RETOUCH NEXUS

REsilienT water gOvernance Under climate CHange within the WEFE NEXUS

Deliverable D4.1

CASE STUDIES DASHBOARD ON BASELINE, GOVERNANCE PRACTICES AND PERFORMANCE EVALUATION

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Date (29/12/2023)

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OTHER	Software, technical diagram, etc.	

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1 Introduction

Water governance in the EU presents a comprehensive framework that aims to ensure sustainable use and management of water resources. Governance schemes and institutional settings reflect the EU's commitment to integrated water management, sustainability, and collaborative approaches involving various stakeholders at different levels. The primary legislation for water governance and protection in the EU is determined by the Water Framework Directive (WFD). However, its implementation in individual Member States may result in diverse water governance structures [Rowbottom et al., 2022]. To provide evidence on water governance schemes in the EU, the RETOUCH NEXUS project, in task T4.1, analysed current water governance contexts, organisational models, and institutional settings at the level of six specific case studies from Spain, The Netherlands, Slovakia, Belgium, Germany and Malta (T4.1 "Case study baseline for water governance schemes and institutional settings"). The main objective of task T4.1 is to contribute to the project result PR1 – a knowledge base for a robust monitoring framework – by boosting the understanding of governance arrangements, institutional settings and of the interdependencies across sectors that all together affect sustainable water management in the preselected case studies from EU countries. A detailed description of water governance schemes at the level of individual RETOUCH NEXUS case studies is provided in the interim report "Milestone 3: Draft Report of Deliverable D4.1" (see Annex 1). As supposed by the task description, obtained results have been processed into the form of a dashboard presenting and comparing the main aspects of water governance across the RETOUCH NEXUS case studies to reach a wider audience. The dashboard makes up the project deliverable D4.1 "Case studies dashboard on baseline, governance practices and performance evaluation" with 31 December 2023 as due date.

This report describes the process of the creation of the dashboard for task T4.1 in the RETOUCH NEXUS project and it presents the most recent versions of the screens of the dashboard (their design may be still subject to change). Each dashboard screen is devoted to one partial aspect of water governance. In this report, also an accompanying description of the main findings for the RETOUCH NEXUS case studies is given.

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2 Dashboard creation

When creating the dashboard on baseline water governance practices and performance evaluation for the RETOUCH NEXUS case studies in task T4.1, the project team had to decide on three questions: a) which information will be presented in the dashboard, b) what will be the visual form of the dashboard, and c) where will the dashboard be made publicly available. In parallel to the dashboard creation, a comparative assessment of the case studies and a summary of the main findings were prepared.

a) Which information will be presented in the dashboard?

Based on the focus of the RETOUCH NEXUS case studies and on the description of task T4.1, an overview of the case studies plus three aspects of water governance have been chosen to be presented in the dashboard: water governance structure; challenges to sustainable water management; data and evaluation of water policies. Input for the three aspects of water governance was based on information collected by RETOUCH NEXUS case study partners in task T4.1. For each aspect of water governance, the input information was shortened, condensed and categorised such that it enabled comparison of the RETOUCH NEXUS case studies. A downside of a dashboard is its limited space and form of presentation, hence, specificities of individual case studies are not presented in the dashboard (D4.1) but they can be found in the milestone report for deliverable D4.1 (Annex 1).

b) What will be the visual form of the dashboard?

Following a review of dashboards available from internet sources, the project team identified three most common forms of their visual appearance: numerical dashboards (e.g. graphs, charts); infographics (e.g. pictures, timelines, process schemes); or text objects (e.g. lists, resumes). As the dashboard for task T4.1 compiles qualitative data on water governance, a combination of infographics and text fields has been chosen as the most suitable form. A map showing all the RETOUCH NEXUS case studies is a basic infographic in the dashboard and additional information is presented either as a brief text or as a tick box.

c) Where will the dashboard be made publicly available?

As the dashboard consists of an introduction to the RETOUCH NEXUS case studies and three aspects of water governance, it should be interactive and allow the user to see different information when selecting a different aspect of water governance. An online, publicly accessible form of the dashboard fulfils these criteria. The RETOUCH NEXUS project has already an active website, so the dashboard will be hosted on the project's webpage.

