water availability and increasing hydrologic variability under climate change, and complex socio-environmental trade-offs resulting from water reallocation or redistribution.

Sanchez Navarro (2021) also identifies a number of challenges to the implementation of eflows policies across the world, in particular lack of political will and stakeholder support, insufficient resources and capacity, in water management and allocation institutions generally, and for the delivery of those functions tasked with assessing and enforcing environmental requirements, institutional barriers and conflicts of interest. Inadequate will and/or capacity on the part of governments to monitor flows and enforce eflows on the ground draws attention to the politics of eflows implementation, which have attracted relatively less scrutiny (Alexandra et al. 2023, Capon and Capon 2017, Horne et al. 2017).

In the EU, the main implementation constraints and challenges concerning eflows, based on a self-assessment of EU national water authorities and river basin authorities, were recently analysed and described by Kampa & Schmidt (2023), with following key conclusions:

- There is mixed progress of EU Member States in terms of institutional, legal and governance measures and mechanisms to establish and support eflows.
    - Most countries have already established (or are in the process of establishing) abstraction permit systems that respect eflows, as well as processes for reviewing water rights to introduce eflows requirements.

    - At the same time, important challenges remain in terms of taking account of cumulative impacts and of impacts of climate change on water availability.
    - Implementing eflows for heavily modified water bodies needs to be further developed.
    - Several countries are still facing challenges in terms of the legal and policy basis, which needs to be further elaborated for implementing eflows. Countries are also facing challenges in terms of stakeholder involvement in eflows definition and implementation. Further challenges include the lack of evaluations of ecological benefits of eflows and mechanisms to deal with opposition to implementation from affected major water users.
- Enforcement and compliance with eflows remain a challenge for many Member States, in particular related to monitoring gaps and to systems of administrative fines when limits of permits are not respected.
- Large uncertainties in both hydrological and biological regimes make it difficult to establish direct connections between the need to implement eflows and changes in ecological status and pose a challenge to an adaptive approach for eflows implementation.
- Jurisprudence regarding implementation of eflows does not seem to be a major challenge in most countries. In some countries, specific training of lawyers and judges is organised by environmental authorities, though in other countries, this potential issue has not been detected yet because of the lack of legal cases on eflows to this date.

Key elements of eflows legal and regulatory frameworks for country analysis

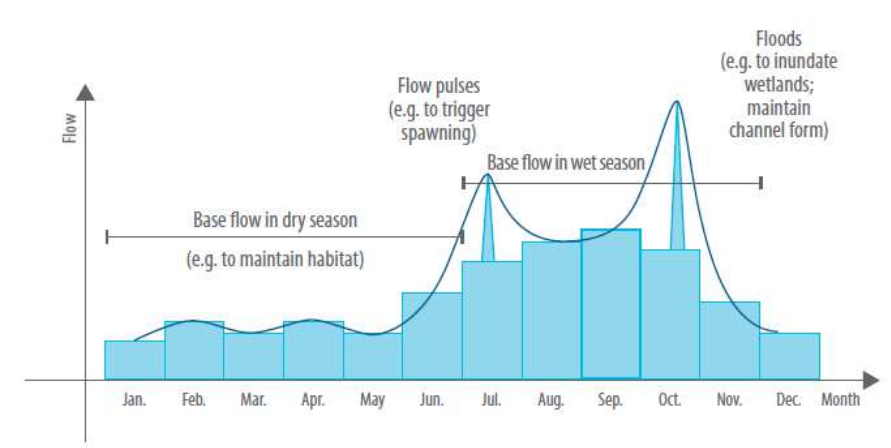
The main types of challenges for setting up and implementing eflows (reviewed in the previous section) concern the type of legal and regulatory instruments used, mechanisms for collaboration and stakeholder support, governance structures, resources and capacity, monitoring provisions, enforcement, a changing hydrological environment, and socio-environmental trade-offs. Drawing on the main challenges in setting up and implementing eflows, the following are the key elements of eflows legal and regulatory frameworks that have been selected for the country analysis in this report.

- **Legal and policy provisions** with focus on national legislation or other type of policy that build the main regulatory framework for eflows definition and implementation.
- **Eflows definitions** in legislation or policy documents. This aims to provide the detailed definitions of eflows developed in national legislation or other type of relevant policy. Among others, this also reflects the extent to which different flow regime components are considered.

Text box 2. Flow regime components

Flow regimes encompass the complete flow pattern (Speed et al., 2013), including flow magnitude, timing, frequency, duration, seasonality, and year-to-year variability, which play a crucial role in maintaining the health of rivers. While ecological flows focus on surface waters, also groundwater is a critical element, supporting ecological flows during dry periods as base flows as well as various water dependent freshwater and terrestrial ecosystems such as wetlands and peatlands. Low groundwater levels can worsen low flows in dry period. Groundwater recharge is therefore important. Groundwater recharge occurs through infiltration of rainfall and infiltration during high and flood flows. Maintaining a natural flow regime, including of flood flows, is therefore crucial in many instances to enhance floodplain groundwater recharge and support base flows during the dry season.

Figure 1 Different components of an annual flow regime relevant for freshwater ecosystems dependent on surface water

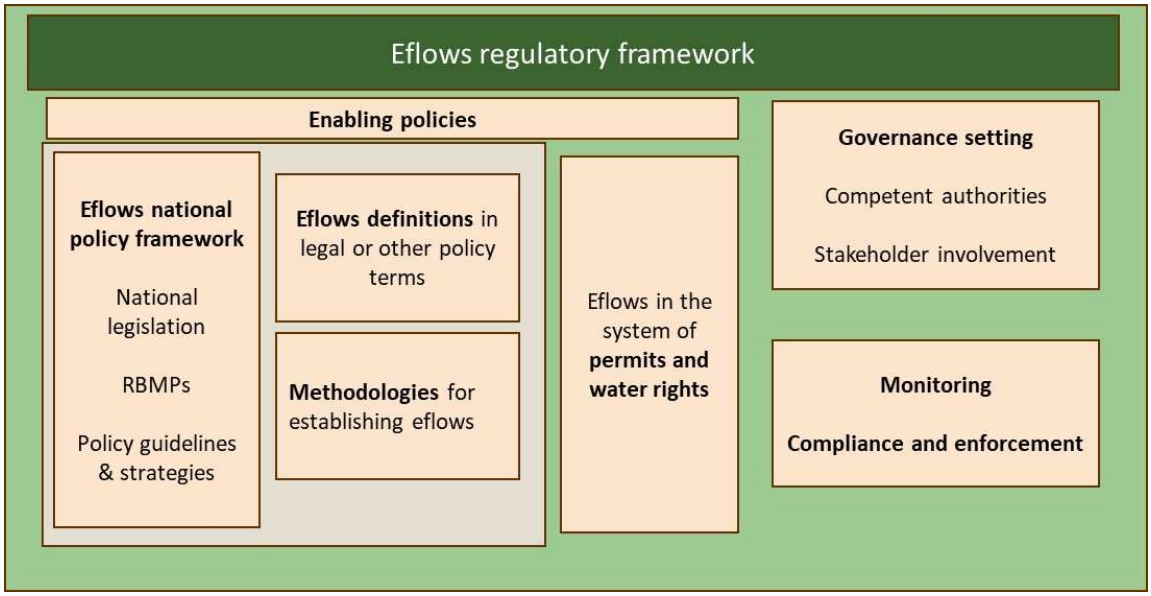


Source: Speed et al., 2013

- **Links of eflows to other elements in the water policy framework**, in particular to groundwater, biological quality elements or species, hydromorphology, and climate change.
- **Methodologies for eflows** in the policy framework. This concerns methodologies for establishing eflows broadly distinguished into hydrological, hydraulic, habitat simulation or holistic methods.
- **Eflows in the system of water rights and permits.** This examines provisions and ongoing processes to revise water rights and abstraction permits as a regulatory mechanism for implementing eflows.
- **Eflows changes under droughts.** This aims to examine whether eflows regulatory frameworks consider the particular ecological conditions under natural droughts and whether revisions of eflows under drought conditions are allowed.
- **Governance of eflows regulation** with focus on competent authorities and the involvement of stakeholders.
- **Eflows compliance and enforcement** with focus on monitoring and reporting provisions, use of penalties and fines.

These key elements of eflows legal and regulatory frameworks build the structure for the review and analysis of national policies presented in this report (see also Figure 2).

Figure 2 Key elements for the analysis of eflows national legal and regulatory frameworks



Eflows in national policy frameworks

Legal and policy provisions

In France, Spain, and Romania, policy requirements for eflows are anchored in national acts and definitions of eflows are included in the legal framework. In England and Finland, eflows are based on the river basin management plans and permit requirements, without specific legal provisions in national legislation. In England, there is a well-defined eflows indicator used for application in RBMPs by competent agencies. In Sweden, river basin environmental quality standards, which are established on the basis of the Environmental Code, refer to "sufficient flow".

Error! Reference source not found. summarises the key laws and other policy instruments relevant to eflows in the six countries studied, and **Error! Reference source not found.** presents the main eflows definitions in the national legal and regulatory frameworks.

Figure 3 Key legislative and other policy instruments for eflows in the six countries examined

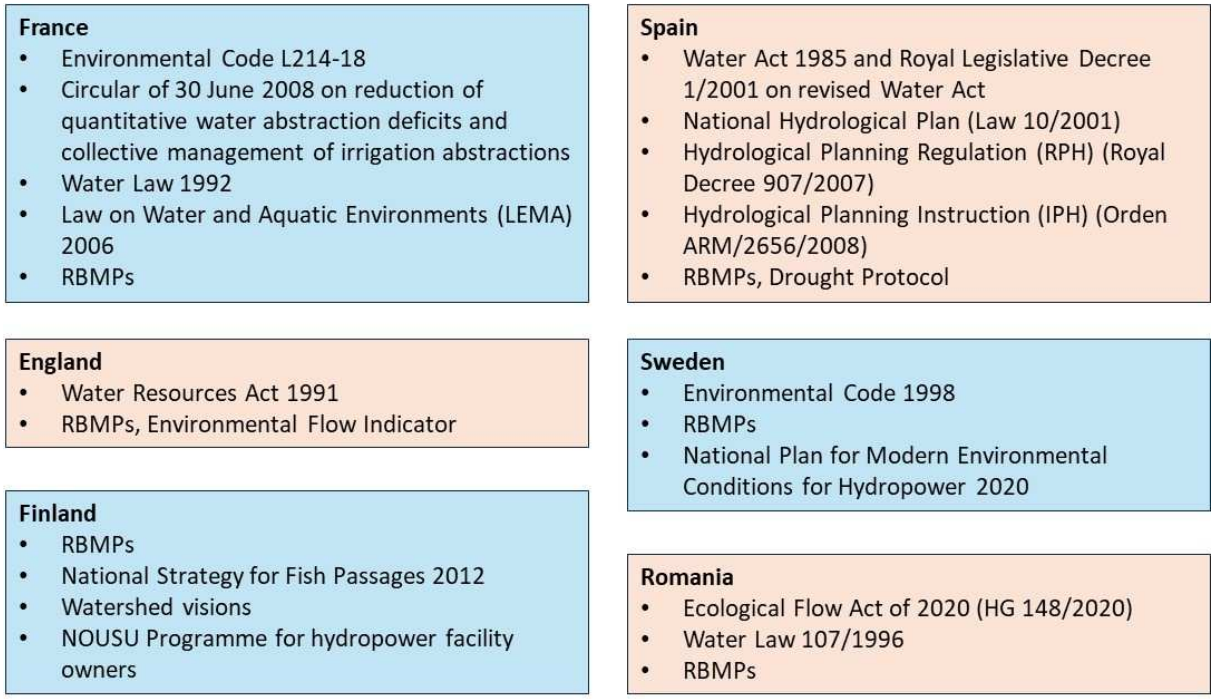


Table 2 Eflows definition in national legal and regulatory frameworks

Country	Definitions	Law
France	**Minimum biological flow ("Débit minimum biologique", DMB):** minimum flow guaranteeing permanently the life, reproduction and circulation of aquatic species **Minimum flow ("Débit plancher"):** intangible minimum flow, corresponding to the 1/10th or 1/20th of the average interannual natural flow **Reserved flows ("Débit réservé"):** minimum flow that must be maintained at any time downstream an infrastructure	Environmental Code Article L.214-18 Circular of 30 June 2008 relevant to the reduction of quantitative water

Country	Definitions	Law
	affecting the river bed. It must correspond to the highest value between the minimum biological flow and the minimum flow **Low flow target ("Débit d'Objectif d'étiage", DOE)**: the reference flow allowing good water status to be achieved and above which all uses are satisfied on average 8 years out of 10 **Drought management thresholds**: 'alert' and 'crisis' flows below which restrictions on water abstractions and uses apply so that essential water uses and the environment are prioritised in the event of droughts	abstraction deficits and collective management of irrigation abstractions Environmental Code Article L. 211-3 II 1°
Spain	**Ecological flow**: Flow that maintains, as a minimum, fish life that would naturally live in the river, as well as the riparian vegetation. Eflows shall be established in such a way as to sustainably maintain the functionality and structure of aquatic ecosystems and associated terrestrial ecosystems, contributing to achieving good status or ecological potential in rivers or transitional waters.	Spanish Water Act Hydrological Planning Regulation (RPH) (R.D. 907/2007)
England	The **Environmental Flow** Indicator (EFI) is used to make sure a water body meets good ecological status, and indicates the proportion of natural flows that are required to support the environment in any given water body. Depending on the sensitivity of the water body it typically indicates that somewhere between 80% and 90% of natural low flows are protected.	Defined in official Environment Agency guidance
Sweden	No eflows definition in legislation. Environmental quality standards set at river basin level refer to a **sufficient flow** (tillräckligt flöde) to maintain basic ecological functions in the natural stream or other relevant parts of the water body and to enable upstream and downstream migration for migratory species	n/a
Finland	No definition in legislation or official guidance	n/a
Romania	**Ecological flow**: the flow necessary for the protection of aquatic ecosystems, both quantitatively and in terms of its dynamics, in order to achieve the environmental objectives for surface water bodies provided for in art. 2.1 of the Water Law 107/1996. **Servitude flow**: the minimum flow required to be permanently left on a watercourse downstream of a dam work, consisting of the ecological flow and the minimum flow required for downstream users	Ecological Flow Act HG148/2020

France

The regulatory ecological flow in France is the **reserved flow ("débit réservé")**, as defined in Article L.214-18 of the Environmental Code which requires the setting of **minimum biological flows ("débit minimum biologique", DMB)** guaranteeing the life, reproduction and circulation of aquatic species downstream of every diversion infrastructure affecting river flow. Appendix 2 of the circular of July 5, 2011 relating to the application of article L214-18 presents the methods to help determine the reserved flow value (RF, 2011). Minimum biological flows are established based on studies focused on local hydrological statistics and considering the linkages between hydraulic and ecological conditions. In all cases, reserved flows cannot be set below a **minimum flow ("debit plancher")** representing 1/10th of the average natural annual flow, or 1/20th for rivers with an average natural annual flow above 80 m3/s. The 1/20th also applies as a minimum servitude for infrastructure used to produce peak-time electricity. The average flow rate should be based on all the years for which data are available, with a strict minimum of 5 years, and should recreate an estimated natural flow removing the impact of abstraction, discharges and water transfers. If the flow upstream of an infrastructure is below the reserved flow, the infrastructure owner is obliged to stop the operation, emphasizing the importance of maintaining flow levels (Interview French experts, 2024). In the absence of a specific study, the reserved flow is set at 1/10th of the yearly average river flow.

Other flow targets which are in place for quantitative management purposes include low flow targets (DOE) and drought management thresholds.

The **low flow target (Débit d'Objectif d'étiage, DOE**) is defined in circular of 30 June 2008 relevant to the reduction of quantitative water abstraction deficits and collective management of irrigation abstractions, defined as "*the reference flow allowing good water status to be achieved and above which all uses are satisfied on average 8 years out of 10*" (RF, 2008). Although not defined in the regulatory framework as the *ecological flow*, the DOE is a key quantitative water management target. It contributes to meet "good status" under the WFD and the requirement of Article L.211-1 of the Environment Code that aims towards a "balanced and sustainable management of water resources", which must make it possible to satisfy "the requirements of biological life in the receiving environment, especially fish and shellfish fauna".

Operationally, the DOE starts from minimum biological flow (DMB) established by Article L.214-18 of the Environment Code and adds it to the flows needed for downstream uses. They take the form of a monthly average flow value at nodal points (key management points in river basins and catchments) above which, it is considered that downstream of the nodal point, all uses (activities, withdrawals, discharges, etc.) are in balance with the proper functioning of the aquatic environment. Hence, minimum biological flows used for DOEs are estimated for strategic points of the catchment and river basin, unlike minimum biological flows used to establish "reserved flows", which only apply immediately downstream of storage, abstraction and derivation infrastructures.

The low flow target (DOE) is set in the catchment and river basin management plans (the SDAGE, SAGE and equivalent documents), and takes into account the development of uses over a certain horizon (10 years for the SDAGE). It can be assigned a margin of tolerance and modulated throughout the year depending on the regime (seasonality). The DOE objective is achieved by controlling upstream abstraction authorizations, by mobilizing new resources and water saving programs upstream and also by better functioning of the hydrosystem. Low flow targets are set in a nested manner, at the most downstream point of each hydrological sub-unit of the river basin, that is individual catchments, sub-catchments and other management units. The low flow targets (DOE) include both a minimum flow to maintain good ecological status and flows to maintain downstream human uses.

Target groundwater piezometric levels (or maximum abstraction volumes) are also set for aquifers connected to surface water bodies, to avoid a drop in aquifer levels impairing the achievement of minimum biological flows. The flow targets are considered achieved if it is observed, a posteriori, that the lowest 10-days average flow (or aquifer level) was maintained above 80% of its value. Flow targets must be met on average 8 years out of every 10. These low flow targets are used to calculate the sustainable abstraction

cap (for more information on the sustainable abstraction cap, see part A on water allocation of this deliverable).

Drought management thresholds are used in drought management and the regulatory framework for setting these thresholds is provided in the Environmental Code Article L. 211-3 II 1° based on the 1992 Water Law (RF, 1992) and the 2006 Law on Water and Aquatic Environments (LEMA) (RF, 2006). 'Alert' and 'crisis' flows (i.e. Débit d'Alerte and Débit de Crise) are used, below which restrictions on water abstractions and uses apply so that essential water uses and the environment are prioritised in the event of droughts:

- 'Alert' level is the average daily flow that indicates that water demand for all water uses downstream may not be met without impacting the aquatic environment. First restrictions on non-priority uses apply.
- 'Crisis' low flow is the average daily flow below which top-priority uses (e.g. essential drinking water provision for humans and animals, and good functioning of freshwater species) are endangered. Non-priority uses are not allowed for the abstraction of water.
- A 'vigilance' level is also set before the 'alert' level and a 'reinforced alert' level is set before the 'crisis' level in order to smooth the implementation of the alert level (some restrictions) to a crisis situation (full restrictions).
- Specific restrictions on water uses apply at each level. An equivalent system based on groundwater levels applies to unconfined aquifers. These targets are set considering the interaction between surface and groundwater, based on studies conducted during the planning process (SDAGE or SAGE).

Overall, different types of flow targets are used in water management in France. The concept of "minimum biological flows" established in Article L214-18 of the Environmental Code is nearest to the concept of Ecological Flows as defined at European level. Under the current regulatory regime, minimum biological flows are specifically required downstream of storage, abstraction and diversion infrastructure. At river basin level, they must be estimated and integrated when establishing low flow targets (DOE). In theory, low flow management targets in France do not necessarily focus on the summer low flows, but may vary throughout the year to recognize the varying flow conditions across seasons, and to ensure that the filling of reservoirs takes into account the natural variability of river flows.

Spain

Water scarcity faced in many Spanish river basins led to an early recognition in the 1985 Water Act (SG, 1985) of the need to establish and implement ecological flows as a restriction in water management. Since 2001, Spanish legislation requires the establishment of eflows as part of the elaboration of the River Basin Management Plans (RBMPs) (Law 10/2001 on the National Hydrological Plan, Royal Legislative Decree 1/2001 on the revised Water Act) (SG, 2001a; SG, 2001b). The Spanish Water Act established the ecological river flows as the flow that maintains, as a minimum, fish life that would naturally live in the river, as well as the riparian vegetation. The establishment of the environmental flow regime, as established in the Water Act, is compulsory content which must be included in the RBMPs.

Operationally, **ecological flows** are defined by Royal Decree 907/2007 "Reglamento de Planificación Hidrológica (RPH)" aligning with the requirements of the WFD. According to Royal Decree 907/2007 Art. 18, ecological flows shall be established in such a way as to sustainably maintain the functionality and structure of aquatic and associated terrestrial ecosystems, contributing to achieving good ecological status or potential in rivers or transitional waters (SG, 2007). The hydrological plan shall determine the regime of ecological flows in the rivers and transitional waters defined in the river basin, including the water needs of lakes and wetlands. For its establishment, the basin organizations will carry out specific studies in each section of the river. The latest amendment of the RPH is from December 2022, updating the requirements and procedures that are taken into account in the 3rd river basin plans and the special drought plans.

During the first cycle of the WFD planning process (RBMP 2009-2015), detailed guidelines for eflows determination within hydrological plans were deemed necessary. These guidelines were outlined in the "Hydrological Planning Instruction (IPH)" (Orden ARM/2656/2008), providing clear directives for calculating and establishing eflows (SG, 2008). The IPH explicitly established that eflows are not a use but a restriction prior to water use (Sanchis-Ibor et al 2022). According to the IPH, ecological flows definition includes the following variables for selected river control gauges (which are defined in each hydrological plan):

- Minimum flow that must be exceeded to maintain the spatial diversity of the habitat and its connectivity, ensuring habitat control mechanisms over the biological communities, in a way that favors the maintenance of the native communities. This is defined monthly for the selected control gauges at hourly/daily/monthly level.
- Maximum flow that must not be exceeded in the ordinary management of infrastructures, to limit circulating flows and thus protect the native species most vulnerable to these flows, especially in heavily regulated sections.
- Temporal distribution of the above minimum and maximum flows, with the objective of establishing a temporal variability of the flow regime that is compatible with the requirements of the different vital stages of the main species of native fauna and flora species present in the water body.
- Channel maintenance discharges (i.e., bank-full discharges), which are flood flows downstream of regulation infrastructures, especially hydropower plants, to control the presence and abundance of the different species, maintain the physico-chemical conditions of the water and sediment, improve habitat conditions and availability through geomorphological dynamics and favour the hydrological processes that control the connection of the transitional waters with the river, the sea and the associated aquifers.
- Maximum rate of change downstream of regulatory infrastructures, to avoid negative effects of a sudden variation in flow rates, such as the entrainment of aquatic organisms during upstream movement and their isolation in the downstream phase. Likewise, it must contribute to maintaining favorable conditions for the regeneration of aquatic and riparian plant species.

Eflows are defined for river control points and rivers highly regulated with dams or reservoirs. In the regulated rivers, which are the majority in Spain, reservoirs are controlled by the River Basin Authority that opens/closes the gates according to the 'exploitation plan' approved previously in the 'Drought Protocol'. The reservoirs release water specifically to maintain eflows in the critical months (summer) as the rest of the year (autumn to spring) abstractions are reduced (irrigation is minimal outside late spring / summer).

In the 2nd cycle RBMPs, efforts were specially focused on the establishment of minimum flows, both for standard hydrological scenarios and drought scenarios. Minimum flows were established in 73% of the river water bodies, whereas the rest of the variables, i.e., maximum flows, change rates and bank-full discharges had been defined in less than 8% of the river water bodies (Mezger et al., 2019), and implemented mainly in selected pilot locations.

England

The Water Resources Act 1991 includes a section on "minimum acceptable flows" which however does not refer to environmental needs but makes provisions for the minimum flow needed for safeguarding public health and for meeting the needs of existing lawful uses of inland waters, namely agriculture, industry, water supply or other purposes (UK Parliament, 1991).

There is no clear reference to ecological or environmental flows in the national legislation. Targets of good ecological status are set for WFD water bodies unless an alternative objective can be justified through the RBMP process. The flow must be sufficient to support the river biology. A nationally consistent method is used by the Environment Agency to analyse what abstraction recovery would be needed to meet environmental flows (**Environmental Flow Indicator**: EFI). The Environment Agency uses the EFI to make sure a water body meets good ecological status. The EFI is part of the procedure that informs decisions on

abstraction licensing. The EFI is not defined in national law but is part of the assessments carried out for the river basin management plans, that provide the framework for managing water bodies in the river basin districts in England (Environment Agency, 2021).

The EFI is used to indicate where abstraction pressures may start to cause undesirable effect on river habitats and species. It indicates the proportion of natural flows that are required to support the environment in any given water body. Depending on the sensitivity of the water body it typically indicates that somewhere between 80% and 90% of natural low flows are protected (Environment Agency, 2020). The EFI has translated for England the UKTAG river flow standards which vary by river type and flow, with stricter standards at lower flows and for water body types considered more sensitive to abstraction (Environment Agency, 2021).

Sweden

Eflows are not defined in national legislation; however, the Environmental Code includes a Chapter on environmental quality standards that are established on the basis of scientific criteria and that need to be complied with when granting a permit to a water activity (Swedish Parliament, 1998a, Chapter 5, Sections 3-5; SEPA, 2017, p. 18-19). On the national level, the surface water-related environmental quality standards are decided by the Swedish Agency for Marine and Water Management (SWaM) and the groundwater-related environmental quality standards are decided by the Geological Survey of Sweden (Swedish Parliament, 2004, Chapter 4, Sections 8-8b; Söderasp, 2018, p. 80). The environmental quality standards transpose the WFD's environmental objectives into the Swedish system; however, they do not specifically mention or define eflows (SwAM, 2019a). Nonetheless, these objectives form the basis for the river basin authorities' work when they develop ecological environmental quality standards for individual water bodies as part of the RBMPs (Michanek and Zetterberg, 2021, p. 203-204). The river basin environmental quality standards are decided on the basis of the Ordinance on Water Management (Swedish Parliament, 2004). They aim at ensuring the existence of a **sufficient flow** (tillräckligt flöde) to maintain basic ecological functions in the natural stream or other relevant parts of the water body and to enable upstream and downstream migration for migratory species (see e.g. County Administrative Board of Norrbotten, 2021; County Administrative Board of Västernorrland, 2021; County Administrative Board of Västmanland, 2021). Eflows are thus regulated through the environmental quality standards, which are covered in the RBMPs.

In 2017, SWaM defined eflows as the proportion of the natural flow of water that needs to be ensured in a watercourse in order not to risk negative ecological consequences. According to a model for determining ecological flow, 30% of the annual mean water flow (MQ) is recommended to maintain good living conditions for most aquatic organisms. When the flow after a water withdrawal is less than 10% of the annual average water flow during the summer season, fish and benthic fauna have been shown to decrease in number and production. An ecological flow needs to be ensured in the watercourse all year round, every day, and even at low tide. Water abstraction may have to be stopped when the water flow falls below the ecological flow. If water abstraction is still allowed below this level, the physical and chemical conditions of the water need to be investigated more closely and the water abstraction possibly limited/compensated. Appropriate flow regulations with regard to ecological flows need to be adapted for different geographical areas and ecosystems (SwAM, 2017). SwAM has also sought to increase awareness on ecological flows in watercourses used for hydroelectric power generation by publishing guiding material on the matter (e.g. Malm Renöfält and Ahonen, 2013).

Overall, policy discussions on eflows so far have focused on hydropower, and other sectors have received less attention (Interview Swedish civil servant, 2024). New legislation for the permit system of hydropower initiated in 2018 (amendment of the Environmental Code) may have further implications for the establishment of eflows in relation to the hydropower sector over the next 20 years (National Plan for Modern Environmental Conditions for Hydropower (Swedish Government, 2020)). Further details on the ongoing revision of hydropower permits to introduce more modern environmental conditions are given in the report section on "Changes to permits and water rights".

Finland

There is no clear reference to ecological or environmental flows in the Finnish legislation. However, permit regulations for projects that affect the water level or water flow in the water body "shall also, if necessary, include regulations on the maximum and minimum water level and arrangements for the discharge of water" (Finnish Parliament, 2011, Chapter 3, Section 10, Subsection 2). This in theory applies to all water bodies. In literature, this has been interpreted to mean the determination of water levels and their fluctuation in all times (Hollo, 2014, p. 149). This provision applies to permits granted for new projects. It does not discuss different seasons or flows (although discussing those is not specifically excluded, either).

Although eflows are not referenced in legislation, they are discussed in the RBMPs, highlighting that the development of the practices for the regulation of water bodies (river flows and lake water levels) will be essential in improving the ecological status of water bodies. The RBMPs interpret eflows as the adequate flow to ensure the functioning of the river ecosystem and to achieve good ecological status of the water body (e.g. Mäntykoski *et al.*, 2022, p. 166). Eflows are most often discussed in the context of returning the water flow to those parts of the watercourse that lost their waterflow as a result of water regulation (e.g. Räinä *et al.*, 2022, p. 91; Centre for Economic Development, Transport and the Environment of Lapland *et al.*, 2020, p. 54). For instance, the plan for the Vuoksi river basin proposes that one should aim at guaranteeing eflows, if the lack of flow prevents achieving good ecological status, and that methodologies for establishing eflows should be further developed (Kotanen, Manninen and Roiha, 2022, p. 109, 113).

In addition, most of the RBMPs highlight that the development of the water regulation practices should aim at restoring the environmental flow of dry, meaning old riverbeds. They use eflows as a term to describe the returning of adequate water flow to secure the river ecosystem and to restore to its natural status (or as close as possible). Defining eflows and investigating the possibilities of use are proposed for all riverbeds that are dry or left with little water due to hydropower operation (see e.g. Räinä *et al.*, 2022, p. 105). Yet, such measures only exist in the RBMPs on a very general level (Puharinen, Belinskij and Soininen 2024, p. 182). None of the current RBMPs includes a clear plan on the achievement of eflows. Thus, the development of water regulation practices and methods to assess eflows and to apply them in all RBDs is considered a priority policy proposal for eflows (Mäntykoski *et al.*, 2022, p. 125; Westberg *et al.*, 2022, p. 136, 140).

Further developments of advisory or planning nature which are relevant to the development of eflows in Finland are described below:

- Ecological flow is mentioned as a measure to be developed in the 2012 National Strategy for Fish Passages, drafted by the Ministry of Agriculture and Forestry (Finnish Government, 2012a, 2012b). The Government's decision concerning the National Strategy for Fish Passages recognizes that changes in legislation need to be discussed to implement eflows in the Finnish system (Finnish Government, 2012a, p. 12). The 2012 National Fish Passage Strategy indicates that measures to promote the migration and reproduction of migratory fish in those water bodies that hold potential for the protection and revitalization of nationally and locally notable fish stocks should be prioritized. Such measures include e.g. orienting the management of fish stocks towards supporting the natural life cycle of fish and developing fisheries regulation to safeguard fish passage (Finnish Government, 2012a, p. 6). However, the National Fish Passage Strategy has no basis in the legislation (no act/decree requires that such strategy is drafted and/or updated or specifies the responsible unit).
- Eflows can be discussed in the watershed vision (vesistövisio), which is a strategic planning document prepared in collaboration of all actors in a river basin and includes a vision for the future of the basin and the steps to achieve it. Typically, watershed visions aim at coordinating between the various water uses, good ecological status, and biodiversity, while not forgetting the anticipation of conflicts between actors and various uses and their improved management (see e.g. Peltonen *et al*., 2022). The watershed vision for the River Oulujoki, for instance, highlights the role

of eflows in improving the status of migratory fish populations. As part of its development, various assessments of the impacts of eflows to the hydropower plants were made. The report also recognizes the need for legislative improvements in the area (Marttunen *et al.*, 2023, p. 63-66, 140).

- The current 'NOUSU Programme', a voluntary programme for hydropower facility owners funded by the government, focuses on removing barriers to fish migrations (Ministry of Agriculture and Forestry of Finland, [no year available]).The programme has "succeeded in removing several dams and in funding measures to create bypass channels and enhance ecological flows. Among other things, the NOUSU Programme provides leverage funding for collaborative processes that aim to remove small hydropower dams. The programme is voluntary for hydropower facility owners. It makes use of a specific, science-based hydropower value assessment tool to establish the present net value of the facility" (Puharinen, Beliskij and Soininen, 2024, p. 183-184, footnotes omitted).

Overall, the most promising measures to improve eflows in the Finnish system are based on voluntary contributions and voluntary participation in their implementation, in particular the NOUSU Programme and the watershed visions. These voluntary processes are often driven by the government or regional authorities and have a participatory character. Nevertheless, these processes also clearly operate in the shadow of the law, since the current permit conditions, the possibilities and limitations of permit reviews provided in the law and the legal weight of the water management objectives may influence their results (Puharinen, Belinskij and Soininen, 2024, p. 184-185 footnotes omitted).

Romania

In Romania, eflows are defined and implemented through national legislation, the Ecological Flow Act of HG148/2020 (RG, 2020), which also outlines the method to determine and calculate eflows. The eflows must be ensured downstream of dams or water intake works located on water courses, it applies both to natural and to (heavily) modified water bodies, while the Act uses the natural flow regime as a reference base (RG, 2020). In cases when ensuring the eflows is deemed not feasible due to technical reasons or disproportional costs, this needs to be justified through specific technical-economic studies: the holders of the water management permit are responsible to conduct these studies within the timeframe and conditions established by law.

The Ecological Flow Act HG148/2020 (RG, 2020) defines **ecological flow and servitude flow** (minimum flow) according to the Water Law 107/1996 (RG, 1996), namely:

- ecological flow, as the flow necessary for the protection of aquatic ecosystems, both quantitatively and in terms of its dynamics, in order to achieve the environmental objectives for surface water bodies provided for in art. 2.1 of the Water Law 107/1996.
- servitude flow (in English translation), as the minimum flow as the flow required to be permanently left on a watercourse downstream of a dam work, consisting of the ecological flow and thenimum flow required for downstream users.

Further, the Ecological Flow Act of 2020 outlines the requirements and principles associated with eflows in Romania. The principles defining ecological flows state that they should be able to:

a) provide a full range of natural variability in the hydrological regime to protect the aquatic ecosystem;
b) be dynamic, variable in time and space, and have multiple values;
c) support the achievement and maintenance of environmental objectives in water bodies according to national legislation;
d) support ecological water requirements of for habitats and species in protected zones;
e) support the achievement of environmental objectives for groundwater bodies;
f) provide suitable habitats for aquatic fauna and integrate the needs of other types of biological organisms such as benthic invertebrates, phytobenthos, phytoplankton and macrophytes.

Eflows links to other elements in water policy framework

The following discusses the extent to which the legal and regulatory requirements for eflows in the analysed national frameworks address links to other key elements indicative of a more holistic approach to eflows. More holistic approaches to eflows take into account all aspects of a flowing water system including both surface and groundwater, the needs of ecosystems and species, the dynamic nature of rivers including their morphology as well as uncertainty in the light of climate change.

Eflows and groundwater levels

This concerns whether groundwater is acknowledged as key factor in supporting eflows and groundwater-dependent ecosystems. This linkage is addressed in the eflows policy frameworks in France, Spain, England and Romania.

Consideration of surface-groundwater connectivity is seldom addressed in environmental flow development due to a lack of methodologies that account for groundwater contributions to instream flow. Under changing climate conditions where extreme hydrologic conditions such as floods and droughts are increasing, water management frameworks that explicitly integrate groundwater and surface water conditions are needed to meet ecological flow needs and determine environmental flows that will support functioning river ecosystems and the aquatic community, improve river health, and sustain key ecosystem services (Yarnell et al. 2022).

- **France.** Management targets for groundwater linked to surface water bodies in the form of groundwater levels are defined, usually in catchment management plans, as well as in the drought thresholds.
- **Spain.** Primarily, the legislative definition of eflows pertains to surface water; however, groundwater is also impacted, particularly in cases involving groundwater-dependent water bodies (e.g., the Doñana wetlands, where groundwater abstractions are regulated to maintain wetland status). The connection between eflows and groundwater is addressed in the IPH, which stipulates that the ecological flow rate calculated according to specified criteria (as outlined in Article 18 paragraphs) should serve as a reference when determining the average interannual flow necessary for computing available groundwater resources.
- **England**. The calculation of the EFI involves the assessment of water availability at water body scale that uses among others also data on groundwater abstractions (natural flow data surface, water abstractions, groundwater abstractions, discharges and influences from reservoirs).
- **Romania.** The principles on which the determination of the ecological flow is based on according to the Ecological Flow Act 2020 include that the ecological flow must ensure that the environmental objectives for bodies of groundwater are achieved and maintained.

Eflows and biological quality elements or species

This concerns whether eflows requirements and definitions are linked to the good status of specific biological quality elements under the WFD or the survival of certain species. This linkage is addressed in the eflows policy frameworks in France, Spain, England, and Romania.

The Water Framework Directive, as well as the Birds and Habitats Directives, set binding objectives on protection and conservation of water-dependent ecosystems. These objectives can only be reached if supporting flow regimes are guaranteed. The establishment and maintenance of ecological flows is therefore an essential element in meeting those objectives. National frameworks for ecological flows should refer clearly to the necessity to link the eflows definition to biological requirements according to the objectives of WFD and the Birds and Habitats Directives (Sanchez Navarro, 2021).

- **France.** The regulatory framework requires the setting of reserved flows downstream of hydraulic infrastructures "*guaranteeing the life, reproduction and circulation of water species downstream of*

infrastructures affecting river flow." In addition, when defining the DOE, the setting of minimum flows for the environment requires flows that allow achieving good ecological status. In both cases (reserved flows and minimum flows), studies are usually carried out to assess the adequate flow targets. In recent years, there has been a more frequent, if not increasingly systematic, use of assessments of the impacts on habitats and species. In particular, studies setting low flow targets involves estimating a naturalised reference flow regime combined with the use of habitat and species modelling methods and complemented by site specific assessments.

- **Spain.** The link of eflows in particular to the survival of fish life is included in the Spanish Water Act. The Spanish Water Act establishes the environmental river flows as those sufficient to maintain at least fish life that would or could live under natural conditions and its riverbank vegetation. The IPH explicitly links eflows to spatial diversity of habitat and its connectivity, biological and native communities.
- **England.** When setting the Abstraction Sensitivity Bands under the EFI methodology, three criteria are considered. These are: the physical habitat of the river, fish monitoring, and invertebrate monitoring. With these elements in mind, the EA is able to categorise water bodies' sensitivity and allocate them to a specific Abstraction Sensitivity Band (ASB) to determine flow requirements (Interview English experts, 2024).
- **Romania.** The principles on which the determination of the ecological flow is based on according to the Ecological Flow Act 2020 include that the ecological flow shall support the ecological water requirements of communities/habitats and species in the protected zones, and that the ecological flows must be able to provide wintering, feeding and breeding habitats for aquatic fauna, integrating the needs of other categories of biological organisms: benthic invertebrates, phytobenthos, phytoplankton and aquatic macrophytes. However, the Act does not provide indications that specific biological aspects or indicators have been taken into account for the calculation of ecological flows.

Eflows, hydromorphology and sediment

This concerns whether eflows requirements and definitions are linked to the hydromorphological structure of water bodies including sediment. This link is addressed in the policy frameworks of France, Spain and England.

The CIS guidance on ecological flows (CIS, 2015) recommended to consider sediment dynamics and river morphology together with hydrology and hydraulics in order to determine eflows. Groundwater is the main factor supporting eflows in streams during low flow conditions in dry seasons. Groundwater will play a crucial role in maintaining the resilience of the water system and aquatic environment during projected increasingly dry periods in the future and more ecosystems will become groundwater-dependent (Kampa & Buijse, 2015).

- **France.** The link of eflows to hydromorphology and sediment is not set in the regulatory framework but studies establishing reserved flows below hydraulic infrastructures and low flow targets (DOE) should include consideration of habitats including hydromorphological conditions and sediments.
- **Spain.** The IPH explicitly links eflows to spatial diversity of habitats, habitat conditions, connectivity, sediment, and geomorphological dynamics.
- **England.** The criteria used to set the Abstraction Sensitivity Bands under the EFI methodology include the physical habitat of the river (in addition to fish monitoring, and invertebrate monitoring mentioned above).

Eflows and climate change

This concerns whether eflows requirements and definitions are linked to climate change. This link is addressed in the policy frameworks of Spain and, to some extent, France and England.

Eflows implementation under changing climatic conditions is a challenge. Generally, eflows strategies set out objectives based on the assumption of climate stationarity. However, if climate change is neglected in eflows planning, then strategies based on annual water availability will fail to deliver the intended long-

term flow regime, and particularly the frequency of higher flow events (John et al. 2021). Despite the high uncertainties involved in modeling climate change, there is a need to test current eflows management practices, adapt policy settings, and assess how they perform under different climate regimes to sustain eflows objectives (Poff et al. 2016).

- **France**. The link between eflows and climate change is not recognized in the regulatory framework, but in the guidance provided by river basin authorities when carrying out studies to establish DOE. During interviews, it was highlighted that there was ongoing debate on how to consider, when setting reserved flows and DOE, a change from a perennial to a temporary river regime ('rivière intermittente') due to changes in rainfall with climate change (i.e. as shown by a naturalized flow regime). On the one hand, it may be assumed that the change in flow regime is driven by climate change and not the uses. Hence reference conditions of intermittent rivers should apply. On the other hand, it could be assumed that the change due to climate change is driven by human pressures. Hence flows should be set to maintain the perennial nature of the river to enhance its resilience. Albeit these questions, there remain knowledge gaps on adequate reference conditions for intermittent rivers (Interview French experts, 2024).
- **Spain**. The link between eflows and climate change is recognised in the IPH in the provisions for monitoring the flow regime. Among others, the monitoring of the flow regime should incorporate into the process forecasts of the effect of climate change on aquatic ecosystems.
- **England**. The link between eflows and climate change is recognized in the National Framework scenarios developed to update the determination of water stress areas in England and explore longer term changes to protect the environment. The National framework scenarios are for planning purposes only, and more detailed local and regional analysis is required to inform decision making (Environment Agency, 2021b).

Table 3 Eflows links to other elements in water policy framework

Eflows requirements address following links	**France**	**England**	**Sweden**	**Finland**	**Spain**	**Romania**
Eflows and **groundwater**	Yes	Yes	No	No	Yes	Yes
Eflows and **status of specific biological quality elements or certain species**	Yes	Yes	No	No	Yes	Yes
Eflows, **hydromorphology and sediment**	Yes	Yes (physical habitat)	No	No	Yes	No (no explicit link)
Eflows and **climate change**	Unclear	Unclear	No	No	Yes	Unclear

Methodologies for establishing eflows in the policy framework

Although the techniques for establishing eflows can be categorized in a variety of ways, four basic groups of methodologies are widely recognised; hydrological methods, hydraulic methods, habitat simulation methods and holistic methodologies.

- Hydrological methods are based on the natural flow regime as a key variable in the structure and functioning of aquatic ecosystems, and usually rely on historical flow data in natural conditions.
- Hydraulic methods relate various parameters, from stream geometry to discharge rate, and the hydraulic parameter is used as a surrogate for habitat factors that are limiting for riverine biota.
- Habitat methods establish flow requirements on the basis of the hydraulic conditions needed to meet specific habitat requirements for biota. Habitat methods are based on hydraulic models that predict how water depths and velocities change with discharge, and these models are based on each species' range of preferences regarding habitat parameters.
- Finally, holistic methods aim to assess the flow requirements of the many interacting components (abiotic and biotic) of aquatic systems. The full spectrum of flows, and their temporal and spatial variability, constitutes the flows to be managed (Sanchez Navarro, 2021).

In France, Spain, England and Romania, there is one or more methodologies for establishing eflows anchored in the policy framework (see overview on types of methodologies used in Table 1Table 4). This is not the case for Sweden and Finland where no eflows methodology is specified yet in legislation or other policies.

Table 4 Methodologies for establishing eflows in case study countries

Methods	Hydrological method	Hydraulic method	Habitat method	Other approach
France	Yes	Yes	Yes	
Spain	Yes		Yes	
England				Yes
Romania	Yes			

France. Three approaches are typically used to establish eflows, depending on the available data and conditions of the catchment.

- The "hydrological" approach is based on the reconstruction of the "natural hydrology" of the watercourse, that is to say in the absence of uses (without withdrawals and replenishment). The principle is to base the DOE value on this so-called "natural" reference to ensure a minimum level of disturbance.
- The "hydraulic" approach is based on the modeling of hydraulic characteristics (water speed, water height, etc.) as a function of flow.
- The results from the hydraulic approach can then be coupled with species preference models by life stages or by groups of species for these characteristics. The species preference models are referred to as the "micro-habitat" method (e.g. ESTIMHAB). These models are not available for all species or all river types.

The hydraulic and micro-habitats methods make it possible to quantify the evolution of physical habitats for the species considered. They can also be used to simulate and compare management scenarios. They are by far the most commonly implemented.

Spain. The establishment of eflows regimes is based on the use of various technical tools including water resources assessment models, modelling of habitats and simulation models of management systems. The IPH, approved by Order ARM/2656/2008 (SG, 2008), of September 10, collects and develops the articles of the Planning Regulation Hydrology (RPH) (SG, 2007) and the Consolidated Text of the Water Law (SG, 1985). The IPH in section 3.4 broadly covers the issue of environmental flows, developing both its objectives and the phases in which it should be implemented and the methodologies to follow for this. The IPH proposes

the definition of minimum flow by integrating the flow computed by hydrological simulation to the ecosystem habitat.

The hydrological series is built based on SIMPA model (Sistema Integrado de Precipitación Aportación) that gives the monthly flows for significant water bodies (river segments). Based on this national database, each Basin Agency makes detailed analysis of base flow at daily basis and adapts the hydrological model to define the natural regime for a 20-year series. From this basis, an estimation of habitat is done, and the methodology is adapted to each river basin considering type of geological substrate (granitic, karst, etc.), location (upper, medium, lower basin) and other specific characteristics (location) (CEDEX, 2010).

The IPH also proposed the application of habitat modelling methods in representative sections based on hydraulic simulation, coupled with the use of habitat preference curves for some target species, allowing curves to be obtained that relate the potential useful habitat to the flow (Sanchis-Ibor et al 2022).

The simulation models of management systems serve to gauge the effect of eflows regimes on the availability of water for economic activities and are essential to feed the consultation process and to design an appropriate implementation strategy. In Spain, the Aquatool-DMA tool has been used as a general support to the planning process. It is used to evaluate the impact on water uses of different alternatives for the implementation of minimum flows in rivers (MITECO, n.d).

England. The Environmental Flow Indicator is part of the overall methodology of the Environment Agency to calculate water availability on a water body scale and develop scenarios that inform decisions on changes to water abstraction to protect the environment. To calculate water availability, a database is used that looks at the balance between the flow in the river, the quantity needed to support the ecology and the water that can be licensed for abstraction. For each water body, the starting point is the natural flow that would be in the river in the absence of any artificial influence. Data used include natural flow data (what flows would be under natural conditions) and artificial influence data including surface water abstractions, groundwater abstractions, discharges and influences from reservoirs. Further, an Abstraction Sensitivity Band (ASB) of high, medium or low sensitivity to abstraction is assigned to each water body based on a combination of physical, macroinvertebrate and fish typology. The ASB defines the EFI (Environmental Flow Indicator), which indicates the quantity of water that should be maintained in the river to protect the ecology and subsequently the amount of water that can be allowed for abstraction (Environment Agency, 2020).

The Environment Agency screens all river waterbodies (except those in flow regulated rivers) to show where abstraction impacts may be causing flows to fall below EFIs when the flow is low. A water body is compliant with EFI when recent actual flows are above the EFI at low flows. Non-compliance with the EFI is divided into 3 categories depending on how far below the EFI recent actual flows are: 1) recent actual flows are up to 25% below the EFI at low flows; 2) recent actual flows are up to 25-50% below the EFI at low flows; and 3) recent actual flows are greater than 50% below the EFI at low flows (Environment Agency, 2022).

Finland. Even though eflows are not defined in legislation, there have been pilots to develop methodologies for assessing them. There is no consensus over the methodology that should be used and the absence of a standardised methodology is identified as a key barrier to eflows implementation. Overall, if the legislation is not modified, further developing eflows will be challenging (Interview Finnish civil servant, 2024).

In 2023, a report was published by the Finnish Environment Institute on the implementation of environmental flows and criteria and prioritization method based on the assessment of ecological benefits (Turunen *et al.*, 2023). This report refers to environmental flows (not ecological flows) and seeks to respond to the need to "systematically assess where environmental flow could yield the largest ecological benefits and where further work on the implementation should be conducted" (Turunen *et al.*, 2023, p. 5). The study presents environmental criteria and develops "a prioritization method that can be used as a guidance

to assess where implementation of environmental flow might yield the best ecological benefits. The selected criteria emphasize the benefits for migratory fish species, which are typically the target species in environmental flow applications. Prioritization was done for 219 hydroelectric powerplants in Finland. This report is not a guidance document that for instance the permit authorities would be required to follow when they assess/reassess permit proposals; rather, it seeks to propose an assessment method and way of identifying the instances in which the eflows implementation would have the biggest ecological impacts (Turunen *et al.* 2023, p. 6).

Romania. The eflows methodology defined in Romania in the Ecological Flow Act of 2020 is a primarily hydrological approach (method RoEflow). It consists of a variable flow of three values, depending on the hydrological regime and forecast. The hydrological approach is (simplistically) correlated with critical periods of fish species, though does not update ichtyofauna studies or consider hydromorphological or hydraulic elements (Ilinca & Anghel, 2023). The hydrological studies necessary for determining the ecological flows are carried out by public or private institutions certified by the central authority in the field of water.

The Act provides explicitly the condition to update the method pending on new evidence and available technology. There are proposals developed to update the primarily hydrological approach (method RoEflow) and incorporate linkages between hydrological regime and aquatic habitat (Gălie et al, 2021). An important issue of contention regarding eflows concerns the impact of the hydropower uses, particularly the impact of capacities smaller than 10MW. The alignment of the river classification and evaluation of hydromorphology to the European standard EN 14614:2004 and updating the methodology would help align the hydromorphological assessments, and there are methods developed to support that goal (Stanca et al, 2023).

Eflows implementation

The implementation of environmental flows involves various regulatory mechanisms, typically carried out through water abstraction licenses or permits, reservoir operation licenses, water allocation plans, and annual water allocation rules (Speed et al., 2013). Details on how water is allocated and can be re-allocated for different water uses, including the environment, are provided in part A of this report which focuses on water allocation regimes. In the following, we focus on mechanisms which are in place in the countries studied to revise permits, licenses, authorisations and water rights, in order to set flow conditions according to eflows requirements. Subsequently, we review if and how the regulatory framework of the countries address eflows implementation under drought conditions.

Changes to permits and water rights

France. Reserved flows are gradually adopted as they apply to new authorisations, renewal of existing authorisations, or of existing authorisations upon request of the State. Article L. 214-18 of the Environmental Code establishes that the minimum biological flows (DMB) apply also to existing works and should be integrated at the date of renewal of their title, and no later than January 1, 2014. However, in practice, this date proved to be unrealistic. In particular, the minimum flows set under the DOE procedure and the definition of a Sustainable Extraction Limit (SEL, see water allocation part A for details) have not led yet to systematic review of existing permits. A partial exception are permits for agricultural irrigation in priority basins for quantitative water management, where individual permits have been cancelled and integrated into a collective permit held by Agricultural User Associations. These collective permits must in theory match the requirements of the SEL, although permits have so far usually included a transition period.

Spain. The 1985 Water Act (SG, 1985) declares all water (surface and groundwater) as public property. However, it allows for the preservation of pre-existing water rights established under the former Water Law (of 1879) under the condition of 'use it or lose it'. Each River Basin Authority maintains a Catalogue of Private Waters, listing water uses classified as private under the Water Law of 1879. Owners of these rights could choose to maintain them under this regime by declaring their existence to the basin organization within a specified period (but not after). The volume of water under this regime is relatively small compared to post-1985 water rights, although exact figures are not available.

In principle, ecological flows in Spain take precedence over water use rights, making water use rights subsidiary to ecological flows. Thus, eflows have the status of a 'priority-constraint' and water users must respect them (majority of users with post-1985 public water rights and the minority registered in the catalogue of private waters under the 1879 Law). As most water rights are public, the Government may reduce their annual or seasonal volume in order to guarantee the eflows. Exceptions may apply during drought periods. Although there are no detailed figures, old water rights are usually groundwater abstractions and they can be subject to constraints in case of aquifer over-abstraction or drought management.

England. While legislation in 2003 enabled new licenses to be time-limited, it did not provide a mechanism for the systematic revision of existing licenses that impact eflows. Progress toward re-allocating water from existing uses to the environment is driven primarily by legal imperatives of the EU Habitats Directive and has been slow to date. There is currently a shift towards Environmental Permitting Regulations, which will require licenses to be reviewed every six years. A small surcharge on water license charges provides limited financing for re-allocation. Powers to revoke and time-limit existing licenses are currently being considered by the UK government, alongside market-based mechanisms to encourage reductions in unsustainable abstraction (Interview English experts, 2024).