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3 Dashboard on baseline, governance practices and performance evaluation

There are six case studies in the RETOUCH NEXUS project: from Spain, The Netherlands, Slovakia, Belgium, Germany and Malta. Three case studies focus on sustainable water – energy – food – ecosystems (WEFE) nexus management for a river basin and they geographically cover the respective river basin, i.e. Jucar River basin in Spain, Upper Main basin in Germany, and Malta, which is a specific example of a river basin that corresponds to the whole country as all the islands in the Maltese archipelago are classified as a single river basin. Other case studies focus on innovative tools in water governance (The Netherlands), water retention in landscape and agricultural irrigation (Slovakia), or water secure communities (Belgium). These case studies geographically cover a region or a locality within a country – the province of North Holland in the Netherlands, South-Western part of Slovakia, and business parks or residential areas in Flanders in Belgium.

An overview of the RETOUCH NEXUS case studies is provided by an introductory screen to the dashboard on water governance (Screenshot 1). Then, water governance structure, challenges to sustainable water management, data and evaluation of water policies in the case studies are presented in the dashboard in a stylized and dense form, each in a separate screen (Screenshots 2-4) as given in Subchapters 3.1-3.3. The online form of the dashboard will be accessible via the project webpage. Design of the online dashboard can be altered throughout the duration of the project by the web development team. Moreover, the dashboard can be extended to incorporate results coming from other tasks or work packages in the RETOUCH NEXUS project.

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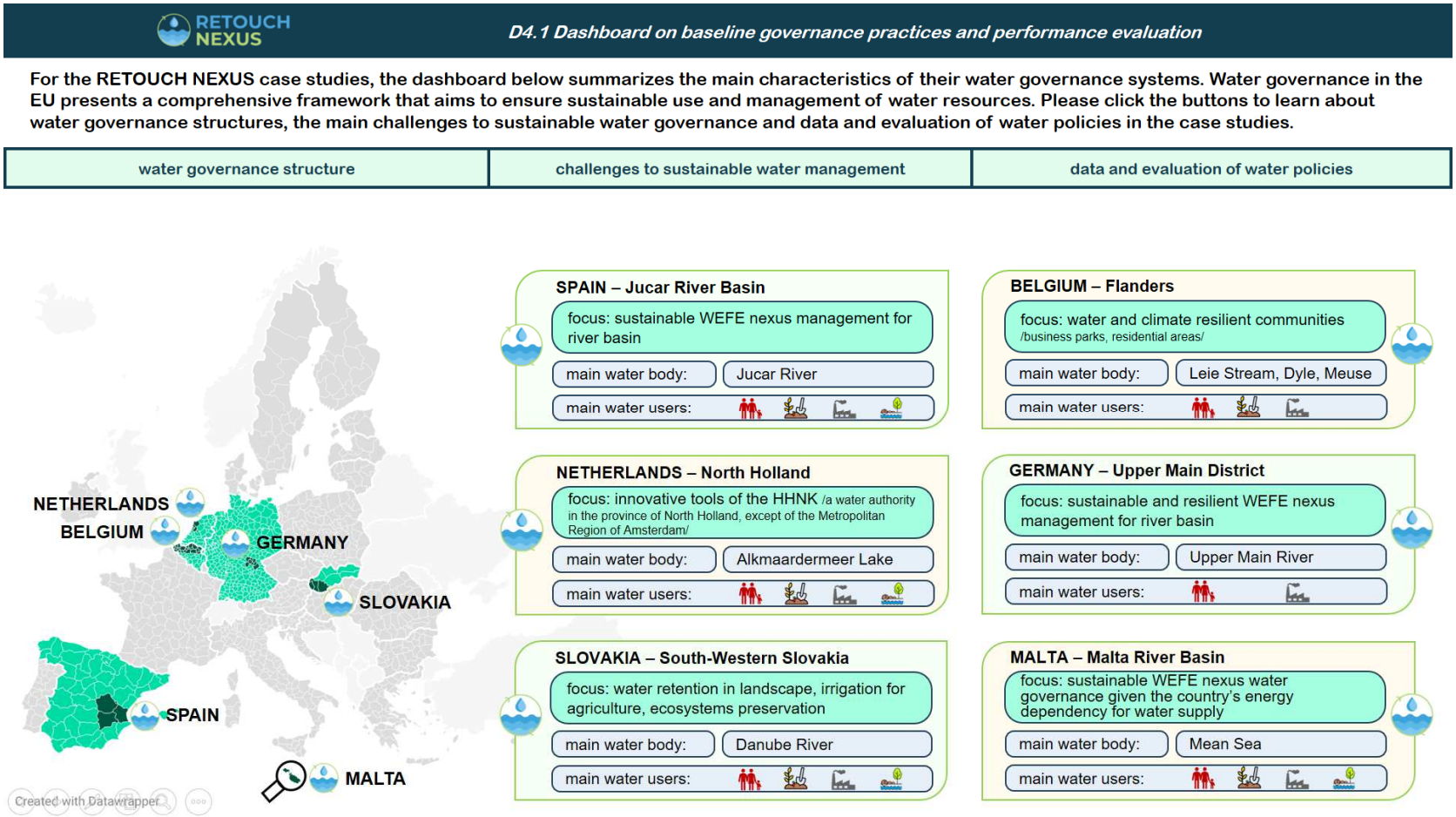
Screenshot 1. Case studies in RETOUCH NEXUS