Sweden. Most Sweden's hydropower plants were built prior to modern environmental legislation, which resulted in 90% of the country's plants being granted unlimited legal concessions to operate. This also meant that there were few fish passes and that the statutory minimum water flow requirements were often insufficient to ensure good ecological status (Lindstöm and Ruud, 2017). Sweden went through a major renewal of the permit system for hydropower in 2018. The 2018 amendment to the Environmental Code establishes a general obligation on hydropower operators to ensure that their operation is consistent with 'modern environmental conditions', also meaning that a facility's permit conditions relating to the protection of human health or the environment are not older than 40 years (Swedish Parliament, 1998a, Chapter 11, Section 27(1); Puharinen, Belinskij and Soininen, 2024, p. 174-175). Modern environmental conditions must apply to water activities to produce hydropower that require a permit (water regulation, water diversion, water transfer or other influence on the flow of water). This also includes the existing water activities (Michanek and Zetterberg, 2021, p. 356-357). If the permit conditions are older than 40 years, the operator needs to apply for a permit review by 2037 (Swedish Government, 2020). All existing hydropower licenses will be reviewed over the next 15 years. Unlimited concessions will no longer be granted, with a maximum for new concessions of 40 years. Additionally, a greater focus will be placed on environmental goals, including minimum environmental flows (SwAM, 2019b). According to Michanek and Zetterberg (2021), this national hydropower plan is only indicative for individual operators, as their environmental conditions are determined by applying the rules of the Environmental Code (p. 358). The affected hydropower companies may apply for compensation from the Hydropower Environmental Fund (Swedish Government, 2020).

Finland. In Finland, water allocation takes place through the permit procedure, but the established priority of water uses does not refer to eflows (Finnish Parliament, 2011, Chapter 4, Section 5, Subsection 2). Further, the lack of a clear timeline in the regulatory framework to review old water rights and existing permits is one of the key problems in the Finnish regulatory system for the introduction of eflows (see e.g. Puharinen, Belinskij and Soininen, 2024). Given the permanence of permits, old permits that grant the right to abstract water exist. The Water Act includes transitional provisions for water regulation permits (Finnish Parliament, 2011, Chapter 19, Section 7), according to which "if a regulation project for which a permit was

issued before 1 May 1991 has considerable detrimental impacts on the aquatic environment and its use, the competent state supervisory authority shall investigate the possibilities to reduce the detrimental impacts of the regulation". After this investigation, "the state supervisory authority, the fisheries authority or the municipality may apply for a review of the permit regulations or impose new regulations, if the detrimental impacts cannot otherwise be reduced to a sufficient extent". However, Section 7(3) of the Water Act limits the applicability of this provision by spelling out that the benefit to be gained from the review must be significant in the view of the circumstances. This is to be analysed from the perspective of public interest. In addition, the review cannot "considerably reduce the overall benefit gained from regulation nor fundamentally change the original purpose of regulation, unless such a purpose has already lost its significance". Section 7(4) also includes provisions on compensation.

For eflows in specific, the regional administration's expertise and knowledge has been central in advancing eflows implementation even though the permitting system and legislation have not required it. As a result, there have already been some instances where permit holders (private or the Finnish State) have applied for a permit modification to ensure eflows (Interview Finnish civil servant, 2024).

Romania. LAW 122 of 2020, which amended and supplemented the Water Law 107/1996, defines that the servitude flows (consisting of the ecological flow and the minimum flow required downstream of a dam or water intake work), which are mandatory in riverbeds, are calculated in hydrological studies developed by public or private entities, are certified by the central water management authority and are provided for in the water management permit or authorization. The Law does not specify whether the provisions apply only to new authorizations or also to amendment of existing authorizations to introduce eflows. The Ecological Flow Act of 2020 (Article 5) states that the operating regulations related to dams or water intake works are to be revised in order to ensure downstream ecological flows but makes no further reference to the system of permits and authorizations or a timeline.

Eflows changes under droughts

Prolonged droughts can prevent the achievement or the maintenance of ecological flows. As drought is part of the natural hydrological variability which is a key element in the functioning and the natural dynamics of aquatic ecosystems, some countries take account of the ecological conditions of natural droughts in the definition and implementation of ecological flows. In France and in Spain, provisions for eflows in legislation and regulations consider natural droughts. Further, in these countries, the regulatory framework allows for reduction of eflows under drought conditions. The aspect of droughts is not specified yet in the regulatory framework for eflows in Sweden, Finland, England, and Romania.

In France, studies defining reserved flows and low flow management targets recreate the natural hydrology of the river. Targets usually consider the QMNA5 (flow characteristics during dry years).[1] Specific provisions are included in the legislative framework, recognizing the temporary nature of some rivers or their natural drying out during the dry season.

Article L. 214-18 of the Environmental Code allows the administrative authority to exceptionally and temporarily set reserved flow rates lower than their nominal minimum value, when a watercourse is subject to exceptional natural low flow. According to 2011 Circular on the implementation of Article L.214-18, these exceptional conditions must be understood as having a return period less than ten years. In such situations, if the flow immediately upstream of the structure is lower than the temporary reserved flow set by the authority, no abstraction is possible and the entire incoming flow must be passed downstream. It is appropriate to avoid the repeated implementation of these exceptional provisions which could have

[1] Five-year low water flow (or QMNA 5) is a monthly flow that is exceeded on average four years out of five. The QMNA 5 is the reference low water flow for the implementation of the water policy. https://glossaire.eauetbiodiversite.fr/en/taxonomy/term/2?page=19

significant consequences for the aquatic ecosystem and its capacity for regeneration. For example, rivers in regions characterized by pronounced natural low water levels will not be able to justify regular application of this provision. Further, the regulatory framework in France restricts, and may even prohibit, both surface and groundwater abstractions at low flows in dry periods.

In Spain, according to Article 18 of the Spanish Hydrological Planning Regulation (RPH), a prolonged drought situation allows the justified reduction of the eflows of water bodies as established in the RBMPs (SG, 2007). A less demanding flow rate regime may be applied provided that the conditions laid down in the RPH on the temporary deterioration of water body status are met. When a drought is declared including risk of shortages to domestic supply, the Drought Management Protocol (DMP) applies, which is revised according to the 6-year WFD planning cycle, and the eflows are reduced according to the drought declaration. The Real Decreto 1159/2021, de 28 de diciembre, revised the Drought Management Protocol including indicators for droughts and scarcity which declare the status of emergency/alert/normality. When emergency status is declared, eflows are reduced and water rights (both surface and groundwater rights) are limited (SG, 2021).

In England, the regulatory framework can limit or prohibit both surface and groundwater abstractions in dry periods. Restrictions on abstraction are first based on 'hands-off flows', which are usually added as a condition on a license to allow a certain amount of abstraction. For example, the hands-off flow at Q95 means that 10% can be abstracted ("take"). During more severe droughts, drought orders may be issued to establish stricter restrictions during which only drought permits – usually reserved for essential uses such as drinking water – are allowed to abstract (Interview English experts, 2024). In the dry summer of 2022, the Environment Agency was supporting river flows via its water transfer schemes (moving water around locally to support environmental flows and abstraction for water users), releasing water from reservoirs and by taking water from groundwater sources (Environment Agency, 2022b).

In the catchment abstraction management strategy (CAMS), which translates the RBMPs and the water abstraction plan into the licensing policy, all river water bodies are screened (except those in flow regulated rivers) to show where existing abstraction impacts cause flows to fall below EFIs when the flow is low (Environment Agency, 2021).

For Sweden, Chapter 2, Section 10 of the Act (1998:812) Containing Special Provisions concerning Water Operations stipulates that in the event of a serious water shortage, the entity responsible for the water operation and the person/entity that has access to the water resource must withhold the water that is unavoidably necessary for the public water supply or for any other public need, if the water shortage is caused by drought or any other comparable circumstance (Swedish Parliament, 1998b). This provision aims at securing the public water supply or other general causes, such as threatened crop failures. It applies in times of disaster-like events, such as droughts and severe winters. There is no specific mention to the needs of the environment in this regulatory context.

In Finland, in case there is a long-term drought or another similar reason that causes a considerable decrease in the supply of water, the quantity of water abstracted by a water abstraction facility may be restricted for a fixed period. The aim is to secure the water for ordinary household use or for community water supply (this is to be prioritized even in normal conditions). The restriction comes from the permit authority which decides the matter based on an application filed by the entity that needs water. If the restriction causes unreasonable loss of benefit to the owner of the water facility, the permit authority may, upon application, order the applicant requesting the restriction and others gaining an essential benefit from the restriction to compensate for the loss of benefit (Finnish Parliament, 2011, Chapter 4, Section 10; also Finnish Government, 2009, p. 85-86). However, there is no specific mention to the needs of the environment in this regulatory context.

Responsibilities and involvement of stakeholders

Competent authorities for eflows

The governance system on eflows in the six studied countries consists of authorities with competence in overall eflows policy design, eflows definition and implementation in the RBMPs, competence in the permit system and in monitoring and compliance checking. In most countries, eflows policy design is in the hands of Ministries or Agencies working at national level. The definition and implementation of eflows in the RBMPs is carried out by river basin authorities or other authorities with equivalent competence for the RBMPs e.g. the County Administrative Boards in Sweden, the Centres for economic development, transport and the environment in Finland and the Environment Agency in England. For details on permit authorities and authorities with competence on monitoring, see detailed descriptions for each country below.

France. The Environment Ministry in the form of its decentralised services at the level of the départements (DDT(M)) is the competent authority on eflows established by the 1992 Water Law (RF, 1992) and the 2006 Law on Water and Aquatic Environments (LEMA) (RF, 2006). The following authorities share competences on eflows:

- Lead on eflows policy: Environment Ministry and its services in the DDT(M). They ensure that reserved flows are included in the conditions of permits for infrastructure affecting the hydrology of rivers.
- Eflows definition in RBMPs: River basin authorities establish the target flows (management targets including minimum biological flows in addition to flows needed for specific uses) under the control of the River Basin Management Council[2].
- Issuing and revising permits that respect eflows: Environment Ministry in the form of the decentralized services in each Département (DDT(M))
- Monitoring, enforcement and compliance with eflows: The water police in France is in charge of enforcement. The water police is mainly under the responsibility of the Environment Ministry and consists of officials in the decentralized state technical services at the Department level (DDT(M)). The national Office for Biodiversity also has a supporting role.

Spain. The main competent authorities for eflows implementation are the River Basin Water Agencies (one Agency per river basin). The Directorate-General for Water at the Ministry for Ecological Transition, with the support of CEDEX and various scientific and academic experts played a key role in the first phase of discussion and definition of eflows methodologies. The establishment of eflows regimes, their monitoring and implementation is the responsibility of the River Basin Agencies, following the governance framework that is primarily set out in the Hydrological Planning Regulation (RPH) and Public Hydraulic Domain Regulation (RDPH). The following authorities share competences on eflows:

- Lead on eflows policy: Ministry for Ecological Transition and Demographic Challenge, Directorate General for Water (DGA), and the River Basin Water Agencies.
- Eflows definition in RBMPs: River Basin Water Agencies
- Issuing and revising permits that respect eflows: River Basin Water Agencies
- Monitoring, enforcement and compliance with eflows: River Basin Water Agencies

England. The Environment Agency is the regulatory body responsible for managing water resources in England. The Environment Agency controls how much water is taken in the permitting system, it regulates existing licenses and grants new ones. The Environment Agency has all relevant competence on eflows

[2] See water allocation report for the composition of this multi-stakeholder organisation; the State is one stakeholder amongst others in this decision making body, but has a major influence in the definition of these targets.

policy; eflows definition in RBMPs; issuing and revising permits that respect eflows; monitoring, enforcement and compliance with eflows.

Sweden. The County Administrative Boards (CABs) are responsible for implementing the RBMPs, which spell out any eflows requirements. The following authorities share competences on eflows:

- Lead on eflows policy: SwAM (supporting and coordinating role and provides national guidance on water management).
- Eflows definition in RBMPs: Eflows definition is not visible in the current RBMPs; however, the County Administrative Boards decide the environmental quality standards for their water district (Swedish Government, 2020, Chapter 4, Section 1).
- Issuing and revising permits that respect eflows: The Land and Environmental Court examines permit applications concerning water activities.
- Monitoring, enforcement and compliance with eflows: The County Administrative Board supervises the vast majority of water operations.

Finland. The RBMPs name the Ministry of the Environment and the Ministry of Agriculture and Forestry in Finland as the two responsible units for developing eflows practices. They should act in cooperation with the Centres for economic development, transport and the environment,[3] the operators of hydropower facilities, and research institutions (e.g. Kotanen, Manninen and Roiha, 2022). The following authorities share competences on eflows:

- Lead on eflows policy: Ministry of the Environment and Ministry of Agriculture and Forestry (both are responsible for developing policies on eflows and their measurement).
- Eflows definition in RBMPs: Centres for economic development, transport and the environment (responsible for preparing RBMPs) (Finnish Parliament, 2004, Section 5).
- Issuing and revising permits that respect eflows: Regional state administrative agencies as the permit authorities according to the Water Act.
- Monitoring, enforcement and compliance with eflows: Centres for economic development, transport and the environment; they are responsible for overseeing the Water Act and the permits. Operators (permit holders) take care of monitoring.

Romania. The relevant authorities with competence on eflows are the Ministry of Environment, Water and Forests, and the National Administration "Romanian Waters". The latter bears the core responsibility for the development and implementation of all the strategies and policies regarding water management, including eflows. The National Administration „Romanian Waters" or its subdivisions, namely the River Basin Administrations, are responsible for issuing water permits. The Ministry of the Environment, Waters and Forests drafts and enforces regulations and supervises the National Administration "Romanian Waters".

Involvement of stakeholders

Participation schemes for stakeholders and water users who may be impacted by relevant measures are particularly crucial for the achievement of eflows. Success will ultimately depend upon effective interaction with stakeholders, from politicians to local users, and the ability to communicate the need for ecological flows among those whose interests are affected (Sanchez Navarro, 2021). The following examines how

[3] The centres for economic development, transport and the environment prepare the RBMPs in Finland (Act on the Organisation of River Basin Management and the Marine Strategy, Section 5). There are seven RBDs in Finland (Åland is not included in this count) and fifteen centres for economic development, transport and the environment. A river basin may thus overlap with the jurisdiction of multiple centres.

stakeholders are involved in the implementation of the policy framework for eflows in the six studied countries.

France. Implementation of management targets in RBMPs and catchment management plans are the shared responsibility of users, organized in three "colleges"[4] and supported by the River Basin Authority (in relation to RBMPs) and specialized technical river syndicates in charge of developing and implementing the catchment management plans for the catchment management councils. Overall, the determination of eflows, whether through dedicated studies or EVPs (Studies of allowable withdrawals that define allowable entitlements at the sub-basin/aquifer levels, as well as eflows values), is a technical study largely remote from the user concerned. Stakeholder involvement is stronger in catchment management planning as well as drought planning. Molle and Collard (2024), for example, have shown how the political process of defining and enforcing eflows could be contested.

Spain. The Hydrological Planning Regulatin (RPH) determined that the process of implementing the ecological flow regime is to be developed in accordance with a consultation process that will take into account existing uses and demands and the regime of concessions, as well as good practices. The Hydrological Planning Regulation IPH (ARM 2656/2008) defines three stages in eflows planning process (SG, 2008). First: technical studies and composing of draft proposal; Second: public participation process; Third: definition and implementation. Stakeholders (urban utilities, irrigators, citizens, etc.) are involved in RBMP design in general which includes consultations and negotiation process (at least in strategic surface water bodies) with the aim of making water use rights compatible with the eflows regime (see Annex on case study of Spain in Kampa & Schmidt (2023)). Water users can express opposition during the RBMP development. However, once the RBMP is approved by Government (Royal Decree), it has a legal status and must be respected. Monitoring is done in a public and transparent way (public online access) and the Water Agency is responsible for implementation and enforcement.

Sweden. Stakeholders, such as government agencies, municipalities, interest organisations and the industry, participated in preparing the plan for the modern environmental conditions of hydropower introduced in the 2018 update to the Environmental Code (Swedish Parliament, 1998c, Section 29-31). The plan describes the procedure and the involvement of stakeholders in its making: for instance, there were a number of opportunities to submit views, including through specific collaboration issues on the timetable and review groups. Dialogue meetings were held with authorities and industry and stakeholder organisations to obtain additional views. During the consultation, five regional consultation meetings were held where all stakeholders had the opportunity to participate. In order to provide the conditions for a well-established plan, special collaboration has taken place with the County Administrative Boards and water authorities. The Swedish Environmental Protection Agency, Kammarkollegiet and the Swedish National Heritage Board have also participated in the work, and the Swedish National Courts Administration has had the opportunity to submit views on the timetable so that the courts are given the conditions for appropriate planning (Swedish Government, 2020, p. 2; 6-7).

Finland. The preparation of the RBMPs is governed by the Act on the Organisation of River Basin Management and the Marine Strategy (Finnish Parliament, 2004). Section 15 of the Act concerns stakeholder participation in the RBMP *preparation* process. For managing the preparation process, each Centre for economic development, transport and the environment needs to arrange sufficient cooperation and interaction with the different authorities and other parties in its operating area by establishing a cooperation group (Finnish Parliament, 2004, Section 14). The government proposal explains that such a group should involve authorities and other stakeholders (Finnish Government, 2004, p. 45-46). The RBMPs

[4] First college: 40% representatives of general and regional councils and, mainly, representatives of municipalities or their groups competent in the field of water
Second college: 40% representatives of water users and aquatic environments, socio-professional organizations, approved environmental protection and consumer defense associations, fishing representative bodies and qualified people
Third college: 20% of representatives of the State or its public establishments concerned

then indicate the parties relevant to the implementation of each aim set in the plans; however, stakeholders other than the owners of the hydropower facilities tend not to be listed.

Further, the voluntary processes in the NOUSU programme on dam removals and watershed visions, which are at present the most promising measures to improve eflows in the Finnish system, can be described as collaborative, bottom-up processes. They are voluntary and participatory and their governance objectives are decided in a collective decision-making process instead of being set out in the law (Puharinen, Belinskij and Soininen, 2024).

England. Stakeholders are not consulted with regards to determining flow requirements for catchments. This process takes place at the national level and is coordinated between the Environment Agency and the UK Technical Advisory Group (UKTAG). Stakeholder consultations occur every six years through the river basin planning process, but this consultation is not oriented on eflows (Interview English experts, 2024).

Romania. The Ecological Flow Act of 2020 does not foresee any specifications for public consultation on the setting of eflows values (RG, 2020). Overall public consultation on water management issues is carried out in the context of river basin management planning. Romania has a national RBMP which consists of a synthesis of the eleven RBMPs and has been updated for the period 2022-2027. The public consultation in the elaboration of the second generation of the RBMPs consisted of two steps: first, providing the relevant information online and, second, organizing consultations with water users in River Basin Committees for the preparation of the RBMPs and of the plans for drought restrictions (Ioana- Toroimac et al, 2018).

Eflows compliance and enforcement

Compliance and enforcement of eflows requirements is closely linked to the presence of appropriate monitoring and reporting systems as well as provisions for penalties and fines in the regulatory framework.

Monitoring and reporting

Monitoring programmes should be adapted to provide an improved picture of hydrological alterations and their impact on habitat/morphology and biology and to effectively support the achievement of ecological flows. The development of operational hydrological monitoring should relate to the surface and groundwater hydrological pressures and be prioritised where action is likely to be needed. The integrated monitoring of hydrological, morphological and biological quality elements will enable the estimation of the effectiveness of flow restoration actions (Sanchez Navarro, 2021).

The following examines to what extent national regulatory frameworks in the studied countries include legal obligations to monitor eflows at large infrastructures/major water intakes as well as at other parts of the river network affected by smaller abstractions and intakes. Specific requirements for monitoring of eflows are in place in France, Spain and England. The policy frameworks of Sweden, Finland and Romania do not include specific provisions for eflows monitoring, although water flows may be monitored as part of general obligations to monitor activities related to abstractions.

France. Article L. 214-18 of the Environmental Code foresees that for works to be built and existing works for which authorization or concession is renewed, the administrative authority will impose the establishment of a control/monitoring system at the expense of the petitioner. The administrative authority should propose the establishment of appropriate monitoring methods allowing for a rapid and easy recording, reporting and control of the water use. In addition, the services responsible for water policing will have to establish a water control plan to monitor the “reserved flows” of the infrastructures.

This control plan will primarily target existing works for which the water regulations or specifications do not impose a control device.

When the administrative authority sets a reserved flow, it may impose monitoring to assess the impact of the new minimum flow on the environment in order to readjust it later if necessary. This prescription must be motivated by the ecological issues linked to the watercourse and the impact of the dam. This monitoring may include physicochemical analyses, biological (macro-invertebrates, fish, etc.), and hydromorphological monitoring. Follow-ups must be proportionate to the present ecological issues and the impacts of the work on the watercourse. This monitoring can integrate data from pre-existing monitoring (WFD monitoring, other legislation) if the location of monitoring stations proves relevant for monitoring the impact of the new reserved flow. However, in practice, the State does not have the capacity to do much of such monitoring.

For low flow targets (DOE), there is a surveillance programme managed by the water agencies at river basin levels and by water managers of catchment management plans. A surveillance programme of Low Flows (ONDE) is managed by the State (Office Francais pour la Biodiversité).

Enforcement is tasked to the water police (officials from the state technical services at the Department level or belonging to the national Office for Biodiversity). They may control river flows downstream of abstraction points to check conformity with the reserved flows or DOE. However, the water police has been weakened by reductions in staff and pressure from agricultural lobbies. It may even sometimes be instructed by the Department-level state representative (the prefect) to turn a blind eye to unlawful abstraction. The water police is mainly activated in cases of gross violation or in times of severe restrictions.

Spain. The River Basin Management Plans (RBMPs) mandate the monitoring of eflows at critical gauges along surface waterways, such as rivers. This legal requirement applies specifically to gauges identified with defined eflows parameters in the RBMP. All river basin authorities have in place a public accessed 'on-line' tool to monitor the eflows status (on-line-automatic-real time monitoring).[5] This is a transparent tool which is available on each river basin authority website and is a capture of 'real time' gauges that have a defined eflow in the RBMP. This automatic monitoring system alerts when flows are at risk of falling short of minimum level.

Drought conditions imply more proactive control and monitoring and management of water reservoirs (releasing water stored to maintain eflows). In practice though, in the 2nd RBMPs, compliance with eflows was monitored in only 11% of the river water bodies where they had been defined (Mezger et al., 2019). An additional shortcoming is that the relationships between eflows implementation and ecological response are not being assessed (Mezger et al., 2019). Recently, there are specific targeted studies being carried out by research institutions on this topic but there are no results available yet (Interview Spanish expert, 2024).

England. Flows are not monitored in every water body. There are gauging stations along water bodies which are used in conjunction with sophisticated hydrological models to interpret flows at various points. These models can provide an overview of an entire catchment, allowing the EA to determine where eflows are not being met. Groundwater levels are monitored similarly. The EA is in the process of launching an approach for operators called the "local flow constraint" – which would allow operators to do their own monitoring and modeling and present it to the EA. This can be used to request a different level of fee, and possibly greater access to water in the catchment, in the case where environmental obligations are still met.

Sweden. There are no specific legal requirements that apply specifically to monitoring eflows. However, the operators are under a general obligation to monitor their activities. The quality of monitoring carried out by

[5] For example, the Automatic Hydrological Information System of the Guadalquivir Basin can be accessed here: https://www.chguadalquivir.es/saih/

the authorities varies between regions. The authorities have different monitoring resources which affects their ability to carry out monitoring (Interview Swedish judge, 2024).

Finland. Permit regulations must include an obligation to monitor the impacts of the project (Finnish Parliament, 2011, Chapter 3, Section 11). Such monitoring obligations cover both the water flow and the water level (Finnish Government, 2009, p. 68; Hollo, 2014, p. 150). The obligation is the same for all abstraction projects despite the size provided that the water management project requires a permit. The Water Act though does not specifically mention eflows in this context. There are also no provisions in the Water Act to publish reports on the level of compliance with eflows (Finnish Parliament, 2011, Chapter 14).

Romania. The Ecological Flow Act of 2020 includes requirements to make available the values of the servitude flows (not specifically of the ecological flows) discharged downstream of a dam or water intake on the website of the permit holder and to submit these monthly to the water management authority that issued the water management permit. Information could not be found on the extent to which this is practiced and applied by the permit holders.

Penalties

Only scarce information is available on penalties and fines that may be applied to permit holders if eflows are not respected. In **Spain,** sanctions in case of non-compliance with defined eflows are generally economic penalties but there can also be penal consequences if non-compliance is considered an environmental crime (criminal offence against natural resources and the environment under the Criminal Code). Decision-making on penalties is an ad-hoc process and the judges decide based on technical reports of legal experts (peritos judiciales) (Interview Spanish expert, 2024). In **Sweden and Finland,** there are no specific penalty rules on eflows. Also in **Romania**, no provisions could be identified for penalties in case eflows are not respected.

Expertise in the legal system

Information is also scarce on the extent to which technical and scientific advisors are used for legal cases on water rights disputes that involve eflows. **In Spain,** there are experts that can be called in by litigating parties. **In Finland,** the permit authority employs legal, scientific and technical advisors. In water issues, the composition of the court in the Vaasa administrative court (the first appeal instance in water issues) and the Supreme Administrative Court includes technical and scientific experts (Finnish Parliament, 1999; Finnish Parliament, 2006). In **France**, trainings for professionals in water management are primarily aimed at a mixed audience, including consulting firms, instructive services, small and medium-sized enterprises, and enforcement agents. Judges and magistrates are not the target audience for these technical trainings, but there have been efforts by the Ministry to distribute documents and raise awareness among magistrates on minimum flow rates and related issues (Interview French experts, 2024).

Discussion of challenges for eflows legal and regulatory frameworks

In this section, we discuss main challenges for the implementation of eflows regulatory frameworks in the six European countries studied in this report. The main challenges identified relate to the following main aspects: development of the legal and regulatory framework; water rights and permits; knowledge and science; water availability and climate change; policy incoherence; enforcement and compliance.

Development of legal and regulatory framework and translation into practice

The existence of **well-developed legislation and regulation** is considered a fundamental enabling condition that underpins most, if not all, cases of successful eflows implementation (Harwood et al. 2018). In several EU countries, the legal and policy basis for implementing eflows (national legislation, policy documents) is still not sufficiently elaborated (Kampa & Schmidt 2023). This may entail the lack of provisions for eflows under national water acts, and/or RBMPs. Further, even if relevant regulations exist, they may not be sufficiently coherent and detailed, leading to the lack of consistent application within the same country.

The six European countries examined in this report are at different stages of policy development on eflows. The most advanced legal and regulatory frameworks on eflows are in place in Spain, France, and England. In Finland, eflows are not defined yet in national policy, and this is considered the most important barrier for making progress on eflows implementation in the country. Also, the methodologies for calculating eflows have not yet been standardised in Finland and completing this process could have a positive impact on eflows implementation (Interview Finnish civil servant, 2024; Interview Finnish judge, 2024). Similarly in Sweden, there is no specific and detailed definition of eflows in national legislation yet. In Romania, eflows have been relatively recently introduced in 2020 in the national legal framework and the methodology for assessing and monitoring of eflows is under development. Therefore, there is still limited evidence regarding eflows implementation (Ramos et al, 2017; Ilinca and Anghel, 2023).

Also, in countries with more advanced frameworks for eflows such as Spain and France, there are challenges when **translating the legal provisions into practice.** In Spain, although the regulatory eflows definition requires different flow regime variables to be met, in practice focus has mainly been so far in defining and implementing minimum flows. The 2017 River Basin Plans monitoring report indicated that although 76.9% of the rivers had established minimum flows, only 9% had set maximum flows, 8.7% channel maintenance discharges and 11.4% change rates downstream of regulatory infrastructures (Sanchis-Ibor et al 2022).

In France, eflows are mainly understood as minimum ecological flows (reserved flows), and in the local context, they usually follow the minimum regulatory requirements such as the $1/10^{th}$ of the average naturalised flow. Catchment-specific and monthly eflows have been systematically introduced in (roughly) the southern half of France, on around 500 control points. This unique effort to cap withdrawals based on priority minimum ecological flows will face growing tension as available flows are reassessed after considering climate-change induced reductions.

Further, the limits of the current approach of quantitative water management in France, which focuses on low flows, start to be acknowledged as well as the need to adapt methods also to high water (floods). It is now seen as necessary to broaden the low flow targets framework, in order to take into account the needs of the environment over the entire hydrological cycle (e.g. maintenance of floods for the impoundment of spawning grounds or of wetlands). However, eflows methods adapted to high water (floods) are currently limited to specific basins and there are no regulations that promote high flow rates during seasons when

they naturally occur. At the same time, despite not being mandatory, rules start to be established on the timing and rate of water releases from water storage schemes to prevent sudden and sharp changes in flow rates that could harm aquatic life or downstream infrastructure. Overall, the regulatory framework on these types of flows still needs to be clarified and further developed (Interview French experts, 2024).

Water rights and permits

A further challenge in national regulatory frameworks lies in existing **water rights and permits** and the extent and timeframe in which these can be reviewed to introduce eflows. This has been confirmed as a key challenge in at least three of the six studied countries, namely in Sweden, Finland and France. In France, the State can change permits in theory at any time without compensation, but in practice, this proves challenging to implement. This is an unpalatable administrative move that is seen as antagonistic by users. In practice, the State prefers to cap water use by imposing eflows rather than through *a priori* maximum withdrawals. In Finland, the review of old permits is extremely difficult in case the permit holder is not interested. Thus, advancing the implementation of eflows currently builds on voluntary contributions of permit holders (Interview Finnish civil servant, 2024; Interview Finnish judge, 2024). In Sweden, a system for reviewing hydropower permits is in place since 2018. However, it will take time for the full effect of this legislation to materialise. The 2018 Environmental Code amendment to review the permit system of hydropower may have implications for the establishment of eflows linked to hydropower over the next 20 years, but the 15–20 year implementation phase is rather long and speaks against swift eflows implementation in the country. Further, the largest hydropower plants have permits that protect the plant owners against permit changes without compensations (Interview Swedish judge, 2024).

Knowledge and science

Gaps in the scientific basis for eflows setting is considered an important barrier to eflows implementation in Spain, France and England, which already have a regulatory framework for eflows in place.

In Spain, despite having one of the most comprehensive eflows legal frameworks in the EU, there are scientific knowledge gaps on the interrelation of surface and groundwater abstractions with eflows, and on the link between eflows and their impacts on ecology. The relationships between eflows implementation and ecological response are not being yet systematically assessed in Spain (Mezger et al., 2019). Recently, specific targeted studies are being carried out by research institutions on this topic but there are no final results available yet (Interview Spanish expert, 2024).

In France, studies in specific catchments have demonstrated the difficulty in obtaining biological evidence on the effectiveness of flow rate regulations, as this requires significant long-term data collection and statistical analysis. Significant changes in flow rates are necessary to observe biological responses in a 10-20 years' time span, and even then, it can be challenging to attribute biological changes solely to flow rate regulations. Natural variability and non-flow related stressors can lead to difficulties in attributing observed changes solely to flow rate regulations. At the same time, the potential risks associated with decreased flow rates, such as reduced water quality and biodiversity loss, need to be carefully considered (Interview French experts, 2024). Overall, targeted and regular monitoring is key for assessing the impacts of implemented eflows on ecosystem condition to prove the ecological benefits of increased flow rates and to adapt eflows, where needed.

Also the science linking flow regimes with ecological status, species and habitats status is still embryonic in France. There are specific models available in the country, which are applicable to various contexts, but they need to be complemented by additional site studies for more robust results (Interview French experts, 2024).

Water availability and climate change

The **declining water availability and increasing variability of the flow regime under climate change** pose further challenges to the implementation of eflows in Europe. This is a key implementation challenge acknowledged in France and in Spain among the studied countries. In both France and Spain, countries where several basins are affected by water scarcity and droughts in recent decades, the definition of eflows in legislation and regulations already considers situations of natural droughts. In France, increased frequency of droughts and reduction in mean river flows have been observed widely, especially in the western and southern regions, which poses great challenge in defining a baseline for eflows. If the available resource is reduced while the eflow is not, allowable withdrawals will be squeezed. The aspects of droughts and climate change are not specified so far in the regulatory framework for eflows in Sweden, Finland, England, and Romania.

Policy incoherence

Among key implementation challenges in several EU countries is **opposition to eflows implementation from major water users** (Kampa & Schmidt 2023, Alexandra et al. 2023, Molle and Collard 2024). In Finland, eflows enforcement is hindered by opposition from hydropower, the key question being the compensation to water users. The situation is similar in Sweden, where there is pressure from the hydropower sector and the government to interpret the regulatory framework in favour of using exemptions under the WFD, prioritising water availability for energy production, rather than what good ecological status would require (Interview Swedish civil servant, 2024; Interview Swedish judge, 2024). Also, compensation of users is a very relevant issue; if hydropower plant owners are compensated for plant removal, many owners (of especially smaller plants) are more willing to apply (Interview Swedish judge, 2024). In France, there is opposition from the energy sector and agricultural users who are most affected by eflows. Although some processes are in place to address this (e.g. binding nature of RBMPs and catchment management plans for all stakeholders and planning decisions), eflows are not directly considered in sectoral investment decisions and eflows policies are not well coordinated with planning processes of these key sectors. Indirectly, water resources availability and eflows are increasingly considered in such assessments.

Enforcement and compliance

A key challenge in enforcing eflows relates to **non-compliance which cannot be detected due to monitoring gaps and lack of resources**. The **lack of resources and capacity** of competent authorities on eflows is considered as a key challenge in most of the countries examined (France, Spain, Sweden, Finland, England). In France, the water police (officials from the state technical services at the Department level or belonging to the national Office for Biodiversity) faces staffing issues to ensure abstraction points comply with permits and drought orders. In Spain, a monitoring system is in place but according to Mezger et al. (2019) compliance with eflows was monitored in only 11% of the river water bodies where eflows had been defined in the 2nd RBMPs. Also in Sweden, resources of the relevant authorities for monitoring are not adequate; therefore, many cases and complaints are only initiated after an environmental organisation takes action (Interview Swedish judge, 2024). Further, the permit conditions for establishing connectivity between various parts of the river are based on assessments which are produced by the applicant and evaluating the quality of such assessments is challenging for Swedish permit authorities (Interview Swedish judge, 2024).

In some countries, there are also difficulties in controlling illegal abstractions which can have a significant impact on eflows. This is an implementation barrier to eflows in both Spain and France among the studied

countries. In France, illegal abstraction, especially agricultural groundwater abstraction, is a key problem. No clear overview is available, but undeclared abstraction points and tampering with metering have been described as common in some areas.

Conclusions

The present report has described and analysed the legal and regulatory frameworks for eflows in six European countries, contributing to an improved understanding of national policies and challenges for eflows set-up and implementation in Europe. The six studied countries face different challenges for eflows implementation, related to their varying degrees of policy development on this topic. Policy requirements for eflows are already anchored in national legislation in France, Spain, and Romania. However, only France and Spain have a longer record of developing and implementing eflows in practice, while the Romanian eflows policy framework was only very recently developed. In England, eflows are not defined in national law but there is a well-defined eflows indicator used for application in RBMPs by competent agencies. In Finland and Sweden, there is no specific definition of eflows and eflows methodologies in national legislation yet.

In European countries with less advanced legal frameworks on eflows, the development of conducive legislation with clear eflows methodologies as well as regulatory instruments to include eflows in water permits are key to making progress on eflows implementation. On the other hand, European countries with more advanced legal frameworks on eflows face scientific knowledge gaps to improve eflows implementation, the need to adapt their regulations and methods for more holistic approaches e.g. to consider high water (floods) and increasing hydrologic variability due to climate change. Also, resources and legal provisions for monitoring and enforcement of eflows need to be strengthened. Common challenges across countries remain the opposition of eflows implementation from key water users, options for compensation and better coordination of eflows with sectoral planning processes.

The description and analysis of national regulatory frameworks for eflows in this report can be used as starting point for further research on the development and effective implementation of eflows policies in European countries. The following research questions may guide a more in-depth analysis of regulatory instruments for the design and implementation of eflows in the GOVAQUA good practice inventory. For each question, indications are made below for sources of potential good practice case studies and lessons that can be drawn from the countries examined in this report.

What are the main characteristics of the most advanced legal and policy frameworks for eflows? How are these integrated with water allocation regimes?

- Good practices and remaining challenges can be drawn from the regulatory frameworks of Spain and France that have among the most advanced eflows frameworks in the EU.
- In both Spain and France, achieving eflows in over-abstracted river basins remains a challenge, and further research can examine the linkages between eflows regulations and the regimes for allocating and reallocating water in specific catchments/regions in these countries.

What kind of provisions can be used to make the legal and policy basis for eflows adaptive to impacts of climate change and droughts on water availability?

- Concerning eflows under droughts, lessons learned can be drawn from France and Spain that have gathered some experience on the implementation of relevant provisions. Concerning adaptiveness of eflows regimes to climate change, there is limited experience in the regulatory frameworks of the countries examined. However, in France, there are efforts to develop regulatory provisions for eflows related to high flows (floods) and their effects on eflows and ecosystem condition.

What regulatory mechanisms can be used to manage trade-offs between eflows implementation and affected water users (e.g. hydropower, agriculture) and reduce conflicts when water availability is decreased? What other types of instruments (e.g. economic instruments, participatory planning) can complement these in managing trade-offs and how?

- In particular for the hydropower sector, some early lessons can be learned from Sweden's recent national plan for hydropower that foresees review of hydropower permits in a specific timeframe and a funding mechanism for mitigation measures. The system of permit revisions for hydropower until 2037 includes revision of environmental conditions that can allow for introduction of eflows among other requirements.
- In France, individual permits for agricultural irrigation in priority basins for quantitative water management have been cancelled and integrated into a collective permit held by Agricultural User Associations.

What arrangements support more effective enforcement and compliance with eflows implementation? What role does monitoring play in improving effectiveness of enforcement and compliance?

- Spain can serve as source of good practice for its system of automatic monitoring of eflows. All river basin authorities have a public accessed 'on-line' tool to monitor the eflows status. This is a capture of 'real time' gauges that have defined eflows in the RBMPs. In some catchments, the 'on-line' eflows monitoring tool is used to inform irrigators and taken into account in irrigation planning.
- In France, the introduction and long-term scientific research on eflows in the Rhone River may also be a source of good practice of how science informs the implementation of eflows on basin level. Before 2014, the Rhône was not subject to water regulations, and there were no minimum flow requirements. After the regulations were implemented, there were substantial increases in minimum flow rates, sometimes by a factor of ten. This allowed for extensive scientific research with many years of data, including before and after comparisons, experience feedback, prediction tests, and effects analysis. The scientific effort associated with the flow changes demonstrated that altering minimum flow rates can lead to predictable changes, though not entirely. The study provided valuable insights into the effects of flow rate changes on biological communities, although it doesn't explain all observed changes due to various other factors at play (Interview French experts, 2024).

Further work in WP2 of GOVAQUA will explore, document and assess selected good practice approaches on legal and regulatory instruments for eflows.

References

Acreman, M.C. and Ferguson, A.J.D. (2010). Environmental flows and the European Water Framework Directive. *Freshwater Biology* 55(1): 32-48.

Acreman, M.C.; Arthington, A.H.; Colloff, M.J.; Couch, C.; Crossman, N.D.; Dyer, F.; and Young, W. (2014). Environmental flows for natural, hybrid, and novel riverine ecosystems in a changing world. *Frontiers in Ecology and the Environment* 12(8): 466-473.

Alexandra, J.; Rickards, L. and Pahl-Wostl, C. (2023). The logics and politics of environmental flows - A review. *Water Alternatives* 16(2): 346-373.

Arthington, A.H., Bhaduri, A., Bunn, S.E., Jackson, S.E., Tharme, R.E., Tickner, D., Young, B., Acreman, M., Baker, N., Capon, S., Horne, A.C., Kendy, E., McClain, M.E., Poff, N.L., Richter, B.D., Ward, S. (2018). The Brisbane Declaration and Global Action Agenda on Environmental Flows. Front. Environ. Sci. 6(45). doi: 10.3389/fenvs.2018.00045.

Arthington, A.H.; Tickner, D.; McClain, M.E.; Acreman, M.C.; Anderson, E.P.; Babu, S., ... & Yarnell, S.M. (2023). Accelerating environmental flow implementation to bend the curve of global freshwater biodiversity loss. *Environmental Reviews*, https://doi.org/10.1139/er-2022-0126Capon, S.J. and Capon, T.R. (2017). An impossible prescription: Why science cannot determine environmental water requirements for a healthy Murray-Darling Basin. *Water Economics and Policy* 3(03): 1650037.

CEDEX (2010)., EVALUACIÓN DE RECURSOS HÍDRICOS EN RÉGIMEN NATURAL EN ESPAÑA (1940/41 – 2017/18), available: https://www.miteco.gob.es/content/dam/miteco/es/agua/temas/evaluacion-de-los-recursos-hidricos/cedex-informeerh2019_tcm30-518171.pdf

Centre for Economic Development, Transport and the Environment of Lapland, Centre for Economic Development, Transport and the Environment of North Ostrobothnia, Centre for Economic Development, Transport and the Environment of South Ostrobothnia, Centre for Economic Development, Transport and the Environment of North Ostrobothnia and Centre for Economic Development, Transport and the Environment of Etelä-Savo (2022). Vesienhoitosuunnitelma vuosille 2022–2027. Osa 2: suunnittelussa käytetyt menetelmät ja periaatteet. River basin management plan for 2022-2027. Part 2: Methodology and principles used for planning. ISBN 978-952-314-999-1. Available at: https://www.doria.fi/bitstream/handle/10024/183647/Raportteja%206%202022.pdf?sequence=1&isAllowed=y.

CIS (2006). Water scarcity management in the context of the WFD. MED Joint Process WFD /EUWI.

CIS (2015). Ecological flows in the implementation of the Water Framework Directive. Guidance Document No. 31

County Administrative Board of Norrbotten (2021). Länsstyrelsen i Norrbottens läns föreskrifter om kvalitetskrav för vattenförekomster i Bottenvikens vattendistrikt. County Administrative Board of Norrbotten's regulations on quality requirements for water bodies in the Bothnian Bay Water District, 25 FS 2021:13. Available at: https://www.lansstyrelsen.se/download/18.55c736ad1817fe045f14a4/1655721629463/13%20A%2012%20Om%20kvalitetskrav%20f%C3%B6r%20vattenf%C3%B6rekomster%20i%20Bottenvikens%20vattendistrikt%20inkl%20bilaga%201-3.pdf.

County Administrative Board of Västernorrland (2021). Länsstyrelsen i Västernorrlands läns (Vattenmyndigheten för Bottenhavets vattendistrikts) föreskrifter om kvalitetskrav för vattenförekomster i Bottenhavets vattendistrikt. County Administrative Board of Västernorrland (Water Authority for the Bothnian Sea Water District) regulations on quality requirements for water bodies in the Bothnian Sea Water District, 22FS 2021:5. Available at: https://www.vattenmyndigheterna.se/vattenforvaltning/miljokvalitetsnormer-for-vatten.html.

County Administrative Board of Norrbotten (2021). Länsstyrelsen i Norrbottens läns föreskrifter om kvalitetskrav för vattenförekomster i Bottenvikens vattendistrikt. County Administrative Board of Norrbotten's regulations on quality requirements for water bodies in the Bothnian Bay Water District, 25 FS 2021:13. Available at: https://www.lansstyrelsen.se/download/18.55c736ad1817fe045f14a4/1655721629463/13%20A%2012%20Om%20kvalitetskrav%20f%C3%B6r%20vattenf%C3%B6rekomster%20i%20Bottenvikens%20vattendistrikt%20inkl%20bilaga%201-3.pdf..

Dyson, M., Bergkamp, G., and Scanlon, J., (eds.). (2008). Flow. The Essentials of Environmental Flows, 2nd Edn. Gland: IUCN.

EC (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

EC (2007). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL: Addressing the challenge of water scarcity and droughts in the European Union.

EC (2012). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Report on the Review of the European Water Scarcity and Droughts Policy.

EC (2015). Ecological flows in the implementation of the Water Framework Directive. Guidance Document No. 31. European Commission. doi: 10.2779/775712

EC (2015b). COMMISSION STAFF WORKING DOCUMENT Report on the implementation of the Water Framework Directive River Basin Management Plans Member State: SPAIN Accompanying the document COMMUNICATION FROM THE EUROPEAN COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risks /* SWD/2015/0056 final */,

EC (2019). REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC): Second River Basin Management Plans; First Flood Risk Management Plans.

EC (2021). EU biodiversity strategy for 2030: bringing nature back into our lives, Publications Office of the European Union.

EC (2023c) Stock-taking analysis and outlook of drought policies, planning and management in EU Member States. https://circabc.europa.eu/ui/group/9ab5926d-bed4-4322-9aa7-9964bbe8312d/library/2bf95a55-c4c6-4a59-89d1-4715f2c8a3c5?p=1&n=10&sort=modified_DESC

Environment Agency (2020). Water resources national framework. Appendix 4: Longer term environmental water needs. Available at: https://assets.publishing.service.gov.uk/media/5e6a5f6086650c727adb438f/Appendix_4_Longer_term_environmental_water_needs.pdf

Environment Agency (2021). Managing water abstraction. Available at: https://www.gov.uk/government/publications/managing-water-abstraction/managing-water-abstraction

Environment Agency (2021b). Updating the determination of water stressed areas in England. Appendix 2: Longer Term Environmental Water Needs (Enhanced Scenario). Available at: https://consult.environment-agency.gov.uk/environment-and-business/updating-the-determination-of-water-stressed-areas/supporting_documents/Appendix%202%20Longer%20Term%20Environmental%20Water%20Needs%20%20Enhanced%20Scenario.pdf

Environment Agency (2022). Flow Compliance Bands. Available at: https://www.data.gov.uk/dataset/a0a19524-e99f-4459-85ea-c6a5ff05075e/flow-compliance-bands

Environment Agency (2022b). Environment Agency taking action during prolonged dry weather, available: https://environmentagency.blog.gov.uk/2022/08/05/environment-agency-taking-action-during-prolonged-dry-weather/

ETC/ICM (2016). Use of freshwater resources in Europe 2002–2012. Supplementary document to the European Environment Agency's core set indicator 018. ETC/ICM Technical Report 1/2016, Magdeburg: European Topic Centre on inland, coastal and marine waters, 62 pp.

Finnish Government (2004). Hallituksen esitys Eduskunnalle laiksi vesienhoidon järjestämisestä, laiksi ympäristönsuojelulain muuttamisesta ja laiksi vesilain muuttamisesta sekä maasta toiseen ulottuvien vesistöjen sekä kansainvälisten järvien suojelusta ja käytöstä tehdyn vuoden 1992 yleissopimuksen vesivaroja ja terveyttä koskevan pöytäkirjan hyväksymisestä ja laiksi sen lainsäädännön alaan kuuluvien määräysten voimaansaattamisesta. HE 120/2004 vp. Government proposal to Parliament for an Act on the organisation of water management, an Act amending the Environmental Protection Act and an Act amending the Water Act, and for the approval of the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, and for the enactment of its legislative provisions. HE 120/2004 vp.

Finnish Government (2009). Government proposal to Parliament concerning new water legislation. Hallituksen esitys Eduskunnalle vesilainsäädännön uudistamiseksi, HE 277/2009 vp.

Finnish Government (2012a). Kansallinen kalatiestrategia. Valtioneuvoston periaatepäätös 8.3.2012. National Strategy for fish passages, Government decision 8 March 2012.

Finnish Government (2012b). Kalatiestrategia – kohti luonnollista elinkiertoa. Fish passage strategy - towards a natural life cycle.

Finnish Parliament (1999). Laki hallinto-oikeuksista (403/1999). Act on administrative courts (403/1999).

Finnish Parliament (2004). Laki vesienhoidon ja merenhoidon järjestämisestä (1299/2004). Act on the Organisation of River Basin Management and the Marine Strategy (1299/2004).

Finnish Parliament (2006). Laki korkeimmasta hallinto-oikeudesta (1265/2006). Act on Supreme Administrative Court (1265/2006).

Finnish Parliament (2011). Water Act (587/2011). Vesilaki (587/2011).

Gălie, A.-C.; Mătreață, M.; Tănase, I.; Rădulescu, D. The Romanian Ecological Flow Method, RoEflow, Developed in Line with the EU Water Framework Directive. Concept and Case Studies. Sustainability 2021, 13, 7378. https://doi.org/10.3390/su13137378

Gebreegziabher, Gizaw Abera, Sileshi Degefa, Wakgari Furi, Gudina Legesse (2023). Evolution and concept of environmental flows (eflows): meta-analysis. Water Supply 1 June 2023; 23 (6): 2466–2490. doi: https://doi.org/10.2166/ws.2023.120

Gleick, P. H. (2000). A look at twenty-first century water resources development. Water International, 25(1), 127-138.

Harwood, A.J., Tickner, D., Richter, B.D., Locke, A., Johnson, S., Yu, X. (2018). Critical Factors for Water Policy to Enable Effective Environmental Flow Implementation. Front. Environ. Sci. (6). https://doi.org/10.3389/fenvs.2018.00037

Hollo, E. J. (2014). Vesioikeus. Porvoo: Edita Lakitieto Oy.

Horne, A.C.; O'Donnell, E.L.; Acreman, M.; McClain, M.E.; Poff, N.L.; Webb, J.A., ... and Hart, B.T. (2017). Moving forward: The implementation challenge for environmental water management. In Horne, A.C.; Webb, J.A.; Stewardson, M.J.; Richter, B.D. and Acreman, M. (Eds), *Water for the environment*, *From policy and science to implementation and management,* pp. 649-673 (Chapter 27). Academic Press.

Horne, A. C., Webb, J. A., Stewardson, M. J., Richter, B. D., and Acreman, M. (eds.). (2017). Water for the Environment: from Policy and Science to Implementation and Management. Cambridge, MA: Elsevier.

Ilinca, C. & Anghel, C.G. (2023) Re-Thinking Ecological Flow in Romania: A Sustainable Approach to Water Management for a Healthier Environment. Sustainability, 15, 9502. https://doi.org/10.3390/su15129502

International Commission for the Protection of the Danube River (ICPDR) (2021). Danube Flood Risk Management Plan. Update 2021. https://www.icpdr.org/sites/default/files/nodes/documents/dfrmp_update_2021_lores_0.pdf

Interview English experts (2024). Two national civil servants on water regulation and eflows. Interview carried out in first half of 2024.

Interview Finnish civil servant (2024). One national civil servant at ministry. Interview carried out in first half 2024.

Interview Finnish judge (2024). One judge from the administrative branch. Interview carried out in first half 2024.

Interview French experts (2024). One national expert on eflows & one civil servant at environmental agency. Interview carried out in first half 2024.

Interview Spanish expert (2024). One national expert on water regulation and management. Interview carried out in first half 2024.

Interview Swedish civil servant (2024). One national civil servant at environmental ministry. Interview carried out in first half 2024.

Interview Swedish judge (2024). One national judge, Land and Environmental Court. Interview carried out in first half 2024.

Ioana-Toroimac, G., Zaharia, L., Moroșanu, G.A., (2018), What is the level of public participation in planning for River Basin Management in Romania? pp. 279-284. In Gastescu, P., Bretcan, P. (edit, 2018), Water resources and wetlands, 4th International Conference Water resources and wetlands, 5-9 September 2018, Tulcea (Romania), p.312 Available online at http://www.limnology.ro/wrw2018/proceedings.html

John A., Horne A., Nathan R., Fowler K., Webb J. A. & Stewardson, M. 2021. Robust climate change adaptation for environmental flows in the Goulburn River, Australia. . Frontiers in Environmental Science 9. (December), 789206. https://doi.org/10.3389/fenvs.2021.789206

Kampa, E. & Buijse, T. (eds) 2015. Contributing Authors: Erik Mosselman, Angela Gurnell, Massimo Rinaldi, Christian Wolter, Simone Bizzi, Mat-thew O'Hare, Nikolai Friberg, Ian Cowx, Roy Brouwer, Daniel Hering, Jochem Kail, Martina Bussettini. A fresh look on effective river restoration: Key conclusions from the REFORM project. Policy brief. Issue No. 3 December 2015, available: https://www.reformrivers.eu/system/files/REFORM_Policy_Brief_No3.pdf

Kampa, E. & Schmidt, G. (2023): Implementation of eflows in the EU. Developed under the Framework Contract 'Water for the Green Deal' - Implementation and development of the EU water and marine policies (09020200/2022/869340/SFRA/ENV.C.1). Specific Contract "Support to the Commission on water quantity management – follow up to the Fitness Check of EU water law conclusions, EU Strategy on Adaptation to Climate Change and Common Implementation Strategy Work Programme for the water directives (2022-2024)"

Kotanen, J., Manninen, P. and Roiha, T. (eds.) (2022). Vuoksen vesienhoitoalueen vesienhoitosuunnitelma vuosille 2022–2027 Osa 1. Vesienhoitoaluekohtaiset tiedot. River basin management plan for the Vuoksi river basin management area for 2022-2027. Part 1. River basin specific information. ISBN 978-952-398-015-0 (PDF). Available at: https://www.doria.fi/bitstream/handle/10024/184581/Raportteja%2020%202022.pdf?sequence=1&isAllowed=y.

Lindstöm, A. and Ruud, A. (2017). Swedish hydropower and the EU Water Framework Directive. Stockholm Environment Institute, Project Report 2017-01. Available at https://mediamanager.sei.org/documents/Publications/SEI-PR-2017-01-Sweden-Hydropower-WFDa.pdf (accessed 8 May 2024).

Malm Renöfält, B. & Ahonen, J. (2013). Ekologiska flöden och ekologiskt anpassad vattenreglering. Available at: https://www.havochvatten.se/download/18.5f66a4e81416b5e51f73112/1708685370007/rapport-hav-2013-12-ekologiska-floden.pdf

Marttunen, M. Turunen, J., Kukkonen, M. , Vilmi, A., Mustajoki, J., Huuki, H., Härkönen, L., Hyvärinen, P., Louhi, P., Räsänen, S., Kopsakangas-Savolainen, M. and Hellsten, S. (2023). Oulujoen vesistöalueen vesistövisio – ARVOVESI-hankkeen tulokset. The watershed vision of the Oulujoki watershed - Results of the ARVOVESI project. ISBN 978-952-11-5568-0 (PDF). Available at: syke.fi/julkaisut; helda.helsinki.fi/syke.