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3.1 Water governance structure

All six countries, where the RETOUCH NEXUS case studies are located, have transposed the EU Water Framework Directive (WFD) into their national legislation. However, the structure of processes and institutions responsible for water policy making, for policy implementation as well as coordination mechanisms among these authorities differs.

From the case study perspective, national level of water governance is the most relevant level of governance for the Slovak and Maltese case study, regional level of governance is the most relevant for the German and Belgian case study and a combination of both applies to the Dutch and Spanish case study. The water governance structure mirrors the constitutional organisation of the country. For small countries (Slovakia, Malta), water decision making and policy setting is a responsibility of the central government and implementation of water policies is a responsibility of institutions subordinate to the central government. For countries with regional administrative constitution (The Netherlands, Germany, Belgium, Spain), water governance is more decentralised, a core ministry of the central government is responsible for a general policy framework, regional governments for its specification and regional authorities for implementation and operation (division of responsibilities depends on the degree of regional autonomy). Municipalities are mostly responsible for drinking water supply and sewage collection. In all case study countries, there are dedicated river basin organisations, as asked for by the WFD. River basin organisations manage water at the scale of natural geographical and hydrological catchment areas, which are not identical with administrative areas of a country (exception: Malta is classified as one river basin, so national authorities can be at the same time considered basin organisations).

Examples:

- Germany: The federal government issues framework regulations and provides the states with a legal regulatory framework. The administrative enforcement of all water legislation, including federal laws, and thus in particular the issuing of official permits, is the responsibility of the federal states. In most federal states (here Bavaria), the water management administration follows the three-level structure of the general administration. First level is a supreme authority, i.e. a state ministry with the water management division, second is an intermediate authority like district governments responsible for regional water management planning, significant water law procedures, administrative procedures. Third level is a lower authority at municipalities and cities with tasks like water law procedures, monitoring of water bodies and official decisions.
- Spain: Ministry for the Ecological Transition and the Demographic Challenge (formerly the Ministry of Agriculture, Food and Environment) is the national government ministry responsible for water policy at the national level. It sets overarching water policy goals and strategies and oversees the implementation of national water plans. Spanish National Water Agency (Agencia Española de Agua - AEAgua) operates under the Ministry for the Ecological Transition and the Demographic Challenge and is responsible for planning, managing, and regulating Spain's water resources at the national level. It plays a crucial role in coordinating water-related activities across Spain. Autonomous Communities are regional authorities that develop and implement water policies and strategies specific to their regions, considering local needs and conditions. River Basin Authorities (Confederaciones Hidrográficas) – Spain is divided into several river basin districts, each with its own River Basin Authority responsible for managing water resources.
- Malta: The ministry with responsibility for water policy is the Ministry for the Environment, Energy and Enterprise. In the development of water policies and management frameworks, the Ministry is supported at a technical level by the Energy and Water Agency. The Agency is responsible for drafting and performing the Government's national policies for the energy and water sectors, and abiding by EU legislation for energy and water sustainability. The River Basin Management Plan is considered as the dedicated national water management strategy.