Ministry of Agriculture and Forestry of Finland (no year available). Vaelluskalakantojen elvyttämisohjelma NOUSU. Available at: https://mmm.fi/vaelluskalat/vaelluskalaohjelma.

Michanek, G. and Zetterberg, C. (2021). Den svenska miljörätten. Iustus.

Mäntykoski, A. (ed), Nylander, E., Ahokas, T., Olin, S., Vähä-Vahe, A. and Närhi, A.-M. (2022). Kymijoen-Suomenlahden vesienhoitoalueen vesienhoitosuunnitelma vuosille 2022–2027. Osa 1: Vesienhoitoaluekohtaiset tiedot. River Basin Management Plan for the Kymijoki River-Bay of Finland 2022-2027. Part 1. River basin specific information. ISBN 978-952-398-012-9 (PDF). Available at: https://www.doria.fi/bitstream/handle/10024/184240/Raportteja%2017%202022.pdf?sequence=1&isAllowed=y.

Mezger, G., De Stefano, L., González del Tánago, M. (2019). Assessing the Establishment and Implementation of Environmental Flows in Spain. Environmental Management 64 (1-2). DOI:10.1007/s00267-019-01222-2

MITECO (Ministerio de Agricultura, Alimentacion y Medio Ambiente) (2010). ESTABLECIMIENTO DE REGÍMENES DE CAUDALES ECOLÓGICOS, available: https://www.miteco.gob.es/content/dam/miteco/es/agua/temas/sistema-espaniol-gestion-agua/planificacion-hidrologica/16establecimientodecaudalesecologicos_tcm30-215775.pdf

Molle, F. and Collard, A.-L. (2024). Sharing water between nature and humans: Environmental flows and the politics of quantification. *Water Alternatives* 17(2): 510-532

Peltonen, L., Marttunen, M., Keskinen, M. and Torkkel M. (2022). Vesistövisiot rakentavat suuntaa ja alustaa yhteistyölle. Ympäristö ja Terveys 53(4). s. 52–57.

Poff, N.L.; Allan, J.D.; Palmer, M.A.; Hart, D.D.; Richter, B.D.; Arthington, A.H.; Rogers, K.H.; Meyer, J.L. and Stanford, J.A. (2003). River flows and water wars: Emerging science for environmental decision making. *Frontiers in Ecology and the Environment* 1(6): 298-306.

Poff, N., Brown, C., Grantham, T. et al. (2016). Sustainable water management under future uncertainty with eco-engineering decision scaling. Nature Clim Change 6, 25–34 (2016). https://doi.org/10.1038/nclimate2765

Puharinen, S.-T., Belinskij, A. and Soininen, N. (2024). Adapting Hydropower to European Union Water Law: Flexible Governance versus Legal Effectiveness in Sweden and Finland'. 13(1) Transnational Environmental Law, pp. 160–189. https://doi.org/10.1017/S2047102523000249

Ramos, V., Formigo, N., & Maia, R. (2017). Ecological flows and the water framework directive implementation: an effective coevolution. European Water, 60, 423-432.

Räinä, P. (ed), Ylikörkkö, J. (ed), Lindholm, A., Puro-Tahvanainen, A., Pasanen, J. and Karjalainen, N. (2022). Kemijoen vesienhoitoalueen vesienhoitosuunnitelma vuosille 2022-2027. Osa 1. Vesienhoitoaluekohtaiset tiedot. River basin management plan for the Kemijoki river basin management area 2022-2027. Part 1. River basin specific information. ISBN 978-952-398-033-4 (PDF). Available at: https://www.doria.fi/bitstream/handle/10024/185060/Kemijoen%20vesist%C3%B6alueen%20vesienhoitosuunnitelma%202022-2027.pdf?sequence=6&isAllowed=y.

RF (République Francaise) (1992). Water law. Loi n° 92-3 du 3 janvier 1992 sur l'eau » and the « Loi n° 2006-1772 du 30 décembre 2006 sur l'eau et les milieux aquatiques

RF (République Francaise) (2006). Water law. Loi n° 2006-1772 du 30 décembre 2006 sur l'eau et les milieux aquatiques

RF (République Francaise) (2008). Circulaire du 30/06/08 relative à la résorption des déficits quantitatifs en matière de prélèvement d'eau et gestion collective des prélèvements d'irrigation.

RF (République Francaise) (2011). Circulaire du 5 juillet 2011 relative à l'application de l'article L. 214-18 du code de l'environnement sur les débits réservés à maintenir en cours d'eau.

RG (Romanian Government) (1996). Water Law 107/1996.

RG (Romanian Government) (2020). Ecological Flow Act of 2020 (HG 148/2020), HOTĂRÂRE nr. 148 din 20 februarie 2020 privind aprobarea modului de determinare şi de calcul al debi-tului ecologic, https://legislatie.just.ro/Public/DetaliiDocumentAfis/223333

Sanchez Navarro, R. 2021. Desk study on environmental flows and flow regulation in the Drina River Basin, available: https://unece.org/sites/default/files/2022-03/Drina%20%20Flow%20Regulation%20Eflow_October%202021.pdf

Sanchis-Ibor, C, Manuel Pulido-Velazquez, Juan Valero de Palma, Marta García-Mollá, 2022. "Water allocation in Spain. Legal framework, instruments and emerging debates", Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access, Josselin Rouillard, Christina Babbitt, Edward Challies, Jean-Daniel Rinaudo. https://iwaponline.com/ebooks/book/857/chapter/2992977/Water-allocation-in-Spain-Legal-framework

SEPA (Swedish Environmental Protection Agency). (2017). Swedish Environmental Law: An introduction to the Swedish legal system for environmental protection. Report 6790 of October 2017. Available at https://www.naturvardsverket.se/4ac2a1/globalassets/media/publikationer-pdf/6700/978-91-620-6790-8.pdf.

SG (Spanish Government) (1985). Water law. Ley 29/1985, de 2 de agosto, de Aguas.

SG (Spanish Government) (2001a). Law on the National Hydrological Plan. Ley 10/2001, de 5 de julio, del Plan Hidrológico Nacional.

SG (Spanish Government) (2001b). Real Decreto Legislativo 1/2001, de 20 de julio, por el que se aprueba el texto refundido de la Ley de Aguas.

SG (Spanish Government) (2007). Real Decreto 907/2007, de 6 de julio, por el que se aprueba el Reglamento de la Planificación Hidrológica (Hydrological Planning Regulation (RPH)).

SG (Spanish Government) (2008). Orden ARM/2656/2008, de 10 de septiembre, por la que se aprueba la instrucción de planificación hidrológica (Hydrological Planning Instruction (IPH)).

Spanish Government (2021). Real Decreto 1159/2021, de 28 de diciembre, por el que se modifica el Real Decreto 907/2007, de 6 de julio, por el que se aprueba el Reglamento de la Planificación Hidrológica

Speed, R., Yuanyuan, L., Le Quesne, T., Pegram, G., Zhiwei, Z. (2013). Basin Water Allocation Planning: Principles, Procedures and Approaches for Basin Allocation Planning. UNESCO, Paris.

Stanca, S. C., Dimache, A. N., Ilinca, C., & Anghel, C. G. (2023). Methodology for determining hydromorphological indicators for rivers with hydropower uses. In IOP Conference Series: Earth and Environmental Science (Vol. 1136, No. 1, p. 012032). IOP Publishing.

Strömberg, R. (1984). Vattenlagen med kommentar. Stockholm: Liber Förlag.

SwAM (Swedish Agency for Marine and Water Management) (2017). Miljöeffekter vid bortledande av vatten. Website, published 7 November 2017. Available at: https://www.havochvatten.se/arbete-i-vatten-och-energiproduktion/vattenuttag/miljoeffekter-vid-bortledande-av-vatten.html.

SwAM (Swedish Agency for Marine and Water Management) (2019a). Havs- och vattenmyndighetens föreskrifter om klassificering och miljökvalitetsnormer avseende ytvatten. 10 December 2019, HVMFS 2019:25. Available at: https://www.havochvatten.se/download/18.4705beb516f0bcf57ce1c145/1576576601249/HVMFS%202019-25-ev.pdf.

SwAM (Swedish Agency for Marine and Water Management) (2019b). Towards sustainable hydropower in Sweden. Website, published 27 November 2019. Available at: https://www.havochvatten.se/en/eu-and-international/towards-sustainable-hydropower-in-sweden.html.

Swedish Government (1997). Regeringens proposition 1997/98:45 för Miljöbalk. Del 2. Government proposal 1997/98:45 for Environmental Code. Part 2.

Swedish Government (2020). Government decision on the National Plan for Modern Environmental Conditions for Hydropower. Regeringsbeslut, Nationell Plan för Moderna Miljövillkor.

Swedish Parliament (1998a). Environmental Code 1998:808. Miljöbalk 1998:808.

Swedish Parliament (1998b). Act (1998:812) Containing Special Provisions concerning Water Operations. Lag (1998:812) med särskilda bestämmelser om vattenverksamhet.

Swedish Parliament (1998c). Ordinance (1998:1388) on Water Operations. Förordning (1998:1388) om vattenverksamheter.

Swedish Parliament (2004). Decree on the management of the aquatic environment quality. Vattenförvaltningsförordning (2004:660).

Söderasp, J. (2018). Law in Integrated and Adaptive Governance of Freshwaters: A Study of the Swedish Implementation of the EU Water Framework Directive. Doctoral dissertation. Luleå: Luleå University of Technology. Available at https://www.diva-portal.org/smash/get/diva2:1254540/FULLTEXT01.pdf (accessed 8 May 2024)..

Tharme, R.E. (2003). A global perspective on environmental flow assessment: Emerging trends in the development and application of environmental flow methodologies for rivers. *River Research and Applications* 19(5-6): 397-441.

Turunen, J., Koljonen, S. and Hellsten, S. (2023). Ympäristövirtaaman toimeenpano – Ekologisten hyötyjen arviointiin perustuva kriteeristö ja priorisointimenetelmä, Syke reports 26/2023. Available at https://helda.helsinki.fi/items/38b92661-9ef3-4601-8e75-539478e6b9e4 (accessed 8 May 2024).

UK Parliament (1991). Water Resources Act 1991, c. 57.

Westberg, V., Bonde, A., Koivisto, A.-M., Mäkinen, M., Puro, H., Siiro, P. and Teppo, A. (eds) (2022). Kokemäenjoen – Saaristomeren – Selkämeren vesienhoitoalueen vesienhoitosuunnitelma vuosille 2022 – 2027. Osa 1: Vesienhoitoaluekohtaiset tiedot. River basin management plan for the Kokemäenjoki - Saaristomeri - Selkämeri river basin management area for 2022 - 2027. Part 1: River basin specific information. ISBN 978-952-398-010-5 (PDF). Available at: https://www.doria.fi/bitstream/handle/10024/184724/Raportteja%2015%202022.pdf?sequence=7&isAllowed=y.

Wineland, S. M., Başağaoğlu, H., Fleming, J., Friedman, J., Garza-Diaz, L., Kellogg,W., Koch, J., Lane, B. A., Mirchi, A., Nava, L. F., Neeson, T. M., Ortiz-Partida, J. P., Paladino, S., Plassin, S.,Gomez-Quiroga, G., Saiz-Rodriguez, R.,

Sandoval-Solis, S., Wagner, K., Weber, N., Winterle, J., Wootten, A. M. (2022). The environmental flows implementation challenge: Insights and recommendations across water-limited systems. Wiley Interdisciplinary Reviews: Water,9(1), e1565.https://doi.org/10.1002/wat2.156524

Yarnell Sarah M., Willis Ann, Obester Alyssa, Peek Ryan A., Lusardi Robert A., Zimmerman Julie, Grantham Theodore E., Stein Eric D. 2022. Functional Flows in Groundwater-Influenced Streams: Application of the California Environmental Flows Framework to Determine Ecological Flow Needs, Frontiers in Environmental Science, Vol 9, DOI=10.3389/fenvs.2021.788295

Annex I – Expert interviews

The following lists the interviews carried out with nine national experts to complement the data collection for Deliverable 2.1 concerning water allocation, eflows and water value chains regulatory regimes. The interviews that provided material for this report on eflows are cited directly in the text.

1. Sweden, interview 1, civil servant, Ministry
2. Sweden, interview 2, judge, Land and Environment Court
3. Finland, interview 1, civil servant, Ministry
4. Finland, interview 2, judge, administrative branch
5. Spain, interview, national expert on water regulation and management
6. France, interview, one national expert on eflows & one civil servant at environmental agency
7. England, interview, two national civil servants on water regulation and eflows
8. Romania interview 1 civil servant, water administration
9. Romania, interview 2, NGO

Annex II – Analysis template (Regulating eflows)

Enabling policies and institutions

Question 1 – How are key requirements set for eflows in your country? *Multiple options are possible* *Depending on the type of response chosen, provide detailed information on the requirements set. E.g. in case of specific national legislation, please provide law number, articles on eflows, and content of requirements.* *Provide key references of relevant documents.*
☐ In national legislation (clearly explain if it is national water law/water act; or a decree; or a regulation; or a specific regulation on dam operation) ☐ In regional legislation ☐ In national guidelines or non-binding standards ☐ In regional guidelines or non-binding standards ☐ In sector-specific guidelines (e.g. eflows guidelines for hydropower) ☐ Case-by-case permit requirements (with or without underlying legislation) ☐ No requirements for eflows ☐ Requirements in development Please explain:
Question 2 – Which key EU policies does the eflows policy framework link to in your country? *Multiple options are possible*
☐ Water Framework Directive ☐ Habitats & Birds Directives (conservation/restoration of habitats and species) ☐ Floods Directive ☐ Environmental Impact Assessment ☐ Other Please specify if different pieces of legislation address eflows for these different policies:
Question 3 – Are there any other strategies or plans which address eflows explicitly? This could include river basin management plans, drought management plans, climate adaptation strategy or plan, sectoral plans (e.g. hydropower national or regional master plans)

Question 4 – Does legislation define one or more competent authorities for eflows implementation at different scales (e.g. ministries, independent agencies, river basin organisations, etc)? **If not by legislation, are the competent authorities defined in another context?**
Question 5 – Explain the role of each competent authority, i.e.
a) Who is the lead authority on eflows policy? Explain: b) Who is responsible for defining eflows in the river basin management planning (RBMP) planning process? Explain: c) Who is responsible for issuing and revising permits that respect eflows? Explain: d) Who is responsible for monitoring, enforcement and compliance with eflows? Explain:
Question 6 – Which stakeholders are involved in the implementation of the overarching policy framework for eflows at more local level? How are decisions taken?

Legal definition & scope of eflows

Question 7 – How does legislation define eflows? Please provide the specific wording.
Question 8 – Do legal and regulatory requirements and methodologies only consider minimum flows? Or do they consider different flows (high flows, flood flows, base flows, etc) in different seasons?
Question 9 – Are the particular ecological conditions of natural droughts included in the definition of eflows in the legal and regulatory framework?
Question 10 – Does the eflows policy framework specify a methodology for establishing eflows? *Choose one option*

☐ Yes, one methodology specified

☐ Yes, more than one methodological option

☐ No methodology specified

☐ Methodology in development

If **yes**, is it a hydrology-based methodology with a focus on minimum flows? Or is it a methodology based on habitat models? Or something else?

Please explain:

Question 11 – Do legal and regulatory requirements apply in theory to any water body or is there a focus on specific waters only, e.g. waters with protected species?

Question 12 – Which specific legal and regulatory requirements for eflows are defined, regarding flow magnitude, timing, frequency, duration, different seasons in the year, and year-to-year variability?

Question 13 – Do legal and regulatory requirements for eflows refer to:

… **the role of eflows for meeting WFD and other policy requirements for good water quality, particularly at low flow conditions (e.g. link of eflows implementation to bathing or recreational waters standards, to regulations for sewage treatment plant discharges, for industrial discharges, for application of fertilisers/pesticides)?** ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between groundwater levels and eflows (groundwater acknowledged as key factor in supporting eflows and groundwater-dependent ecosystems)? ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between eflows and the status of specific biological quality elements (e.g. fish) under WFD? ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between eflows and the survival of certain species? ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between eflows and keeping healthy ecosystems to provide key ecosystem services? ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between eflows, hydromorphology and sediment? ☐ Yes ☐ No ☐ Unclear

Please explain:

… the link between eflows and climate change? ☐ Yes ☐ No ☐ Unclear

Please explain:

Question 14 – How are the eflows requirements from the overarching policy framework translated into requirements at more local level?

Multiple options are possible

☐ Eflows for specific water bodies determined in River Basin Management Plans and Programmes of Measures of WFD

☐ Eflows established for specific hydraulic infrastructure (e.g. dams) based on national/regional regulations

☐ Other

Please explain:

Eflows in the water allocation regime

Question 15 – How are eflows addressed in water allocation in your country?

Multiple options are possible

☐ A cap on total water abstractions (surface and groundwater) is imposed to protect and preserve eflows (cap imposed before water becomes over-allocated and eflows cannot be met) (prior restriction approach)

☐ Reallocation or reduction of abstraction rights of water users (e.g. hydropower, irrigation) to ensure eflows are protected (eflows are considered as "another water use")

☐ A legal right to water for the environment is established (water license held by an entity on behalf of the environment). This involves granting entitlements to the environment (non-consumptive use), similar to consumptive entitlements.

☐ Other

Please explain:

Question 16 – Does the regulatory framework allow for reduction of eflows under drought conditions?

Eflows and the system of permits and water rights*

*(*in addition to questions asked under "permitting regime" in water allocation section of questionnaire)*

Question 17 – Is there a clear regulatory framework to limit or prohibit abstractions at low flows in dry periods? **If yes, does this apply to both surface and groundwater abstractions?**
Question 18 – Are there old water rights? Define year (year of legislation) before which water rights are defined as "old"
Question 19 – Is there a clear timeline set in the legal and regulatory framework to review old water rights and existing abstraction permits? Does the legal and regulatory framework make specific reference to the introduction of eflows in this context?

Enforcement and compliance

Question 20 – Is there a legal obligation to monitor eflows at large infrastructures and major water intakes (e.g. dams)?
Question 21 – Is there a legal obligation to monitor eflows at other parts of the river network affected by smaller abstractions and intakes?
Question 22 – Are there regular reports published by competent authorities on the level of compliance with eflows in different river basins and water bodies (based on monitoring)?
Question 23 – Does the legal and regulatory framework foresee penalties for permit holders if eflows are not respected? If yes, what type of penalties is foreseen? Is this limited to permit holders for large infrastructures and major water intakes (e.g. dams)?
Question 24 – Are the impacts of implemented eflows on ecosystem condition regularly assessed based on monitoring and, if needed, eflows adapted? (i.e. adaptive management)
Question 25 – Are there trainings offered by competent authorities to lawyers and judges on eflows, to be prepared for legal cases on water rights disputes involving eflows implementation?
Question 26 – Are technical and scientific advisors called in, if there are legal cases on water rights disputes involving eflows implementation?

Barriers

Question 27 – Which of these barriers do you think apply most to the implementation of eflows in your country?

Multiple options possible. Barriers may vary between different places in the country. We ask for an overall judgement, but please explain in what ways your judgement should be qualified below.

On a scale of 1 (very important), 2 (important), 3 (less important) to 4 (not important)

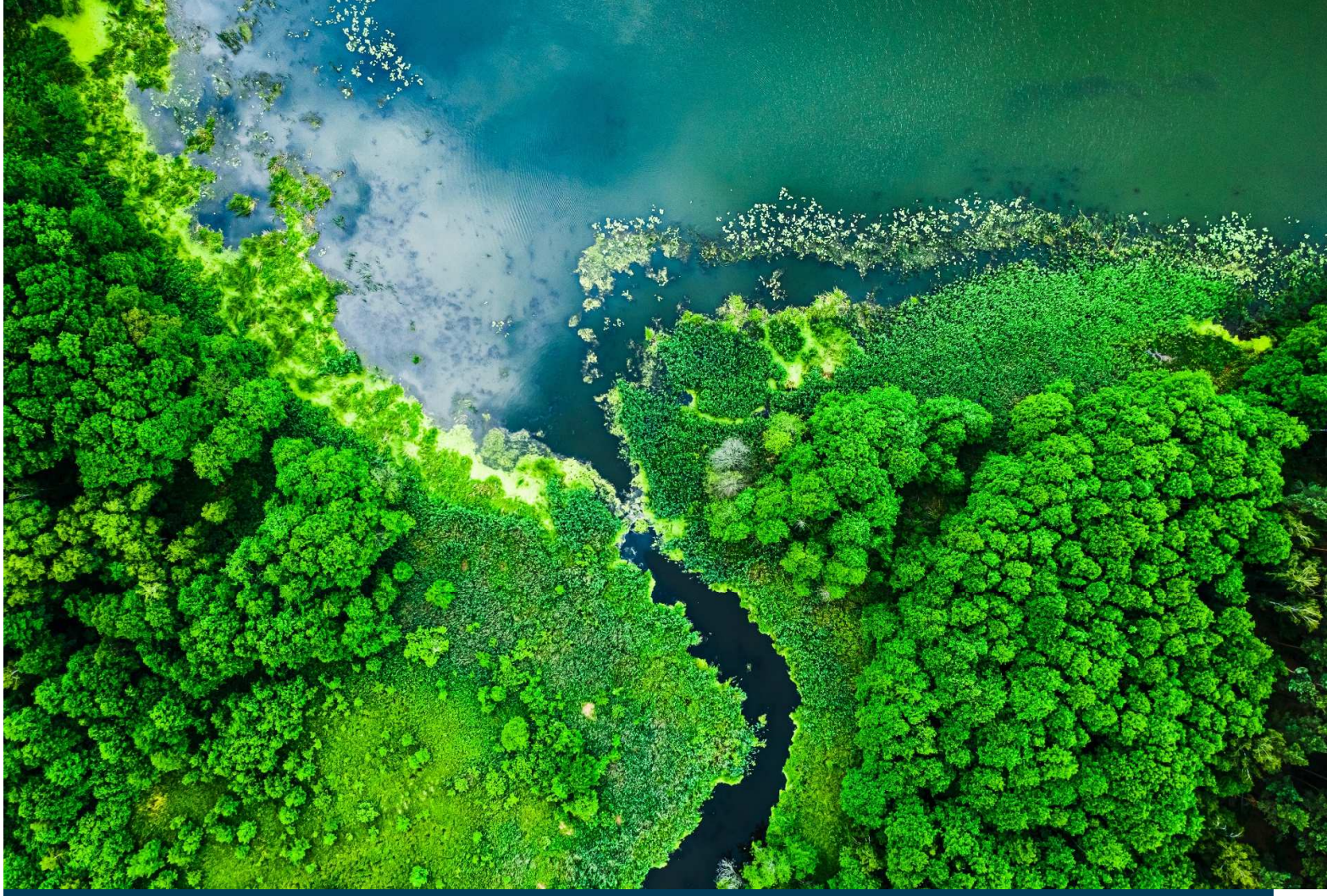
Eflows **definition and implementation mechanisms** set out in legal framework are **not sufficiently precise and detailed** and so implementation can differ across the country. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Uncertainties on the definition of eflows and lack of clear methodologies in the legal framework for establishing eflows. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Eflows **definition and implementation mechanisms** set out in legal framework for eflows are **not properly translated in local context**. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Declining water availability and increasing variability of flow regime under climate change. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Scientific barriers e.g. lack of scientific knowledge on interrelation of surface and groundwater abstractions with eflows, lack of appropriate data and models on flow regimes. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Eflows implementation hindered by not controlling **illegal groundwater and surface water abstractions.** Explain possible reasons (use examples/mention specific cases, if applicable):	
Old water rights cannot be reviewed (or difficult to review) to introduce eflows requirements. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Eflows implementation hindered by **lack of information exchange and collaboration between different policy institutions** relevant to water use, e.g national authorities for environment, energy, flood protection, regional and local authorities implementing water management measures. Explain possible reasons (use examples/mention specific cases, if applicable):	

Eflows enforcement hindered by **opposition of water users (e.g. hydropower, irrigation) because of reduction of economic benefits** when eflows are introduced. Explain possible reasons (use examples/mention specific cases, if applicable), explain which water users: …	
Eflows policies are not considered in planning processes and policies of key sectors that are major water users and may thus impact eflows implementation (in particular, hydropower plans; CAP and rural development programmes for agriculture; water utility strategic plans; industrial water use policies and planning) Explain possible reasons (use examples/mention specific cases, if applicable):	
Eflows implementation and enforcement hindered by **lack of involvement of stakeholders** other than authorities. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Eflows implementation hindered by **lack of communication to convince citizens** on the importance of water in the river Explain possible reasons (use examples/mention specific cases, if applicable): …	
Eflows implementation hindered by **lack of resources and capacity** of competent authorities for this issue. Explain possible reasons (use examples/mention specific cases, if applicable): …	
Compliance check of eflows implementation hindered by **unsuitable monitoring** framework for this purpose Explain possible reasons (use examples/mention specific cases, if applicable): …	
Enforcement of eflows hindered by **insufficient penalties** to permit holders when eflows are not respected Explain possible reasons (use examples/mention specific cases, if applicable): …	
Other Please explain: …	

Question 28 – Are there any steps planned to develop the existing legal and regulatory framework for eflows definition and eflows implementation?

Good practice

Question 29 – please report any good practice / front runners in implementing successfully eflows that you have come across during your research for this questionnaire *Compiling such examples will be useful for Task 2.2 on innovative governance mechanisms*



GOVAQUA Policy matrix – Part C Regulating value chains and sustainable water footprints

GOVAQUA Deliverable 2.1

Penttilä, O., Belinskij, A., Rouillard, J., Tarpey, J., Kampa, E., Díaz, E., Berbel, J., Junjan, V.

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Version	Date	Released by	Nature of change
1.0	31.07.2023	Eleftheria Kampa	Milestone background document
1.1	30.04.2024	Outi Penttilä	Ready for country information review
1.2	20.06.2024	Outi Penttilä	Draft deliverable submitted for internal review
	21.6.2024-28.6.2024	Suvi Sojamo, Esther Diaz-Cano	Review of the draft deliverable
1.3	29.07.2024	Outi Penttilä	Revisions made based on the internal reviewers' comments and suggestions.

Contents

List of Abbreviations

Abbreviation	Explanation
AWS	Alliance for Water Stewardship
CSDDD	Directive on corporate sustainability due diligence
CSRD	Corporate Sustainability Reporting Directive
EC	European Commission
EDPR	Environmental Damage (Prevention and Remediation) Regulations (England)
EMAS	Eco-Management and Audit Scheme
EU	European Union
ISO	International Standards Organisation
NFI	Directive 2014/95/EU disclosure of non-financial and diversity information by certain large undertakings
NGO	Non-Governmental Organization
OECD	Organisation for Economic Cooperation and Development
SDG	Sustainable Development Goals
STWI	Sweden Textile Water Initiative
UN	United Nations
WEFW	Water, Energy, Food Waste nexus
WFD	Water Framework Directive

Introduction

Research Objective

This report focuses on the challenges and opportunities that relate to designing and implementing sustainable water governance in value chains. The report aims to contribute to the ongoing policy discussions on the role of sustainable water management in the context of corporations' value chains. Its specific objectives are:

- To provide insights into how value chain-related legal regulatory frameworks are designed and implemented in the European Union and in the six Living Lab countries of GOVAQUA;
- To discuss challenges with the design and implementation of value chain-related legal regulatory frameworks in Europe; and
- To identify opportunities for innovative solutions to implement sustainable water management through water-related value chains in Europe.