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Except for authorities primary responsible for water policy setting and implementation, there are multiple other actors and sectors influencing partial policies and the realisation of specific measures. The additional authorities often include actors from the agricultural, industrial or even the building sector. In this sense, water management in RETOUCH NEXUS case studies is fragmented.

Examples:

- The Netherlands: At the national level, the Ministry of Infrastructure and Water Management has the primary responsibility for water policy in almost all areas with Rijkswaterstaat being its executive body responsible for implementing water related policies and regulations. However, the Ministry of Economic Affairs and Climate Policy is responsible for climate mitigation policy, and the Ministry of Agriculture, Nature and Food Quality for nature protection and agriculture.
- Slovakia: The core authority for water management is the Ministry of Environment of SR, which manages water at the national level, creates water policies and frameworks for care, preservation and use of national water resources, their quantity and quality. There are several state enterprises subordinate to the Ministry of Environment of SR with specific competences and responsibilities, mainly: Slovak Water Management Enterprise (cares of watercourses, ensures the supply of water from waterways and reservoirs, arranges flood protection, maintains water in ecosystems); Water-Management Construction (operates hydroelectric power plants); Water Research Institute (water management research, preparation of materials supporting strategy development); etc. The Ministry of Agriculture and Rural Development of SR has competences related to agricultural policy. A subordinate state enterprise to the Ministry of Agriculture and Rural Development of SR responsible for irrigation and drainage systems shared by farmers is the enterprise Hydromeliorations.

Coordination among actors and sectors involved in water governance follows the formalised system of water governance in each case study as well as other established procedures. In particular, vertical coordination among actors in the water sector reflects their relations of subordination. Superior authorities issue regulations, rules, instructions, and provide guidance for subordinate authorities. Horizontal coordination across sectors is ensured by inter-ministerial committees at the governmental level and by other platforms discussing and negotiating water policies, their implementation, operational synergies and complementarities on a regular or ad hoc basis at the level of stakeholders from the governmental, private, public and non-profit sector.

Examples:

- Belgium: Mainly two types of horizontal cooperation take place under the lead of the Committee on Integrated Water Policy and basin secretaries. The Coordination Committee on Integrated Water Policy (CIW) is responsible for the coordination of the integrated water policy in the Flemish Region. The CIW is composed of the leading officials of all administrative entities involved in water management. The basin secretariat is responsible for day-to-day operations within the basin and preparatory work for the basin board, area and thematic consultations and the basin council.
- The Netherlands: Cooperation and administrative agreements between water authorities and provinces/municipalities. Moreover, there are representative bodies such as the 'Unie van Waterschappen' (Union of Water Authorities) that operate as a spokesperson towards the national government on water related issues and stakes. There are also representative bodies for all municipalities (regarding transport and distribution of (drinking) water (Vereniging Nederlandse Gemeenten and RioNED) and for the drinking water companies (Vewin).

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Screenshot 2. Water governance in RETOUCH NEXUS case studies – water governance structure

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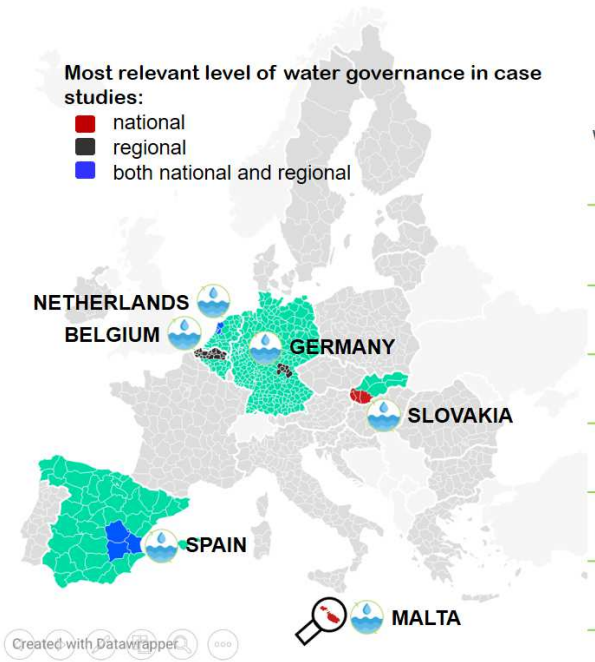
D4.1 Dashboard on baseline governance practices and performance evaluation