The focus of the analysis is on the six case studies forming the network of Living Labs of the EU project GOVAQUA, including five EU countries (Spain, France, Romania, Finland, Sweden) and the United Kingdom (UK). Although the UK is not part of the EU, water policy and management remains highly structured around the Water Framework Directive (WFD).

This report (Part C) is one of three parts composing Deliverable 2.1 of the GOVAQUA project. Part A focuses on water allocation and B addresses in more detail the legal and regulatory approaches in relation to ecological flows.

Methodology

The report produces a doctrinal legal analysis of European legislation on value chain-related legislative framework at the European Union and national levels. Based on literature (e.g. Puharinen *et al.*, 2021; Sojamo *et al.*, 2021), a national policy template with the following questions was drafted for the six Living Lab countries. Each country's domestic legal and regulatory framework was analysed in light of these questions:

- What is the national framework for regulating value chains? The respondent was asked to reflect the question both in light of the general statutory framework and in light of the sector-specific self-regulation schemes for corporate social responsibility as well as with regard to the ongoing discussions for adopting a legislative framework.
- If value chains are legislated nationally, does the legislation cover water management and quality issues (e.g. human right to water, environmental standards that are relevant to water)?
- If value chains are legislated nationally, what is the scope of the legislation (in other words, what is the range of companies to which it applies)?
- If value chains are legislated nationally, what is the adopted approach? (The duties relate to reporting; the duties are based on due diligence obligations; the legislation includes provisions on liability.)
- If value chains are regulated nationally, how is the enforcement regulated?
- If value chains are regulated nationally, has the regulation been applied in national courts?

The responses to the questionnaire were produced by national experts. Given their briefness, the responses were then complemented by an analysis of primary legal sources for each country, such as legal acts and decrees, the preparatory materials of those legal instruments, legal literature and possible relevant jurisprudence of national courts to enable a more comprehensive analysis.

Outline of the Report

This report is structured into three chapters. It starts by introducing the relevant EU-level discussions and the used terminology on the legal, regulatory and institutional framework for value chains. It then moves to a country-by-country analysis of the legal and regulatory framework, first analysing the general regulatory framework for corporations' due diligence obligations in each Living Lab country and then scrutinising the potential value chain-specific regulatory framework and its elements. Based on these descriptive chapters, the conclusions highlight key challenges in implementing water stewardship in value chain-relevant legal regulatory frameworks for sustainable water management in Europe, while also indicating avenues for further work on innovations and solutions that can facilitate future implementation of value chain related regulation and policies.

Key characteristics of value chain regulation

International policy framing

There is currently no comprehensive international treaty that would regulate value chains. Given the lack of binding instruments, voluntary, non-binding measures have been introduced. These include e.g. the UN Global Compact, which consists of ten principles that call companies to respect universal principles of human rights, labour, environment and anti-corruption to enhance the sustainability of their operation (UN, 2000). The OECD's Guidelines for Multinational Enterprises on Responsible Business Conduct contain recommendations for multinational enterprises to encourage positive contributions enterprises can make to sustainability and to minimise adverse impacts, for instance, on the environment in their operations and supply chains (OECD, 2023).

In respect to water, "global initiatives, guidelines and tools that focus on the role of business and their value chains under the banners of corporate water stewardship and water security" have been developed (Sojamo and Rudebeck, 2024, p. 313). Such initiatives, guidelines and tools seek to improve the sustainability of companies' water use in terms of both environmental and human rights aspects (Puharinen *et al.*, 2021). Notably, the Alliance for Water Stewardship (AWS) hosts the site-level International Water Stewardship Standard. AWS defines water stewardship as "the use of water that is socially and culturally equitable, environmentally sustainable and economically beneficial, achieved through a stakeholder-inclusive process that includes both site- and catchment-based actions" (AWS, 2023). The European Water Stewardship Program, a regional initiative to AWS which has now ceased to exist, established a system for businesses, industry and agriculture to develop sustainable water management practices, based on a program including standards, a certification and a communication scheme (EWP, 2017). The EWS certified sites are these days monitored under the AWS.

EU policy framing

The EU has enacted the most impactful value chain legislation thus far. These measures adopt different approaches to regulating value chains: some are based on reporting duties and standardization, some on due diligence approach, and some seek to establish liability for violations of due diligence (Puharinen *et al.*, 2021).

The reporting and standardization-based approach is adopted, for instance, in Regulation (EC) No 1221/2009 that concerns the voluntary participation by organisations in a Community Eco-Management and Audit Scheme (EMAS). Last amended in 2023, the Regulation establishes EMAS as a voluntary measure to promote

organizations' environmental performance and the establishment and implementation of environmental management systems. The established requirements follow Sections 4-10 of the EN ISO 14001:2015 standard. Transparency and public reporting are also central elements of EMAS (EC, 2009, Annex II). The related environmental review includes water-related aspects (EC, 2009, Annex I).

The Directive (EU) 2022/2464 regarding corporate sustainability reporting (CSRD) modernizes the rules on environmental and social information that needs to be reported. It amends the Directive 2014/95/EU that concerns the disclosure of non-financial and diversity information by certain large undertakings (EC, 2014). The Directive 2014/95/EU required companies to disclose relevant non-financial information so that investors and other stakeholders may have access to a more complete picture of their development, performance, and the impact of their activities to, for instance, the environment or human rights. The new CSRD imposes the reporting obligations to a broader set of companies (EC, 2022a, article 19a). It requires them to enclose information on "sustainability matters", which the CSRD defines as "environmental, social and human rights, and governance factors" (EC, 2022a, article 2). The information on sustainability matters needs to be included in the undertaking's management report and it contains e.g. a brief description of the undertaking's business model and strategy, "a description of the time-bound targets related to sustainability matters set by the undertaking", "a description of the undertaking's policies in relation to sustainability matters", a description of the adopted due diligence process regarding sustainability matters, information on the existing incentive schemes linked with sustainability matters as well as a description on principal risks associated with sustainability matters (EC, 2022a, article 19a). The CRSD applies not only to the undertaking's own activities but also its value and supply chains (EC, 2022a, article 19a). The relevant sustainability reporting standards are required to specify the required information on water pollution and resources (EC, 2022a, article 29b). On 31 July 2023, the Commission adopted delegated Regulation on the European Sustainability Reporting Standards (EC, 2023). Once in force, it will specify the requirements for the reported information, requiring for instance submitting the information on the value chain, including the information on water pollution and water resources (EC, 2023, Annex 1).

In addition to reporting, the EU legal framework also seeks to standardize the criteria for sustainable financing. In 2020, the Commission introduced the EU taxonomy for sustainable activities as part of its sustainable finance framework and to meet the objectives of the European Green Deal by directing investment towards sustainable initiatives and projects. In 2023, the taxonomy was expanded to cover activities relevant to the sustainable use and protection of water and marine resources (EC, 2023a). Specifically, water supply activities related to the "construction, extension, operation, and renewal of water collection, treatment and supply systems for human consumption" from surface and ground water are covered with a set of technical screening criteria related to regulatory compliance, Infrastructure Leakage Index, and metering. An additional extension of the taxonomy (EC, 2023b) covers circular economy objectives and addresses the production of alternative water resources for non-human use, such as irrigation and industrial reuse, through reclaimed water (e.g. rain and storm water as well as grey water).

The EU has also sought to regulate the value chains of certain sectors such as timber products (EC, 2010) and minerals (EC, 2017). These initiatives are examples of due diligence-based regulatory tools that establish duties for operators to provide information, to carry out risk assessment procedures and to put in place risk mitigation procedures; however, they do not address water-related issues.

The newly adopted Directive on corporate sustainability due diligence (CSDDD) adopts both the due diligence-based approach to regulating value chains as well as concerns liability. It covers large companies and the respect for human rights and environmental issues in their value chains. First proposed by the Commission in 2022, the draft Directive sought to establish a due diligence obligation to such companies throughout their value chains to foster the identification of adverse environmental and human rights impacts (EC, 2022b). As the current voluntary approaches to due diligence had not been adequate in achieving large-scale improvements and certain Member States have initiated national legislative campaigns to curb the breaches of due diligence in value chain, the proposal sought to improve and harmonize the due diligence obligations applicable to corporations, "increase corporate accountability for adverse impacts", and

"improve access to remedies for those affected by adverse human rights and environmental impacts of corporate behaviour" (EC, 2022b, p. 3).

The version of the Directive that was adopted in the European Parliament on 24 April 2024 seeks to establish due diligence obligations to corporations for adverse impacts on human rights and the environment and liability for such violations. In the adopted form, the CSDDD lays down rules on due diligence obligations throughout a company's own activities and the value chain of a company and liability for non-compliance with such duties as well as an obligation to "adopt and put into effect" a transition plan for climate change mitigation (EP, 2024, article 1). Scope-wise, the proposed Directive shall apply to EU-based companies that have more than 1.000 employees on average and a net worldwide turnover of more than 450 million euros, as well as to an ultimate parent company of a group that reaches such thresholds even if the company itself falls short of the thresholds. In addition, the scope of the proposed Directive covers non-EU-based companies that generate a net turnover of more than 450 million euros in the EU as well as ultimate parent companies of groups that go over such thresholds (EP, 2024, article 2). The due diligence obligation in value chain covers both a company's own activities as well as its business partners' activities in the chain of activities. Such a chain covers both upstream business partners related to the production of goods or the provision of services by that company and those of its downstream business partners related to the distribution, transport and storage of a product of that company (EP, 2024, articles 1 and 3(g)).

The key obligations include a duty to carry out a risk-based human rights and environmental due diligence. This obligation consists of duties to integrate due diligence into company policies and risk management systems, identify and assess adverse impacts, mitigate and prevent potential adverse impacts, stakeholder engagement, notification, monitoring, and public communication of due diligence (EP, 2024, article 4). Article 5 further identifies requirements for a due diligence policy a company must uphold, whereas article 7 establishes a duty to prevent and mitigate potential adverse impacts. The proposal allows for introducing more stringent obligations in national legislation (EP, 2024, article 3a).

The enforcement provisions of the CSDDD require that each Member State must designate a supervisory authority to monitor compliance with the due diligence obligations. The authority must have adequate powers and resources to carry out the monitoring and it must be able to consider substantiated concerns submitted by natural and legal persons (EP, 2024, articles 17-19). The CSDDD also requires that companies can be held liable for damages caused by intentional or negligent failures to comply with the due diligence obligations. The civil liability would not extend to damage caused solely by the company's business partners. Although Member States can exercise national discretion in deciding the conditions under which an alleged injured party may authorise e.g. a trade union, non-governmental environmental organisation or other non-governmental organisation to bring action to enforce the rights of the injured party, the conditions must be reasonable (EP, 2024, article 29).

Annex to the CSDDD includes lists of specific adverse environmental impacts and adverse human rights impacts that would be relevant for this Directive in determining the content of due diligence (EP, 2024, p. 37). Indeed, the definition of "adverse environmental impact" is based on the breach of the prohibitions and obligations included in the Annex (EP, 2024, article 3(1)(b)). Annexes I and II use lists of key international conventions in the field of human rights and environmental protection to define such adverse impacts. When it comes to freshwater issues, the Commission's original list of environmental agreements did not refer to any water-related instruments but referred to water as part of the human rights violations in Part I of the Annex (EC, 2022b, Annexes). In 2023, the European Parliament suggested amendments to Part II of the Annex and incorporated references to the 1982 UN Convention on the Law of the Sea and the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes to prevent, control and reduce water pollution (EP, 2023). In the version of the text that the European Parliament adopted, Annex I refers to the prohibition to "restrict workers' access to adequate food, clothing, and water and sanitation in the workplace" (EP, 2024, Annex I, para 8). In addition, paragraph 18 prohibits causing "any measurable environmental degradation", such as water pollution or excessive water consumption, which, for instance, "denies a person access to safe and clean drinking water", "makes it difficult for a person to access sanitary facilities or destroys them", or "substantially adversely affects ecosystem services through which an

ecosystem contributes directly or indirectly to human wellbeing". Paragraph 18 further stipulates that these requirements are to be "interpreted in line with" the right to life, right to an adequate standard of living, and the right to health as determined in international human rights' conventions. Annex II, however, no longer contains references to freshwater protection.

Finally, in the context of the Europe 2020 Strategy, the European Commission launched the Roadmap to a Resource Efficient Europe in 2011 (EC, 2011), which aimed to ensure economic growth while simultaneously reducing resource use. The roadmap recognizes the role of companies' value chains in achieving these aims for instance through exchanging information and inter-actor cooperation. The roadmap also set a target for 20% reduction in the food chain's resource inputs. The EU Code of Conduct on Responsible Food Business and Marketing Practices (EC, 2021) identifies improved resource efficiency within operations as an "indicative action". It specifically mentions improved water efficiency via "water management practices, waste water quality, water recovery and re-use." The impact of the food value chain on resources is also noted in the EU's Circular Economy Action Plan (EC, 2020).

Institutional, regulatory and legal challenges

There are challenges to fostering resource efficient behaviour in value chains such as agriculture, industry, and energy, among others. Regulations and standards can be valuable in meeting SDG objectives, including those related to water supply, but they can also present obstacles to businesses and value chains. Kaplinsky and Morris (2017) identify some barriers for regulations and standard to lead to improved sustainability and resource use: the costs to achieve certifications may exclude smaller producers and disadvantaged groups, and standards may require basic skills that marginalised groups may not have. McKinsey (2009) further points out that regulating water use may require technological solutions that come at costs which may hamper production. Vos and Boelens (2014) question international private certification schemes' ability to operationalise sustainable and/or fair production and trade of agricultural products at the local level. Although certification schemes have "potential to prevent water grabbing and water contamination", the schemes tend to "target on-farm irrigation technology and record keeping, disregarding how water use is geographically and politically embedded in catchments, territories, and broader institutional, socio-economic and cultural contexts" (p. 224). To address such concerns, the schemes should incorporate broader views of environmental and social impact (Vos and Boelens, 2014). Other key barriers recognised by Lucas *et al*. (2024) include, for instance, the resource-intensive nature of implementing water stewardship within a corporation and the conceptual complexity of water stewardship and governance and leadership-related issues, such as the lack of state actors' enabling potential and "a lack of understanding of how collective action should be governed in practice (e.g. who should lead it, how competing interests should be reconciled, and how actors should be held accountable)" (p. 26).

Voluntary standards and the related reporting and monitoring measures operate by enabling the civil society and media to scrutinize the corporations' actions in the field of corporate social responsibility (Morgera, 2020). Reporting on the basis of voluntary guidelines may raise awareness and increase transparency; however, such mechanisms often suffer from inadequate enforcement and may lead to greenwashing. Altogether, voluntary reporting has not been particularly effective in preventing human rights and environment related violations (Smit *et al.*, 2020a).

Smit *et al.* (2020a) further highlight that transforming due diligence into a legal duty of care increases the monitoring costs of public authorities. It would also increase the production costs of large companies but could lead to benefits to their brand image, reputation, and sales. At the same time, they recognize that if regulated, due diligence obligations tend to be rather generic. This will also apply to those concerning water stewardship.

One of the key regulatory challenges relates to the proposed CSDDD, as it addresses freshwater as part of the due diligence obligations only to a limited extent. The Explanatory Memorandum (EC, 2022c) explains

that the treaties listed in the Annex were selected strictly to "ensure clear obligations and legal certainty". The Annex only excludes those treaties that "create an obligation that is sufficiently precise and implementable for the companies" (EC, 2022c, p. 5, 9). The list of the environmental standards is thought to be exhaustive. Although for instance Foot (2022) argues that the material scope of the Directive may be interpreted to cover freshwater issues and that the reference to water in the context of Part I of the Annex on human rights can be argued to cover both quantity and quality of the freshwater resource, the CSDDD incorporates the environmental aspects of the freshwater issues only to a limited extent. As it does not refer to the most relevant multilateral environmental agreements on freshwater issues and excludes non-binding instruments from its purview, the CSDDD mostly excludes the pollution and depletion of freshwater from its scope (Foot, 2022). Lafarre (2023) further questions whether the chosen approach to enforcement in the CSDDD through civil liability is the most effective means to internalize the costs of human rights and environmental violations. If the civil liability regime recognizes the principle of limited liability, it may result in its strategic exploitation to enable the parent companies to "shift risk disproportionately to undercapitalized subsidiaries" (Lafarre, 2023, p. 225-227).

Characterising value chain systems

For the purposes of GOVAQUA, "value chain" is used to refer to "the sequence of activities through which raw materials or components are transformed into final products" (Bair, 2008, p. 15). Such sequences may be conducted by a corporation within its boundaries and under one legal jurisdiction; however, they have increasingly been "fine-sliced and broken up as activities that were previously collocated have been relocated across organizational or geographical boundaries" (Pedersen *et al.*, 2017, p. xv). Corporations' value chains can refer to the fragmented and globalized production networks that operate transnationally across State boundaries and are complex and diverse. Such networks consist of a company's subsidiaries and suppliers (ILO, 2016; Salminen and Rajavuori, 2019). Corporate water stewardship in such networks thus covers both the direct water-related operations of the transnational corporations and the water-related activities in their value chains through the operations of their suppliers (AWS, 2011). In the context of GOVAQUA, corporate responsibility consists of complying with the standards and regulations relevant to water use and governance in force within a jurisdiction and of adopting complementary measures to prevent social and environmental harm (after Morgera, 2020). Corporate social responsibility broadens "the scope of stakeholders within a company beyond shareholders, so as to include all interest groups affected by the company's activities, such as: governments, employees, boards of directors, investors, consumers, suppliers, local communities in and around areas where the company operates, civil society, and the public at large" (Morgera, 2020, p. 19).

On domestic level, value chains, and the entities that make them up, are simultaneously dependent on water resources and can also have impacts on water resources. Different elements of value chains will have different relationships with water resources and face a range of challenges in this regard. For example, a portion of the value chain related to manufacturing may have a high dependency on water, but low impacts. Here, the importance of water to this portion of the value chain would still be considered high. From the perspective of actors in the value chain, there is an incentive to set standards and targets to enhance their performance in these areas with regards to water use, and in turn environmental performance. From a regulatory standpoint, this similarly means that these portions of the value chain present an opportunity for identifying where to prioritize regulation, which may also include targets and standards. Splitting up the different components of the value chain, and assessing the dependencies and impacts, can therefore be a helpful approach towards identifying the key challenges, opportunities, and good practice. Such an approach is also mutually beneficial to the actors within the value chain itself, who can gain information on their risks and vulnerabilities with respect to their water use.

On transnational level, various actors of the value chain may have different impacts on water depletion and quality. The regulatory approach to corporate water stewardship in value chains may take the form of voluntary standards and reporting, due diligence-based approaches, or seek to combine due diligence approach with liability for human rights' violations or environmental damage (Puharinen *et al.*, 2021). The

regulatory framework in Europe is going through a transition phase: the recently enacted corporate accountability acts in various European countries, such as France and Germany, and the adopted CSDDD of the EU ensure that the legal framework will be in flux for the years to come. Distilling good practices from the country-specific examples will assist in promoting the transition to more sustainable water stewardship in Europe.

GOVAQUA will thus study how the value chains are regulated and governed currently on domestic levels in various European countries, what kind of an approach the existing proposals and legislative frameworks adopt, and to what extent they regulate corporate water stewardship. The project seeks to assess the options for regulating corporate water stewardship with an aim of contributing to the ongoing European debates on corporate responsibility legislation with the perspective of water.

Legal, regulatory and policy framework on value chains on national level

Finland

General legal and regulatory framework

Although no specific legislation on value chains exists, Finnish company law establishes a framework for some due diligence-related obligations. For instance, Section 5 of Chapter 1 of the Limited Liability Companies Act (624/2006) establishes that "[t]he purpose of a company is to generate profits for the shareholders, unless otherwise provided in the articles of association" (Finnish Parliament, 2006). Such other purpose provided in the articles of the association may include sustainability issues (Puharinen *et al.*, 2021, p. 183). The Act also imposes the management of the company a duty to act with "due care and promote the interests of the company" (Finnish Parliament, 2006, Chapter 1, Section 8). Although such due care does not require the management of a company to adopt due diligence procedures or to uphold stringent policies for corporate social and environmental responsibility (Mähönen, 2013), acting in accordance with such a standard of care requires taking decisions that are based on adequate information (Finnish Government, 2005, p. 41). The management's failure to act with due care may result in liability for damages caused to the company intentionally or through negligence (Finnish Parliament, 2006, Chapter 22, Section 1).

The Finnish Accounting Act (1336/1997) includes duties relevant to sustainability reporting that apply to large companies, listed small companies, and listed medium-sized companies (Finnish Parliament, 1997, Chapter 7, Section 1). This Act – and particularly Chapter 7 that entered into force on 31 December 2023 – transposes the CSRD into domestic law. The duty to prepare a statement on sustainability requires that the reporting entity presents the information on its effects on sustainability issues and how sustainability matters affect the development, profit and status of the reporting entity (Finnish Parliament, 1997, Chapter 7, Section 3). As the Government proposal explains, such sustainability issues cover impacts on humans and the environment (Finnish Government, 2023, p. 31). The amended Accounting Act requires that a reporting entity's sustainability report describes its relationship between business operations and sustainability issues and the operating principles of business operations (Finnish Parliament, 1997, Chapter 7, Section 4); sustainability-related targets and information on them (Chapter 7, Section 5); the procedures regarding sustainability issues (Finnish Parliament, 1997, Chapter 7, Section 7); and its most relevant sustainability risks (Finnish Parliament, 1997, Chapter 7, Section 8). Such a sustainability reporting duty covers not only the reporting entity's own actions but also its value chain, including information concerning its products and services, its business relationships and its supply chain (Finnish Parliament, 1997, Chapter 7, Section 11).

Companies also face due diligence requirements through environmental law. For instance, the Environmental Protection Act (527/2014) seeks to e.g. "prevent the pollution of the environment and any risk of this, prevent and reduce emissions, eliminate adverse impacts caused by pollution and prevent environmental damage" (Finnish Parliament, 2017, Chapter 1, Section 1). The Act establishes a permit system for activities that cause or may cause environmental pollution (Finnish Parliament, 2014, Chapter 4, Section 27). It further requires that all operators need to have "knowledge of the environmental impacts and risks of their operations, and of the management of these impacts and risks and ways to reduce adverse impacts" and obligates operators to prevent and limit environmental pollution when undertaking operations (Finnish Parliament, 2014, Chapter 2, Section 6-7). Similarly, the Water Act (587/2011) stipulates that a "water resources management project shall be implemented and water resources and water areas otherwise used in a way that it does not cause any avoidable infringement of a public or private interest" (Finnish Parliament, 2011, Chapter 2, Section 7). The Act on Compensation for Environmental Damage (737/1994), in turn, regulates the issue of compensation for environmental damage that is caused by activities carried out in a certain area and resulting from e.g. pollution of the water, air or soil (Finnish Parliament, 1994, Section 1). However, these environmental legislation requirements are very limited in addressing value chains of different activities (Puharinen *et al.*, 2021).

Value chain-specific legal and regulatory framework

No specific legislation on value chains exists; however, in reaction to the EU proposal, the issue has been studied both in the context of Finland and the potential implications of the CSDDD to least developed countries (Helminen *et al*., 2020; Ngangjoh-Hodu *et al*., 2023).

The role of certificates and reporting has been recognized as a significant corporate social responsibility issue in Finland. In 2010, the Ministry of Employment and the Economy of Finland has also published a study of self-regulation and its forms in various fields, e.g. food production and forestry (Sorsa, 2010). The study claims that self-regulation has been particularly popular among corporations especially when it applies to international value chains. Such governance modes consisted particularly of reporting and standardisation; however, the study also indicated that all elements of corporate social responsibility are rarely covered at the same time (Sorsa, 2010, p. 19). Water management had been included into some of the self-regulation regimes. For instance, the Finnish Forest Certification System brought water protection into the forest management agenda (Sorsa, 2010, p. 68).

Corporate water stewardship has also been studied given that the implementation of the International Water Strategy of Finland includes a goal that Finnish companies would become world leaders in corporate water stewardship by 2030. A study by Sojamo et al. (2021) recognizes that developing sustainable water management and governance along the value chains may offer a tool for increasing the companies' overall environmental and social responsibility (Sojamo *et al.*, 2021, p. 110-111). The report recommends using recognizable international standards for water stewardship, including the Alliance for Water Stewardship's International Water Stewardship Standard (Sojamo *et al.*, 2021, p. 111).

France

General regulatory framework

France has a more elaborate legislative framework regarding due diligence in value chains, mounting to claims that it was one of the regulatory pioneers (e.g. Smit *et al.*, 2020b, p. 56). The French regulatory framework for value chains includes the Law No 2017-399 of 27 March 2017 on the corporate duty of vigilance for parent and instructing companies (Vigilance Law) (RF, 2017a).

Although the Vigilance Law constitutes the most comprehensive element of the regulatory framework, the regulation of due diligence in value chain is also affected by the Law No 2014-773 of 7 July 2014 on the orientation and the programming related to the policy on development and international solidarity (RF, 2014). As Smit *et al.* note (2020b), "[t]his law defines the objectives of State action". Article 8 of the law provides that "the policy on development and international solidarity takes into account the requirement [l'exigence] for societal responsibility of public and private actors [...] In the context of this requirement for societal responsibility, companies implement risk management procedures aimed at identifying, preventing or mitigating social, sanitary and environmental harms as well as impacts on human rights which may result from their activities in partner countries". Further, article 8 provides that France "encourages" companies headquartered in France and operating abroad to implement the OECD Guidelines for Multinational Enterprises as well as the UNGPs" (p. 58). In addition, France has also transposed the Directive 2014/95/EU of 22 October 2014 amending directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups (RF, 2017b; RF 2017c).

France has also put in place a regulatory framework for corporate social responsibility. The New Economic Regulations Law No 2001-420 seeks to increase transparency and enable shareholders and other stakeholders to better assess the overall performance of companies (RF, 2001). The Action Plan for Business Growth and Transformation (the "PACTE Law", 2019) has modified Article 1833 of the French Civil Code, which now provides that "the company is managed in its corporate interest, taking into consideration the social and environmental issues of its activity" (RF, 2019). The CSRD was transposed into the French law in 2023 (RF, 2023a; RF, 2023b).

Value chain-specific legal and regulatory framework

The duty of vigilance

Pursuant to article L. 225-102-4.-I. of the Commercial Code, as introduced by the Vigilance Law, the vigilance obligations apply to

> *Any company which, at the close of two consecutive financial years, employs at least five thousand employees within its own company and in its direct or indirect subsidiaries whose registered office is located in France, or at least ten thousand employees within its own company and in its direct or indirect subsidiaries whose registered office is located in France or abroad, shall draw up and effectively implement a due diligence plan.*

As Smit *et al.* (2020b) note, that article defines the scope of the Vigilance Law. Furthermore, it differentiates between companies that fall under the scope of the Law and are thus subject to the vigilance obligations and those companies that fall under the Law's *rationae personae*, that is, are covered by the vigilance obligations of other companies and, hence, enter into the perimeter of the Law (p. 60). The French Constitutional Court clarified the scope of the Law in its decision of 23 March 2017 (Constitutional Court of France, 2017). Rather than using a turnover threshold to determine the scope of applicability of the Law as is the case with for instance the Modern Slavery Act of the UK, the Vigilance Law requires that a company has its registered office in France, is registered in a certain corporate form, and fulfils the requirement of the number of employees as stipulated in article 1 of the Vigilance Law (Smit *et al.*, 2020b, p. 61). The requirements are rather restrictive; in 2018, it was estimated that only 237 companies would fall under the scope of the Vigilance Law (Bright, 2018, p. 12). The Vigilance Law is meant to strengthen the response to human right violations and harm to the environment "in France and abroad" (National Assembly, draft law No 2578, 11 Feb. 2015 as cited in Smit *et al.*, 2020b, p. 61).

The key vigilance obligations the Law establishes are to draft a vigilance plan, disclose it, and implement it (RF, 2017a, article L. 225-102-4.-I; Smit *et al.*, 2020b, p. 64). In this sense, the chosen legislative approach is based on *ex ante* prevention plan rather than on reporting duties that can best be described as *ex post* measures (Bright, 2018, p. 10). As noted in literature, the obligation to implement the plan is one of conduct

rather than result. In other words, the companies need to "take all steps in their power to reach a certain result [obligation de moyens] rather than to guarantee the actual attainment of that result [obligation de résultat]" (Smit *et al.*, 2020b, p. 69).

The Vigilance Law further explains the required content of the vigilance plan by stipulating that it needs to "contain reasonable vigilance measures adequate to identify risks and to prevent severe impacts on human rights and fundamental freedoms, on the health and safety of persons and on the environment [...]" (RF, 2017a). It is noteworthy that none of the key terms, such as "risk", "severe impact", or "the environment", are defined in the Vigilance Law, which is often argued to introduce an element of legal uncertainty in the interpretation of the duty to prepare a vigilance plan (Savourey and Brabant, 2021, p. 145-146; Smit *et al.*, 2020b, p. 62-63). Given that "the environment" is not defined in the Law, its text does not specify any clear duties for water protection, either. Similarly, the text is silent about the specific human rights that it should apply to and hence does not refer to the right to water. It has nonetheless been argued that the United Nations Guiding Principles on business and human rights and OECD Guidelines for Multinational Enterprises should "serve as inspiration to interpret the Vigilance Law" as they inspired the content of the vigilance plan (National Assembly, No 3582, 16 March 2016, p. 11 as cited in Smit *et al.*, 2020b, p. 65; Savourey and Brabant, 2021, p. 145-146).

The Vigilance Law further stipulates that the plan must cover the company's own activities as well as those of the "companies it controls within the meaning of II of article L. 233-16, directly or indirectly, as well as the activities of subcontractors or suppliers with whom there is an established commercial relationship, when these activities are related to this relationship" (RF, 2017a). As Cossart *et al.* (2017) explain, the French legislation defined the term "established commercial relationship" as "a stable, regular commercial relationship, taking place with or without a contract, with a certain volume of business, and under a reasonable expectation that the relationship will last" (p. 320).

As for the content of the vigilance plan, which was intended to be put together with the company's stakeholders, the Commercial Code as amended by the Vigilance Law identifies five elements (RF, 2017a):

- A risk mapping meant for their identification, analysis and prioritisation;
- Regular evaluation processes regarding the situation of subsidiaries, subcontractors or suppliers with whom there is an established commercial relationship, in line with the risk mapping;
- Adapted actions to mitigate risks or prevent severe impacts;
- An alert and complaint mechanism relating to the existence or realisation of risks, established in consultation with the representative trade union organisations within the company; and
- A system monitoring implementation measures and evaluating their effectiveness.

The Commercial Code, article L. 225-102-4.-I as introduced by the Vigilance Law also recognises a possibility to issue a decree on these vigilance measures (RF, 2017a); however, no such a decree has been issued yet.

The enforcement options

The Vigilance Law provides a twofold system of enforcement. First, pursuant to article L. 225-102-4 of the Civil Code, as amended by the Vigilance Law, anyone with standing can file a complaint to a competent court to oblige a company to establish, implement, and publish a vigilance plan in case of non-compliance with the vigilance obligations (RF, 2017a). According to literature, i.e. "victims, NGOs or trade unions" have such standing (Bright, 2018, p. 12; Smit *et al.*, 2020b, p. 70). The company would first be given three months to fulfil its vigilance obligations. If no action was taken to comply with the Vigilance Law, a competent court could be asked to order the company to comply with its vigilance obligations. Such an order could be accompanied with a periodic penalty payment (RF, 2017a).

Second, the 2017 Vigilance Law also establishes a system of civil liability for damage that the execution of the vigilance obligations could have prevented (RF, 2017a). Such liability is based on the parent or instructing company's own fault in not complying with the vigilance obligations set out in the Vigilance Law (Smit *et al.*,

2020b, p. 68). A civil liability procedure may be initiated before the competent court by any person who can demonstrate an interest in taking action (RF, 2017a).

Article 225-102-5 of the Commercial Code, as introduced by the Vigilance Law, further stipulates that the general conditions of civil liability proceedings, set out in articles 1240 and 1241 of the French Civil Code, also apply (RF, 2017a). These conditions include the existence of damage, the existence of a breach of an obligation, and the existence of a causal link between the damage and the breach (for an explanation, see Smit *et al.*, 2020b, p. 68; Bright, 2018, p. 14-15). The burden of proof for the existence of these conditions falls on the claimant (Smit *et al.*, 2020b, p. 68-69); the difficulties related to producing such proof have been identified as one of the key issues that prevent the victims of human right violations and environmental harm from having access to effective remedies (Palombo, 2019, p. 266; Bright, 2018, p. 15; Schilling-Vacaflor, 2021).

Originally, the Vigilance Law also included a possibility that a court could have ordered a company to pay a civil fine of up to 10 million euros in case of non-compliance. However, the French Constitutional Court found that it did not fulfil the requirements set out in other relevant legal frameworks. As civil fines constitute criminal sanctions, "specific principles apply, such as the principles of criminal liability and legality of offences, which require the laws to be clear and specific in order to ensure legal predictability" (Bright 2018, p. 13; Constitutional Court of France, 2017). The Constitutional Court did, however, validate the other key elements of the Vigilance Law (Cossart *et al.*, 2017, p. 321-322).

Currently, the enforcement procedure concerning the Vigilance Law has been initiated against e.g. Suez, one of the world's leading private water supplier, on the basis of its supplier causing a health crisis and depriving the population of drinking water in Osorno, Chile, in July 2019. The case is currently being deliberated in the Paris Court of Appeal (FIHD, 2024).

Romania

General legal and regulatory framework

The general regulatory framework present in Romania seems to be focused on the level of strategy development and incorporation of the EU regulations. In 2018, the government adopted the National Strategy for Sustainable Development 2030 which provides the framework for the outline of the SDGs for the period 2020-2030 (Romanian Government, 2018). Subsequently, measures regarding the inclusion of the EU provision encompassed in the Green Deal and the provisions included in the National Plan for Recovery and Resilience (adopted by the EU Council in Oct 2021) have been developed.

The Romanian legal and regulatory framework recognizes some due diligence-related obligations; however, as Aureli *et al.* (2020) note, the issue of corporate social responsibility has been introduced in particular because of the pressure from the EU (p. 7, 22). For instance, the Order of the Ministry of Public Finance no. 1938, transposes the NFI Directive into Romanian legal system (Romanian Government, 2016). The duty to provide a statement on non-financial information applies to entities that fulfil the established criteria and must include information on at least environmental, social and personnel aspects, respect for human rights, combating corruption and bribery (Romanian Government, 2016). The Order further specifies that the environmental information to be included in the statement include details regarding "the current and foreseeable impact of the entity's operations on the environment and, as the case may be, on health and safety, renewable and non-renewable energy use, greenhouse gas emissions, water use and air pollution" (Romanian Government, 2016). Furthermore, the statement must also include "the impact of the company's activity and the use of goods and services that it produces on climate change, as well as its commitments to sustainable development, to the fight against food waste and the fight against discrimination and the promotion of diversity" (Romanian Government, 2016). As Aureli *et al.* (2020) note, such information and

indicators are additional to the NFI Directive (p. 14). The CSRD has been transposed to the Romanian legal system in 2024 (Romanian Government, 2024).

Furthermore, Romanian environmental legislation provides a broad framework for water protection and use but does not specifically address value chains. The Government Emergency Ordinance no. 195/2005 on environmental protection establishes that environmental protection is the obligation and responsibility of all natural and legal persons (Romanian Government, 2005, article 6(1)). The Government Emergency Ordinance no. 195/2005 on environmental protection and the Government Emergency Ordinance no. 195/2005 on integrated pollution prevention and control further include the rules concerning the permitting regime for activities and projects that may have significant environmental impacts requiring a permit (Romanian Government, 2005a; Romanian Government, 2005b). The Government Decision No. 1213/2006 includes rules on environmental impact assessments that need to be carried out for public and private projects that may cause significant environmental impacts. The assessment is an integral part of the project's authorisation (Romanian Government, 2006). In addition, the Water Law 107/1996 requires water users to "save water through judicious use", which is to be achieved by using the best available technologies, and to "ensure the maintenance and repair of their own installations" (Romanian Parliament, 1996, article 12). The Water Law also prohibits the pollution of water resources and establishes a monitoring duty (Romanian Parliament, 1996, articles 15 and 17). Furthermore, the Water Law stipulates that waterworks that are defined in article 48 of the Water Law may be carried out only with a water management permit. The Water Law establishes the pertinent regulatory framework (Romanian Parliament, 1996, articles 48-64). Recently, the Romanian Parliament adopted the Law Number 96/12 April 2024 on the quality of water intended for human consumption (Romanian Parliament, 2024). This law provides the framework for the improvement of the quality of drinking water. The aim is to increase the consumption of water from the public provision, and therefore to limit the consumption of bottled water.

The National Strategy for Sustainable Development of Romania outlines the general measures to be taken in order to ensure the availability and sustainable management of water resources. Particular attention is addressed to develop measures regarding the limitation of wasting water, ensure water safety, and, more generally, to improve water quality (Romanian Government, 2018).

Value-chain specific regulatory framework

There are limited explicit provisions regarding value chains in Romanian legal and policy framework.

The National Strategy on circular economy, adopted by the Romanian Government on 21 September 2022 provides the framework for decisions regarding the introduction of sustainability conditions and value chains on a number of products such as electronic and telecommunications products, batteries and vehicles, plastics, packaging, textiles, construction and buildings, as well as food, water and nutrients. The reference to water is limited and outlines the intention to and need to undertake actions to implement labels and digital product passports which include, among other criteria, also water consumption during the product's life cycle (Romanian Government, 2022a).

The Decision No 107 of 29 June 2022 outlines a series of actions to be undertaken in order to facilitate sustainability and circularity in the area of textiles. This Decision includes a general statement on the intention to promote sustainable and equitable value chains but does not provide additional details on how that would be achieved (Romanian Government, 2022b).

Existing research in the field is also limited. Petrariu *et al.* (2021) investigate the value chain performance within the Romanian setting and provide results which indicate that in terms of the Water, Energy, Food Waste (WEFW) nexus the current policies are not coherent across sectors (due to short-term orientation of policy makers and functional separation between policy areas), that the incoherent legislative framework impedes upon the creation of economic opportunities, and that regional economic differentials also impedes upon the creation of economic opportunities in the WEFW sector.

Spain

General legal and regulatory framework

Spain adopted a national strategy on companies' corporate social responsibility in 2014.

In addition, the Law on Sustainable Economy of 4 March 2011 aims to introduce the structural reforms needed to create conditions that favour sustainable economic development into the legal system (SG, 2011, article 1). The term "sustainable economy" is understood to mean a growth pattern that reconciles economic, social and environmental development in a productive and competitive economy that is capable of favouring quality employment, equal opportunities and social cohesion and that can guarantee respect for the environment and the rational use of natural resources in such a way as to enable the needs of present generations to be met without compromising the options for future generations to service their own requirements (SG, 2011, article 2). Particularly the third part of the Law concentrates on environmental sustainability (SG, 2011, articles 77-111). The Law requires state-owned corporations to produce annual sustainability reports (SG, 2011, article 35). As part of such reporting duties, state-owned companies need to review their production processes for goods and services by applying environmental management criteria aimed at compliance with the standards of the EU environmental management and auditing system (SG, 2011, article 35(2)(b)). Pursuant to article 35(2)(d), such companies need to include in their contracting processes conditions referring to the level of greenhouse gas emissions and maintenance or improvement of environmental values that may be affected by the execution of the contract (SG, 2011).

Private corporations with more than one thousand employees are mandated to publish a sustainability report. Moreover, corporations may publish their policies and results in corporate social responsibility on an annual basis by means of a specific report based on the objectives, characteristics, indicators and international standards and apply to be recognised as a socially responsible company (SG, 2011, article 39). The minimum content of the reports is presented in the Order ESS/1554/2016, article 3 of which lists the commitment to the environment as a possible issue on which information can be included (SG, 2016).

Law 11/2018, of December 28, 2018 amending the Commercial Code, the revised Capital Companies Law approved by Legislative Royal Decree 1/2010, of July 2, 2010 and Audit Law 22/2015, of July 20, 2015, as regards non-financial information and diversity also establishes reporting duties for Spanish corporations. Its article 49 establishes the range of corporations that fall under the scope of these duties (SG, 2018). It also puts forward the requirements for such a statement, which needs to inter alia contain information on the impact of the corporation's activities to environmental and social issues. Such environmental information consists of details on the current and foreseeable effects of the company's activities on the environment and, where applicable, health and safety, environmental evaluation or certification procedures, the resources dedicated to the prevention of environmental risks, the application of the precautionary principle, and the amount of provisions and guarantees for environmental risks. The environmental information to be provided in the non-financial information statement includes information on sustainable use of resources, such as water consumption and water supply in accordance with local limitations (SG, 2018, article 49(3)).

The Law 12/2013, of 2 August, concerns value chain management in food sector. However, the Law does not mention the environment; rather, it aims to achieve balance in the food chain and to ensure fair, loyal, and effective competition while maintaining an adequate level of prices and adequately informing consumers (SG, 2013a). The Law 16/2021 of December 14, 2021 modifies and extends the cases in the Law 12/2013 applies (SG, 2021).

The 2015 Corporate Governance Code (Código de buen gobierno de las sociedades cotizadas) is voluntary and includes good governance recommendations for listed corporations, thereby excluding the small and medium-sized enterprises (Comisión Nacional del Mercado de Valores, 2015, p. 10). The Code recognises environmental issues and, for instance, recommends that the corporation's risk control and management policy take into account the environmental risks in addition to other relevant risks (Comisión Nacional del

Mercado de Valores, 2015, recommendation 45, p. 40). Recommendation 54 further suggests that a corporation's corporate social responsibility policy should state the principles or commitments the company will voluntarily adhere to in its dealings with stakeholder groups, specifying among other things its strategy with regard to sustainability, the environment and social issues (Comisión Nacional del Mercado de Valores, 2015, p. 45).

The Spanish legal and regulatory framework in the field of environmental law also establishes duties related to the environment that apply to corporations when they cause adverse impacts on the environment. For instance, the Law 21/2013, of 9 December 2013, on Environmental Assessment seeks to raise the level of environmental protection by requiring that a strategic environmental impact assessment is carried out for plans and programmes and an environmental impact assessment for projects. Such an assessment duty applies to both water resources management plans and programmes as well as specific projects (SG, 2013b, article 8). Furthermore, the Royal Decree 445/2023, of 13 June, modifies and extends the cases in which projects are subject to ordinary or simplified environmental assessment (SG, 2023).

In turn, the Law 26/2007, of October 23, on Environmental Liability concerns liability for prevention and repair of environmental damage in accordance with the polluter pays principle (SG, 2007, article 1). Such liability applies throughout a corporation's value chain, provided that a subsidiary was operating under the instructions of a parent company or the parent company was using the subsidiary fraudulently to limit liability (SG, 2007, article 10).

Therefore, even though Spain does not have a specific, value-chain focused legal and regulatory framework in place for water stewardship, the Spanish framework establishes an "expectation that businesses respect human rights and protect the environment in all their operations and supply chains" by disclosing information and reporting and requires, for instance, the assessment of environmental impact of corporate actions (Smit *et al.,* 2020b, p. 278). It is notable, however, that the corporate social responsibility framework also relies on voluntary actions on the part of the corporations and that the efficacy of the reporting and transparency-based legal and regulatory framework for influencing corporations' behaviour has been questioned (Smit *et al.,* 2020b, p. 227, 279).

Value chain-specific regulatory framework

Although there is presently no established framework on value chains in Spain, discussions regarding its creation have taken place. In this vein, a public consultation was convened concerning a proposed draft law on the protection of human rights, sustainability, and due diligence in transnational business activities (SG, [year not known]). Regrettably, progress on this front has been stagnant since 2022, with no further advancements reported.

Within this context, Directive (EU) 2019/633 on unfair business-to-business commercial practices in the agricultural and food supply chain is noteworthy, however. It acknowledges the prevalent disparities in bargaining power between suppliers and buyers of agricultural and food products. Spanish Law 16/2021 of 14 December, amending Law 12/2013 of 2 August, focusing on measures to enhance the functioning of the food supply chain, strives to attain equilibrium within the food supply chain and promote fair competition (SG, 2021). It also emphasizes maintaining appropriate pricing levels and furnishing consumers with adequate information. This legislation mandates the documentation of contractual conditions in written form to determine prices (SG, 2021). However, while Law 16/2021 endeavours to rectify imbalances in bargaining power and enhance transparency within the food value chain, it lacks provisions pertaining to environmental and social performance.

Sweden

General legal and regulatory framework

At the moment, Sweden has no comprehensive due diligence legislation that would apply to value chains; however, the Swedish company law establishes general duties on reporting and disclosure of information (Government Offices of Sweden, 2021, p. 4). For instance, the Annual Accounts Act (1995:1554) concerns sustainability reporting and transposes the directive on non-financial information into Swedish legislation (Swedish Parliament, 1995). Its Chapter 6, which was amended in 2024, transposes the CSRD into Swedish legal system and establishes sustainability reporting obligations for companies. Pursuant to Section 10 of Chapter 6 of the Annual Accounts Act, this duty applies to companies where:

> *1. The average number of employees in the company during each of the last two financial years has been more than 250,*
>
> *2. The company's reported total assets for each of the last two financial years amounted to more than SEK 175 million,*
>
> *3. The company's reported net sales for each of the last two financial years have amounted to more than SEK 350 million.*

This report may be a separate document or attached to the administration report required by the Act (Swedish Parliament, 1995, Chapter 6, Sections 10-11; see also Chapter 7, Section 31a-31c). In terms of content, the sustainability report must cover "the sustainability information needed for understanding the company's development, position and results and the consequences of the business, including information on issues relating to the environment, social conditions, personnel, respect for human rights and counteracting corruption" (Swedish Parliament, 1995, Chapter 6, Section 12(1)). The report should further state for instance the material risks that relate to the company's business including the company's business relationships, products or services that are likely to have adverse consequences and the relevant measures to manage such risks (Swedish Parliament, 1995, Chapter 6, Section 12(1)).

Sweden has published a separate corporate governance policy for companies under state ownership. Although the policy acknowledges that from the point of legislation, the key reporting obligations are set for instance in the Companies Act and Annual Accounts Act, it also recognises that state-owned enterprises "should act as role models within the area of sustainable business and should otherwise behave in a manner that promote public confidence" (Government Offices of Sweden 2017, p. 4). Such enterprises need to "act responsibly and work actively to comply with international guidelines regarding environmental consideration, human rights, working conditions, anti-corruption and business ethics" (Government Offices of Sweden, 2017, p. 4). Hence, in their reporting, these enterprises need to provide inter alia information on matters related to the environment if such issues are judged material to the company or its stakeholders. The materiality analysis covers not only the company's own operations but also its value chain and stakeholders (Government Offices of Sweden, 2017, p. 11). Given the existence of this policy, it has been argued that the Swedish government has been particularly active in promoting the environmental corporate social responsibility in state-owned enterprises (Smit *et al.*, 2020b, p. 281).

Environmental law also imposes due diligence obligations on the companies. For instance, the Swedish Environmental Code requires that anyone who carries out or intends to carry out an activity or undertake a measure shall acquire the knowledge necessary, taking into account the nature and scope of the activity or measure, to protect human health and the environment against harm or nuisance (Swedish Parliament, 1998, Chapter 2, Section 2). The entity undertaking an activity or measure must also take protective measures to prevent and mitigate harmful impacts on the environment (Swedish Parliament, 1998, Chapter 2, Section 3). The Environmental Code also establishes the framework for requiring an environmental impact assessment

prior to undertaking an activity (project-based impact assessment) or preparing a plan or programme (strategic environmental impact assessment) (Swedish Parliament, 1998, Chapter 6). Although exceptions exist, environmentally harmful activities also require prior authorisation in the form of a permit (Swedish Parliament, 1998, Chapters 9-15).

Value chain-specific legal and regulatory framework

At the moment, Sweden has no comprehensive due diligence legislation that would apply to value chains in general, nor in the specific context of water stewardship. The adopted CSDDD will, however, force the Swedish legislator to consider the matter.

There are or have been various water-related corporate social responsibility initiatives in Sweden. For instance, the Sweden Textile Water Initiative (STWI) sought to promote sustainable water management in textile industry. In it, the participating fashion brands engaged their suppliers to improve resource efficiency and reduce negative impacts. This initiative lasted 2015-2017 and is currently inactive (Swedish Water House, 2014). The Stockholm International Water Institute's Swedish Water House cluster group on water and food also published an interactive guide in 2016 to help companies to reduce water risks in their own operations and supply chain (Swedish Water House, [not known]).

United Kingdom

General legal and regulatory framework

The UK legal system establishes no specific statutory framework for water stewardship in value chains; however, there is a regulatory framework relevant to corporate social responsibility matters in other areas. For instance, the Modern Slavery Act of 2015 establishes a framework for offences related to slavery, servitude and forced or compulsory labour, and human trafficking. The Act establishes a duty for businesses with a turnout of £36 million or more (globally) to publish a statement on describing their actions in preventing slavery and human trafficking. This duty also applies to their supply chains (UK Parliament, 2015, section 54). The Modern Slavery Act does not, however, cover environmental issues, and the majority of the Act's provisions only cover England and Wales; however, certain provisions also extend to Scotland and Northern Ireland (UK Parliament, 2015, section 60).

The Companies Act (2006), in turn, requires the directors of UK-incorporated companies to prepare a strategic report (UK Parliament, 2006, section 414A). The purpose of the strategic report is to provide information on how the director has performed the duty to promote the success of the company, prescribed in Section 172 of the Act, which includes the need to consider "the impact of the company's operations on the community and the environment" (UK Parliament, 2006, sections 414C and 172). A parent company has a duty to prepare a consolidated strategic report for all companies in the group (UK Parliament, 2006, section 414A(3)).

Different types of companies have different reporting obligations (UK Parliament, 2006, section 414C; Smit *et al.*, 2020b, p. 298-300). A large company's strategic report must include a statement on how the director has taken into account the matters set out in Section 172 of the Act (UK Parliament, 2006, section 414CZA; Smit *et al.*, 2020b, p. 298). A quoted company's strategic report must include "the main trends and factors likely to affect the future development, performance and position of [the] business" and "information about [e.g.] environmental matters (including the impact of the company's business on the environment)" (UK Parliament, 2006, section 414A(7)). After the transposal of the EU Non-Financial Reporting Directive into the Companies Act, the strategic report of a traded company, a banking company, an authorised insurance company, and a company carrying on insurance market activity must include a non-financial and sustainability information statement (UK Parliament, 2006, section 414CA). This statement "must contain

information, to the extent necessary for an understanding of the company's development, performance and position and the impact of its activity" and one of the minimum requirements concerns impacts on "environmental matters (including the impact of the company's business on the environment)" (UK Parliament, 2006, section 414CB). Such reporting requirements also extend to the conduct of subsidiaries and suppliers (Smit *et al.*, 2020b, p. 316), and, as Smit *et al.* (2020b) note, these requirements have become central in tort law-related arguments before the UK courts (p. 300).

In the field of environmental regulation, the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (EDPR) applies to environmental damage caused to e.g. surface or ground water in England (UK Parliament, 2015, section 4). Pursuant to section 13,

> *An operator of an activity that causes an imminent threat of environmental damage, or an imminent threat of damage where there are reasonable grounds to believe that the damage will become environmental damage, must immediately*
>
> *(a)take all practicable steps to prevent the damage; and*
>
> *(b)(unless the threat has been eliminated) notify all relevant details to the enforcing authority appearing to the operator to be the appropriate one.*

Failure to undertake such measures is an offence (UK Parliament, 2015, section 13(3)). Under these Regulations, an operator "means the person who operates or controls an activity, including the holder of a permit or authorisation relating to that activity" (UK Parliament, 2015, section 2(1)). In addition, the Environmental Protection Act (1990) includes offences relevant to the environment, particularly when it comes to the waste treatment (UK Parliament, 1990).

Tort law-based legal and regulatory framework

Being a common law system, the UK legal framework relevant to corporate social responsibility also includes a possibility to establish a company's liability under tort law, that is, outside the statutory framework. Such a liability would be based on negligence in cases where the company owed a duty to the claimant and a breach of that duty would cause the claimant to suffer loss. Based on case law, the test for owing a duty would require that the occurred damage would be foreseeable, that a sufficiently proximate relationship between the parties would exist; and that imposing a duty of care would be fair, just and reasonable in all the circumstances (*Caparo Industries v Dickman* case; Smit *et al.*, 2020b, p. 312). Determining whether a breach of a duty existed, in turn, included analysing whether the defendant had failed to comply with what a reasonable person would do in those circumstances (*Blyth v The Company of Proprietors of The Birmingham Waterworks*). Most existing cases concerning tort liability under the framework of negligence have studied the matter in cases where the claims have been brought by the employees of subsidiaries (Smit *et al.*, 2020b, p. 312-313). The Supreme Court's decision in the case of *Vedanta Resources plc v Lungowe and Others* nonetheless confirms that the employment relationship is not a compulsory element for the success of such a claim (*Vedanta Resources plc v Lungowe and Others*, para. 44).