For the RETOUCH NEXUS case studies, the dashboard below summarizes the main characteristics of their water governance systems. Water governance in the EU presents a comprehensive framework that aims to ensure sustainable use and management of water resources. Please click the buttons to learn about water governance structures, the main challenges to sustainable water governance and data and evaluation of water policies in the case studies.

water governance structure | challenges to sustainable water management | data and evaluation of water policies



Water governance structure	water policy setting		implementing institutions				coordination mechanisms	
	national government	regional government	national authorities	regional authorities	municipalities	river basin managers	vertical coordination	horizontal coordination
SPAIN Jucar River Basin	☑ METDC	☑ Valencia; Castilla-La Mancha	☑ NWA	☑	☑	☑	☑ top-down	☑
NETHERLANDS North Holland	☑ MIWM	☑ North Holland	☑ RWS	☑	☑	☑	☑ bottom-up	☑
SLOVAKIA South-Western Slovakia	☑ ME	☐	☑ SWME	☐	☑	☑	☑ top-down	☑
BELGIUM Flanders	☐	☑ Flanders	☐	☑ CIW	☑	☑	☐	☑
GERMANY Upper Main District	☑ Federal Government	☑ Bavaria: MECP	☐	☑ MECP, districts	☑	☑	☑ top-down	☑
MALTA Malta River Basin	☑ MEEE	☐	☑ EWA; ERA	☑	☐	☐ (basin = the whole country)	☐	☑

Abbreviations: METDC – Ministry for Ecological Transition and Demographic Change (Spain); MIWM – Ministry of Infrastructure and Water Management (The Netherlands); ME – Ministry of Environment (Slovakia); MEEE – Ministry of Environment, Energy and Enterprise (Malta); MECP – Bavarian Ministry of Environment and Consumer Protection (Germany); NWA – National Water Agency (Spain); RWS – Rijkswaterstaat (Department of Waterways and Public Works) (The Netherlands); SWME – Slovak Water Management Enterprise (Slovakia); EWA – Energy and Water Agency (Malta); ERA – Environment and Resources Authority (Malta); CIW – Flemish Committee for Integrated Water Policy (Belgium)

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3.2 Challenges to sustainable water management

In general, challenges to sustainable water management stem from volatile and unstable supply, demand for and quality of water; competing needs of different water users, sectors and regions; water pollution; climate change and similar [Cosgrove – Loucks, 2015; Jayawardena, 2012]. All actors in the water sector are exposed to spatial and temporal insecurity of adequate water resources and therefore, a holistic and coherent approach to water governance is needed.

Within the RETOUCH NEXUS case studies, an approach interlinking water – energy – food – environment (WEFE) is developed in Spain, The Netherlands and Malta. In the Belgian, German and Slovak case study, a nexus approach is just under development. Cross-sectoral cooperation and coordination in water governance for the latter group of countries exists typically on a bilateral basis, as a link between water and agriculture, water and the environment, and water and energy.

Examples:

- The Netherlands: In 2013, authorities and societal actors concluded the Agreement on Energy for Sustainable Growth at the national level. As a follow up, stakeholders from five economic sectors including electricity, built environment, industry, agriculture and land use, and mobility concluded the Agreement on Climate in 2019. Its successor was recently launched as National Climate Platform. In these latter initiatives, the regional water authorities have been, and still are, represented by their umbrella organization Union of Regional Water Authorities. In 2022, the national Ministry of Infrastructure and Water Management wrote a letter to Parliament explaining its new water and soil central approach. This is a national call to put natural water systems and infrastructure as well as soil quality central to all other decision making.
- Germany: In order to maintain the good quality of drinking water in Bavaria, the Bavarian state government, together with farmers, water suppliers, associations and institutions signed the Bavarian Water Pact. The aim is to combine all forces in order to voluntarily, in addition to the legal requirements, improve the condition of the water bodies in accordance with the targets set out in the Water Framework Directive. The focus is on the input of nutrients (e.g. nitrogen and phosphorus). In addition, suitable measures must be taken jointly to minimize the total input of substances into surface waters and groundwater.
- Belgium: Cross-sectoral policies and strategies promoting policy coherence between water and key related areas, in particular environment, agriculture, energy, health, land use and spatial planning do not exist in a very structural way. However, there is political support for water as an element interlinking economic sectors, as has been put forward in the Flemish Water Policy Note.