Although the Supreme Court's decision in the case of *Vedanta Resources plc v Lungowe and Others* concerned the jurisdiction of the UK courts to address the matter, the Supreme Court has confirmed that according to the UK tort law principles, a parent company may be held liable for a breach of a duty of care if an action of its foreign subsidiary causes damage (*Vedanta Resources plc v Lungowe and Others*, para. 54; *Okpabi & Others v Royal Dutch Shell Plc & Another*, para. 27; McCorquodale 2019). The Supreme Court further opined that adopting company-wide policies may be equivalent to adopting a duty of care (*Vedanta Resources plc v Lungowe and Others*, para. 52; Van Ho 2020). To establish this, the Court considered whether the parent company had "asserted its own assumption of responsibility for the maintenance of proper standards of environmental control over the activities of its subsidiaries" and had "laid down but also implemented those standards by training, monitoring and enforcement" (*Vedanta Resources plc v Lungowe and Others*, para.

61). Both *Vedanta* and *Okpabi* cases concerned the environmental damage, including the pollution of water resources, caused by subsidiaries.

Although tort law has been put forward as a tool to hold parent companies liable for environmental harm caused by their subsidiaries, it has been speculated that the Court's finding that a company's voluntary actions form the basis of its duty of care may lead to "a retreat on the part of parent companies from group-wide disclosure and control of subsidiaries" so that claims concerning the company's management and control of its subsidiaries are harder to make (Bradshaw, 2020, p. 147, also 149, 150). As a remedy for environmental harm, tort cases have also been criticized because "there is no guarantee that damages paid to claimants will be applied to environmental remediation" (Bradshaw, 2020, p. 149, 150).

Value chain-specific legal and regulatory framework

There is no value chain-specific legislation at the national level that would cover environmental issues or water stewardship in value chains. However, Waste and Resources Action Programme, which is a climate action non-governmental organisation, introduced the Courtauld Commitment in cooperation with the UK Government to tackle the issue of water stewardship not only in the companies' own operations but also throughout their value chains. The related 2030 Water Roadmap applies to food and drink businesses. The Roadmap is "an ambitious voluntary agreement […] that brings together organisations across the food system to a make food and drink production and consumption more sustainable" (WRAP, 2021). The Roadmap constitutes a joint vision for protecting water resources that are critical for food supply. It identifies the actions needed from businesses to deliver the vision, sets out milestones for achieving the goal, envisages actions required for delivering the vision and sets out a reporting framework (WRAP, 2021).

Conclusion

In most cases studied in this report, there is a lack of explicit regulatory framework that would comprehensively cover value chains, even though in many cases human rights and environment-related due diligence requirements also follow from other legislation. The lack of explicit regulatory framework is particularly relevant in relation to water-related value chains, which have not been subjected to specific legal or regulatory framework in any of the studied jurisdictions.

However, the French Vigilance Law is an exception as it establishes the legal framework for environment-related value chains and has often been singled out as a frontrunner in the field of value chain management. Despite the Vigilance Law's innovative nature, realising water stewardship in value chains is nonetheless hindered by for instance the following issues:

- the lack of definition of the Vigilance Law's key terms, such as "the environment" and "human rights" as well as "risk" and severe";
- the low number of companies that the vigilance duties apply to and the related problems of identifying these companies; and
- the "extremely high" burden of proof concerning e.g. damage and causality that falls on the claimant makes it difficult to guarantee effective remedies.

In the next phases of GOVAQUA, a more detailed case analysis of the French Vigilance Law will be carried out to further develop the understanding of how the Vigilance Law may be or has been used to support water stewardship in value chains, particularly in light of the lessons to be learned for transposing the CSDDD (Commission's proposal for a Directive on corporate sustainability due diligence) into the legal systems of the EU Member States.

Another innovative legal aspect that is relevant to water stewardship throughout a company's value chain is the role that litigation may play in fostering sensitivity to water issues throughout a company's value chain.

In the UK, such litigation may be grounded on tort law, whereas in France, the Vigilance Law recognizes civil liability as the form of enforcement. Furthermore, the CSDDD contains provisions on civil liability. Although it remains to be seen in which form such a civil liability requirement will be transposed to EU Member States' domestic legal systems, litigation may become a legal technique that has a bearing on realizing water stewardship.

Given that the statutory legal framework in the studied countries does not comprehensively recognize and cover water stewardship in value chains, various voluntary proposals on specific sectors have been developed. For instance, in the UK, the 2030 Courtauld Water Roadmap that applies to food and drink businesses has been developed to support water stewardship. Voluntary, sometimes sector-specific water stewardship initiatives also exist in Sweden and Finland. As is the case in Finland, such initiatives may build on recognizable international standards for water stewardship, including the Alliance for Water Stewardship's International Water Stewardship Standard. The future work under GOVAQUA will also attempt to distil the best practices relevant to water stewardship first developed as part of voluntary standards.

References

Aureli, S., Salvatori, F. and Magnaghi. E. (2020). A Country-Comparative Analysis of the Transposition of the EU Non-Financial Directive: An Institutional Approach. Accounting, Economics, and Law: A Convivium 10 (2): 20180047. https://doi.org/10.1515/ael-2018-0047.

AWS (Alliance for Water Stewardship) (2023). About the Alliance for Water Stewardship. Website. Last modified 2023. Available at: https://a4ws.org/about/. Last visited 4 July 2024.

Bair, J. (2008). Global Commodity Chains: Genealogy and Review, in Frontiers of Commodity Chain Research. Stanford University Press, pp. 1–34.

Blyth v The Company of Proprietors of The Birmingham Waterworks [1856] EWHC Exch J65.

Bradshaw, C. (2020). Corporate Liability for Toxic Torts Abroad: Vedanta v Lungowe in the Supreme Court, Journal of Environmental Law, Volume 32, Issue 1, March 2020, Pages 139–150, https://doi-org.libproxy.helsinki.fi/10.1093/jel/eqaa005.

Bright, C. (2018). Creating a Legislative Level Playing Field in Business and Human Rights at the European Level: Is the French Law on the Duty of Vigilance the Way Forward? SSRN Scholarly Paper. Rochester, NY. https://doi.org/10.2139/ssrn.3262787.

Caparo Industries v Dickman [1990] 1 All ER 568.

CEO Water Mandate (2011). United Nations Global Compact. CEO Water Mandate. https://ceowatermandate.org/

Comisión Nacional del Mercado de Valores (2015). Código de buen gobierno de las sociedades cotizadas. Good governance code for listed companies. Available at: https://www.cnmv.es/docportal/publicaciones/codigogov/codigo_buen_gobierno.pdf. Last visited 11 June 2024.

Constitutional Court of France (2017). Décision n° 2017-750 DC du 23 mars 2017.

Cossart, S., Chaplier, J. and Beau de Lomenie, T. (2017). The French Law on Duty of Care: A Historic Step Towards Making Globalization Work for All. Business and Human Rights Journal 2 (2): 317–23. https://doi.org/10.1017/bhj.2017.14.

EC (2009). Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC.

EC (2010). Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 laying down the obligations of operators who place timber and timber products on the market.

EC (2011). Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Roadmap to a Resource Efficient Europe. COM(2011) 571.

EC (2014). Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups.

EC (2017). Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas.

EC (2020). Communication from the commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A new Circular Economy Action Plan For a cleaner and more competitive Europe.

EC (2021). EU Code of Conduct on responsible food business and marketing practices.

EC (2022a). DIRECTIVE (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting.

EC (2022b). Proposal for a Directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937, 23.2.2022 COM(2022) 71 final 2022/0051 (COD).

EC (2022c). Commission Staff Working Document, Follow-up to the second opinion of the Regulatory Scrutiny Board, Accompanying the document, Proposal for a Directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937, SWD(2022) 39 final, 23 February 2022.

EC (2023a). Annex to the Commission Delegated Regulation (EU) …/... supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities.

EC (2023b). Annex to the Commission Delegated Regulation (EU) …/... supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities.

EC (2023d). Commission Delegated Regulation (EU) …/... of 31.7.2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

EP (European Parliament) (2023). Amendments adopted by the European Parliament on 1 June 2023 on the proposal for a directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937 (COM(2022)0071 – C9-0050/2022 – 2022/0051(COD))1.

EP (European Parliament) (2024). European Parliament legislative resolution of 24 April 2024 on the proposal for a directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937 (COM(2022)0071 – C9-0050/2022 – 2022/0051(COD)).

EWP (European Water Partnership) (2017). European Water Stewardship Standard. Available at: https://irp-cdn.multiscreensite.com/12b9c9f9/files/uploaded/EWS%2BEuropean%20Water%20Stewardship%20Standard%20v2017.pdf.

Finnish Government (2005). The Government's proposal to Parliament for new limited liability company legislation, HE 109/2005 vp. Hallituksen esitys eduskunnalle uudeksi osakeyhtiölainsäädännöksi, HE 109/2005 vp.

Finnish Government (2023). The Government's proposal to the Parliament to amend the Accounting Act and the Auditing Act, as well as some related acts, HE 20/2023 vp. Hallituksen esitys eduskunnalle laeiksi kirjanpitolain ja tilintarkastuslain muuttamisesta sekä eräiksi niihin liittyviksi laeiksi, HE 20/2023 vp.

Finnish Parliament (2006). Limited Liability Companies Act (624/2006). Osakeyhtiölaki (624/2006).

Finnish Parliament (1997). Accounting Act (1336/1997). Kirjanpitolaki (1336/1997).

Finnish Parliament (2017). Environmental Code (527/2017). Ympäristönsuojelulaki (527/2017).

Finnish Parliament (2011). Water Act (587/2011). Vesilaki (587/2011).

Finnish Parliament (1994). Act on Compensation for Environmental Damage (737/1994). Laki ympäristövahinkojen korvaamisesta (737/1994).

Foot, C. (2022). Towards Corporate Obligations for Freshwater? The European Commission's Proposal for a Corporate Sustainability Due Diligence Directive and Freshwater Issues'. Erasmus Law Review, 15(3), pp. 173–189. Available at: https://doi.org/10.5553/ELR.000238.

Government Offices of Sweden (2017). The state's ownership policy and guidelines for state-owned enterprises 2017. Available at: https://www.government.se/contentassets/c6382135343d45fe8685ab7fa53a2fa3/the-states-ownership-policy-and-guidelines-for-state-owned-enterprises-2017.pdf. Last accessed 11 June 2024.

Government Offices of Sweden (Regeringskansliet) (2021). Direktiv om tillbörlig aktsamhet för företag i fråga om hållbarhet. Fact memorandum 2021/22:FPM71. Available at: https://data.riksdagen.se/fil/733768E4-2DE1-4987-8CE5-B0A7F0E825EE. Last accessed 11 June 2024.

Helminen, S., Alenius, J., Walta, V. and Donner, S. (2020). Judicial Analysis on the Corporate Social Responsibility Act. Publications of the Ministry of Economic Affairs and Employment 2020:44. ISBN: 978-952-327-553-9. Available

at:
https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/162411/TEM_2020_44.pdf?sequence=1&isAllowed=y;%20. Last accessed 11 June 2024.

ILO (2016). International Labour Office, Report IV Decent work in global supply chains, International Labour Conference, 105th Session, 2016. https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_468097.pdf.

IFDH (International Federation for Human Rights) (2024). Suez case: the Paris Court of Appeal must ensure the effectiveness of the Law on the Duty of Vigilance. Website, last updated 4 March 2024. Available at: https://www.fidh.org/en/issues/business-human-rights-environment/business-and-human-rights/suez-case-hearing-court-of-appeal. Last visited 11 June 2024.

Kaplinsky, R. and Morris, M. (2017). How Regulation and Standards Can Support Social and Environmental Dynamics in Global Value Chains. International Centre for Trade and Sustainable Development. Issue paper. https://www.greenindustryplatform.org/sites/default/files/downloads/resource/How%20Regulation%20and%20Standards%20Can%20Support%20Social%20and%20Environmental%20Dynamics%20in%20Global%20Value%20Chains.pdf

Lucas, O., Bromley, E., Steen, B. and Mhonda, M. (2024). Water Stewardship: Current perspectives and approaches. Report prepared for British Standards Institution (BSI). National Centre for Social Research. Available at: https://www.bsigroup.com/siteassets/pdf/en/insights-and-media/insights/white-papers/bsi-water-stewardship-final-findings-report-v5clean.pdf.

McKinsey (2009). The global corporate water footprint: Risks, opportunities, and management options. https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/sustainability/pdfs/report_large_water_users.aspx.

McCorquodale, R. (2019). Parent Companies can have a Duty of Care for Environmental and Human Rights Impacts: *Vedanta v Lungowe*. Cambridge Core Blog, 11 April 2019. Available at: https://www-cambridge-org.libproxy.helsinki.fi/core/blog/2019/04/11/parent-companies-can-have-a-duty-of-care-for-environmental-and-human-rights-impacts-vedanta-v-lungowe/. Last accessed 11 June 2024.

Morgera, E. (2020). Corporate accountability in international environmental law. 2nd edn. Oxford; Oxford University Press.

Mähönen, J. (2013). Ei-taloudellinen informaatio ja corporate governance. Defensor Legis 4/2013, p. 566–578.

Ngangjoh-Hodu, Y. Gazzini, T., Kent, A., Siikavirta, K. and Morris, P. (2023). The proposed EU Corporate Sustainability Due Diligence Directive and its impact on LDCs: A Legal Analysis. Ministry for Foreign Affairs of Finland. ISBN 978-952-281-370-1.

OECD (Organisation for Economic Co-operation and Development) (2023). OECD Guidelines for Multinational Enterprises on Responsible Business Conduct. OECD Publishing, Paris. https://doi.org/10.1787/81f92357-en.

Okpabi & Others v Royal Dutch Shell Plc & Another [2021] UKSC 3.

Palombo, D. (2019). The Duty of Care of the Parent Company: A Comparison between French Law, UK Precedents and the Swiss Proposals. Business and Human Rights Journal 4 (2): 265–86. https://doi.org/10.1017/bhj.2019.15.

Pedersen, T., Devinney, T., Tihanyi, L., and Camufflo, A. (eds) (2017). Editors' Introduction, in Breaking up the Global Value Chain: Opportunities and Consequences. Emerald Publishing.

Petrariu R, Constantin M, Dinu M, Pătărlăgeanu SR, Deaconu ME (2021) Water, Energy, Food, Waste Nexus: Between Synergy and Trade-Offs in Romania Based on Entrepreneurship and Economic Performance. *Energies*. 14(16):5172. https://doi.org/10.3390/en14165172.

Puharinen, S.-T., Belinskij, A. and Sojamo, S. (2021). Yritysten vesivastuu oikeudellisesta näkökulmasta. Ympäristöpolitiikka ja -oikeus, XIV, p. 167.

RF (République Francaise) (2001). The New Economic Regulations Law No 2001-420. Loi n° 2001-420 relative aux nouvelles régulations économiques.

RF (République Francaise) (2014). Law no. 2014-773 of 7 July 2014 on the orientation and the programming related to the policy on development and international solidarity. Loi n° 2014-773 du 7 juillet 2014 d'orientation et de programmation relative à la politique de development et de solidarité internationale.

RF (République Francaise) (2017a). Vigilance Law no. 2017-399 of 27 March 2017 on the duty of care of parent companies companies and ordering companies. Loi n° 2017-399 du 27 mars 2017 relative au devoir de vigilance des sociétés mères et des entreprises donneuses d'ordre.

RF (République Francaise) (2017b). Ordinance No 2017-1180 of 19 July 2017 on the publication of non-financial information by certain large undertakings and groups of companies. Ordonnance No 2017-1180 du 19 juillet 2017 relative à la publication d'informations non financières par certaines grandes entreprises et certains groupes d'entreprises.

RF (République Francaise) (2017c). Decree No 2017-1265 of 9 August 2017 for the application of Ordinance No 2017-1180 of 19 July 2017 on the publication of non-financial information by certain large undertakings and groups of companies. Décret No 2017-1265 du 9 août 2017 pris pour l'application de l'ordonnance No 2017-1180 du 19 juillet 2017 relative à la publication d'informations non financières par certaines grandes entreprises et certains groupes d'entreprises.

RF (République Francaise) (2019). The Action Plan for Business Growth and Transformation (the "PACTE Law") No 2019-486. Loi n° 2019-486 du 22 mai 2019, Plan d'action pour la croissance et la transformation des entreprises (Loi Pacte).

RF (République Francaise) (2023a). Law no. 2023-171 of 9 March 2023 relating to various provisions for adaptation to European Union law in the fields of economy, health, work, transport and agriculture. Loi n° 2023-171 du 9 mars 2023 portant diverses dispositions d'adaptation au droit de l'Union européenne dans les domaines de l'économie, de la santé, du travail, des transports et de l'agriculture.

RF (République Francaise) (2023b). Ordinance No. 2023-1142 of 6 December 2023 relating to the publication and certification of information regarding sustainability and the environmental, social and corporate governance obligations of commercial companies. Ordonnance n° 2023-1142 du 6 décembre 2023 relative à la publication et à la certification d'informations en matière de durabilité et aux obligations environnementales, sociales et de gouvernement d'entreprise des sociétés commerciales.

Romanian Government (2005a). Government Emergency Ordinance no. 195/2005 on environmental protection, published in the State Gazzette no. 1196 of December 30, 2005. Ordonanţă de urgenţă nr. 195 din 22 decembrie 2005 privind protecția mediului.

Romanian Government (2005b). Government Emergency Ordinance no. 195/2005 on integrated pollution prevention and control, published in the State Gazzette no. 1078/30 November 2005. Ordonanţă de urgenţă nr. 152 din 10 noiembrie 2005 privind prevenirea şi controlul integrat al poluării.

Romanian Government (2006). Decision no. 1213 of 6 September 2006 regarding the establishment of the framework procedure for assessing the impact on the environment for certain public and private projects, published in the State Gazzette no. 802 of 25 September 2006.

Romanian Government (2016). Order no. 1938 of 17 August 2016 regarding the modification and completion of some accounting regulations, published in the Romanian State Gazette No. 680 on September 2, 2016. Ordin nr. 1.938 din 17 august 2016 privind modificarea şi completarea unor reglementări contabile.

Romanian Government (2018). Decision no. 877 of 9 November 2018 regarding the adoption of the National Strategy for the Sustainable Development of Romania 2030, published in the Romanian State Gazette No. 985 of 21 November 2018. Hotărâre nr. 877 din 9 noiembrie 2018 privind adoptarea Strategiei naționale pentru dezvoltarea durabilă a României 2030.

Romanian Government (2022). Decision no. 107 of 29 June 2022 on the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - EU strategy for sustainable and circular textiles - COM(2022) 141 final, published in the Romanian State Gazette No. 664 of 4 July 2022. Hotărâre nr. 107 din 29 iunie 2022 referitoare la Comunicarea Comisiei către Parlamentul European, Consiliu, Comitetul Economic și Social European și Comitetul Regiunilor - Strategia UE pentru textile sustenabile și circulare - COM(2022) 141 final.

Romanian Government (2024). Order no. 85 of 12 January 2024 for the regulation of sustainability reporting issues, published in the Romanian State Gazette No. 75 of 26 January 2024. ORDIN nr. 85 din 12 ianuarie 2024 pentru reglementarea aspectelor referitoare la raportarea privind durabilitatea, publicat în monitorul oficial nr. 75 din 26 ianuarie 2024.

Romanian Parliament (1996). Water Law, no. 107 of 25 September 1996. Legea apelor. Lege nr. 107 din 25 septembrie 1996.

Romanian Parliament (2024). Law no. 96 of 12 April 2024, for the approval of Government Ordinance no. 7/2023 on the quality of water intended for human consumption, published in the Romanian Gazette No. 351 of 15 April 2024. Lege nr. 96 din 12 aprilie 2024 pentru aprobarea Ordonanței Guvernului nr. 7/2023 privind calitatea apei destinate consumului uman.

Salminen, J. and Rajavuori, M. (2019). Transnational sustainability laws and the regulation of global value chains: comparison and a framework for analysis. Maastricht Journal of European and Comparative Law, 26(5), p. 602. Available at: https://doi.org/10.1177/1023263X19871025.Savourey, E. and Brabant, S. (2021). The French Law on the Duty of Vigilance: Theoretical and Practical Challenges Since Its Adoption. Business and Human Rights Journal 6 (1): 141–52. https://doi.org/10.1017/bhj.2020.30.

Schilling-Vacaflor, A. (2021). Putting the French Duty of Vigilance Law in Context: Towards Corporate Accountability for Human Rights Violations in the Global South? Human Rights Review 22 (1): 109–27. https://doi.org/10.1007/s12142-020-00607-9.

SG (Spanish Government) (year not known). Prior public consultation. Preliminary draft law for the protection of human rights, sustainability and due diligence in transnational business activities. Consulta pública previa. Anteproyecto de ley de protección de los derechos humanos, de la sostenibilidad y de la diligencia debida en las actividades empresariales transnacionales. Available at: https://www.mdsocialesa2030.gob.es/agenda2030/documentos/220208-consulta-publica-definitiva.pdf.

SG (Spanish Government) (2007). Law 26/2007, of October 23, on Environmental Liability. Ley 26/2007, de 23 de octubre, de Responsabilidad Medioambiental.

SG (Spanish Government) (2011). Sustainable Economy Law 2/2011 of 4 March 2011. Ley 2/2011, de 4 de marzo, de Economía Sostenible.

SG (Spanish Government) (2013a). Law 12/2013, of 2 August on measures to improve the functioning of the food supply chain. Ley 12/2013, de 2 de agosto, de medidas para mejorar el funcionamiento de la cadena alimentaria.

SG (Spanish Government) (2013b). Law 21/2013, of 9 December 2013, on Environmental Assessment. Ley 21/2013, de 9 de diciembre, de evaluación ambiental.

SG (Spanish Government) (2016). Order ESS/1554/2016, of September 29, which regulates the procedure for the registration and publication of social responsibility and sustainability reports of companies, organizations and public administrations. Orden ESS/1554/2016, de 29 de septiembre, por la que se regula el procedimiento para el registro y publicación de las memorias de responsabilidad social y de sostenibilidad de las empresas, organizaciones y administraciones públicas.

SG (Spanish Government) (2018). Law 11/2018, of December 28, modifying the Commercial Code, the consolidated text of the Capital Companies Law approved by Royal Legislative Decree 1/2010, of July 2, and Law 22/ 2015, of July 20, on Account Audit, on non-financial information and diversity. Ley 11/2018, de 28 de diciembre, por la que se modifica el Código de Comercio, el texto refundido de la Ley de Sociedades de Capital aprobado por el Real Decreto Legislativo 1/2010, de 2 de julio, y la Ley 22/2015, de 20 de julio, de Auditoría de Cuentas, en materia de información no financiera y diversidad.

SG (Spanish Government) (2021). Law 16/2021, of December 14, which modifies Law 12/2013, of August 2, on measures to improve the functioning of the food chain. Ley 16/2021, de 14 de diciembre, por la que se modifica la Ley 12/2013, de 2 de agosto, de medidas para mejorar el funcionamiento de la cadena alimentaria.

SG (Spanish Government) (2023). Royal Decree 445/2023 of 13 June amending Annexes I, II and III of Law 21/2013 of 9 December on environmental assessment. Real Decreto 445/2023, de 13 de junio, por el que se modifican los anexos I, II y III de la Ley 21/2013, de 9 de diciembre, de evaluación ambiental.

Smit, L., Bright, C., McCorquodale, R., Bauer, M., Deringer, H., Baeza-Breinbauer, D., Torres-Cortés, F., Alleweldt, F., Kara, S., Salinier, C. and Tejero Tobed, H. (2020a). Study on due diligence requirements through the supply chain. Final report. European Commission, Directorate-General for Justice and Consumers. Publications Office. Available at: https://data.europa.eu/doi/10.2838/39830. Last visited 11 June 2024.

Smit, L., Bright, C., McCorquodale, R., Bauer, M., Deringer, H., Baeza-Breinbauer, D., Torres-Cortés, F., Alleweldt, F., Kara, S., Salinier, C. and Tejero Tobed, H. (2020b). Study on due diligence requirements through the supply chain. Part III, country reports, European Commission, Directorate-General for Justice and Consumers. Publications Office. Available at: https://data.europa.eu/doi/10.2838/703732. Last visited 11 June 2024.

Sojamo, S., Salminen, J., Puharinen, S.-T., Belinskij, A., Halonen, M., Heikinheimo, E., Saari, P., Airaksinen, J., Illman, J., Behm, K., Reinikainen, A. and Usva, K. (2021). Vesivastuullinen Suomi 2030 – parhaat käytänteet, ohjauskeinot ja

toimintamallit. Government Office, Helsinki. ISBN: 978-952-383-310-4. Available at: https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/163047/VNTEAS_2021_26.pdf?sequence=1&isAllowed=y. Last accessed 11 June 2024.

Sojamo, S. and Rudebeck, T. (2024). Corporate engagement in water policy and governance: A literature review on water stewardship and water security. Water Alternatives 17(2): 292–324.

Sorsa, K. (2010). Itsesääntely ja yhteiskuntavastuu, OPTULA 14/2010; TEM reports 45/2010. ISBN: 978-952-327-553-9. Available at: https://tem.fi/documents/1410877/2869440/Itses%C3%A4%C3%A4ntely+ja+yhteiskuntavastuu.pdf/4283142a-3faa-4d2e-82da-5c9af1a15482/Itses%C3%A4%C3%A4ntely+ja+yhteiskuntavastuu.pdf?t=1465550166000. Last visited 11 June 2024.

Swedish Parliament (1995). Annual Accounts Act (1995:1554). Årsredovisningslag (1995:1554).

Swedish Parliament (1998). Environmental Code (1998:808). Miljöbalk (1998:808).

Swedish Water House (not known]). Water journey. Archived website. Available at: https://web.archive.org/web/20191020111352/http://waterjourney.swedishwaterhouse.se/about-the-project/. Last visited 11 June 2024.

Swedish Water House (2014). Sustainable Textile Water Initiative (STWI). Website, last updated [not known]. Available at: https://siwi.org/sustainable-textile-water-initiative/. Last accessed 11 June 2024.

UK Parliament (1990). Environmental Protection Act 1990.

UK Parliament (2006). Companies Act 2006.

UK Parliament (2015). Modern Slavery Act 2015 (MSA).

UK Parliament (2017). Environmental Damage (Prevention and Remediation) (England) Regulations 2015.

UN (United Nations) (2000). Global Compact. Available at: https://www.unglobalcompact.org/what-is-gc/mission/principles.

Van Ho, T. (2020). Vedanta Resources Plc and Another v. Lungowe and Others. American Journal of International Law 114(1):110-116. doi:10.1017/ajil.2019.77.

Vedanta Resources plc v Lungowe and Others [2019] UKSC 20.

Vos, J. and Boelens, R. (2014). Sustainability Standards and the Water Question. Development and Change 45(2): 205-230. https://doi-org.libproxy.helsinki.fi/10.1111/dech.12083.

WRAP (Waste and Resources Action Programme) (2021). A roadmap towards water security for food & drink supply. Available at: https://wrap.org.uk/sites/default/files/2021-12/WRAP-A-Roadmap-Towards-Water-Security-for-Food-and-Drink-Supply.pdf. Last accessed 11 June 2024.