To reflect on challenges influencing the quantity and quality of water, specific measures are an integral part of water governance in all RETOUCH NEXUS case study countries. The countries usually have two types of measures in place: measures aimed at prevention of problems with water quantity or quality and measures aimed at solutions in emergency situations. They handle water protection, water allocation, use, resolving problems and define water use priorities. Various sets of measures are included in the water legislation, in action plans or result from other governance processes.

Examples:

- Slovakia: There is an Action Plan to address the consequences of droughts and water scarcity in Slovakia called ‘Water is the Value’. It distinguishes three groups of measures: preventive, operative and crisis measures. However, for some of the measures a time plan and/or allocation of financial resources are not given. In the updated Water Plan of Slovakia for the third planning period (2021 to 2027), drought has been identified as a significant water management problem for the first time. In a situation of extreme droughts, the Ministry of the Environment of SR prioritizes the supply of drinking water to citizens along with the protection of the environment.

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Specific measures can be applied by municipalities taking into account local conditions. Municipalities are allowed and are responsible for restricting the use of drinking water from public water supply if there is water shortage and for providing an alternative water supply for inhabitants in emergency situations.

- Malta: Whilst a formal framework/mechanism to solve conflicts related to water is not established, an effective engagement with stakeholders is ensured through the establishment of a National Water Table which brings together stakeholders from the public and private sector to implement the measures in key water management planning documents such as the River Basin Management Plans and the Flood Risk Management Plan. The outcome of the discussions of the National Water Table are aimed to help inform policy decisions at the national level.

With increasing complexity of the water issues and with increasing decentralisation of water governance, national, subnational or basin authorities may be on their capacity frontier in terms of human and financial resources. Sufficient capacities of institutions are a precondition for a good water governance. The case studies in RETOUCH NEXUS identified mainly lack of financing as an obstacle for an improvement in the functioning of water governing institutions (Slovakia, Belgium).

Examples:

- Spain: Declared capacities, staff, budget and level of autonomy of central and catchment-based organisations should be sufficient to carry out their functions. However, interviews with stakeholders representing different levels of governance will be required to get more insight.
- Slovakia: Capacities of central as well as catchment-based organisations are not sufficient. One of the goals of The Water Policy Concept for 2021-2030 is to ensure an efficient and transparent water management with clearly defined competences. The Concept proposes a review and update of the competence and organizational structure within the water management and it sets several measures to stabilise the financing of state water administration at all levels, state enterprises and organisations in the water sector, and to develop personal and material capacities of institutions.

Continuing development in the water sector and the external environment may bring specific challenges that can spread to other regions, water users, or levels of governance. These challenges boost innovative solutions and governance practices. An example of innovative practices from the Belgian case study is as follows:

- Belgium: There are several rainwater collection and purification systems being integrated in new building complexes. In Agnetenpark Peer, the investment for the innovative rainwater system, is financed by the sales of the new apartments. The investment of the purification system will be financed by the water tariff for using the rainwater, set at a lower fee than the fee per cubic meter to use drinking water. Furthermore, the COOCK project on water-conscious building encourages companies from the entire construction chain to apply and integrate innovative technologies in the field of water-conscious building into their operations. This project aims to strengthen the resilience of the built environment to drought and water scarcity through the application of individual and collective innovative technologies in the field of smart water use, circular water use with rainwater and grey water and local groundwater recharge. A potentially new instrument, not in place yet (studies are still ongoing), is the Infiltration bonus. Those who drain storm water directly to public property pay for storm water infrastructure, drainage and treatment. Those who thus keep rainwater on their own property will be rewarded.

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Screenshot 3. Water governance in RETOUCH NEXUS case studies – challenges to sustainable water management

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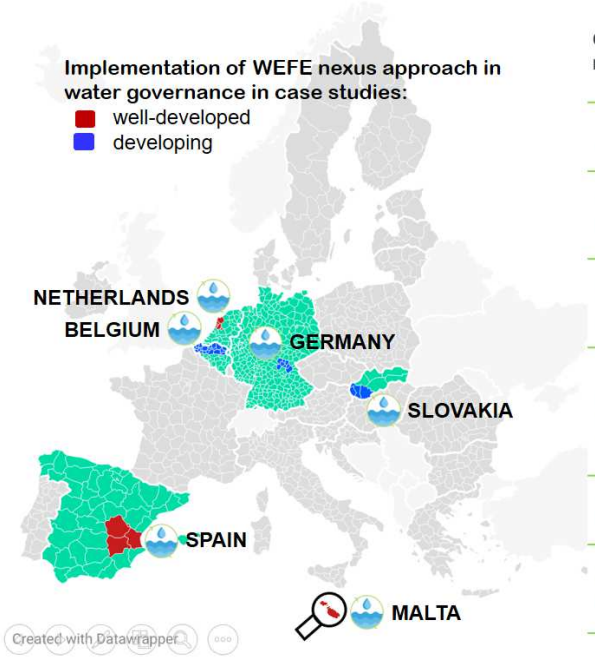
D4.1 Dashboard on baseline governance practices and performance evaluation

For the RETOUCH NEXUS case studies, the dashboard below summarizes the main characteristics of their water governance systems. Water governance in the EU presents a comprehensive framework that aims to ensure sustainable use and management of water resources. Please click the buttons to learn about water governance structures, the main challenges to sustainable water governance and data and evaluation of water policies in the case studies.

water governance structure | **challenges to sustainable water management** | data and evaluation of water policies



Challenges to water management	WEFE nexus approach in water governance	measures for water scarcity and precaution	capacities of institutions (personal and financial)	other specific challenges
SPAIN Jucar River Basin	collaboration among sectors is facilitated	☑	declared capacities and level of autonomy are sufficient	- water markets extension - public-private partnership for innovations
NETHERLANDS North Holland	cross-sectoral cooperation at the national level, emphasis on water-soil nexus	☑	institutions adequately equipped from the judicial responsibility point of view	- societal demand shifts create pressure on an increase of capacities
SLOVAKIA South-Western Slovakia	basic collaboration, water-soil concept under development	☑	lack of capacities, a review of competences and institutional structure is foreseen	- stable financing of state water administration required
BELGIUM Flanders	basic collaboration, WEFE nexus concept not developed yet	☑	lack of structural, long-term funding mechanisms for water systems management	- valuing water such that investments in alternative water sources are facilitated - resilience to climate change
GERMANY Upper Main District	basic collaboration, WEFE nexus concept not developed yet	☑	capacity limits (personal and financial) have been reached	- water withdrawal charges not applied in Bavaria
MALTA Malta River Basin	cross-sectoral coordination between water and energy, and environment well developed	☑	institutions have adequate capacities	- energy dependency for water supply of the island

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3.3 Data and evaluation of water policies

As required by the EU Water Framework Directive, water legislation and policies applied in individual countries including river basin management plans are being evaluated and their achievements monitored. This requirement is directly formulated by the European water legislation; hence it applies across all Member States.

Monitoring and evaluation of the state of water bodies and of water policy objectives is based on data collected and available in comprehensive or specialized databases. Good databases for water policy making together with flexible processes for implementation of measures, appropriate instruments to govern water, coherence between water-related sectorial policies, sufficient institutional capacities, cooperation and stakeholder engagement support the realization of water policies in practice. Two RETOUCH NEXUS case study countries have a water information system (Spain, The Netherlands) integrating a wide range of water-related data. In the other countries (Slovakia, Belgium, Germany, Malta) diverse data sources provide information on the water sector. Gaps in data range from restricted public availability to high aggregation in terms of temporal coverage, geographical scope, or water bodies.

Examples:

- Spain: There is a National Water Information System in Spain – a national database able to integrate and cross-relate all relevant data on water management. Other sources of information include SINAC and Hispagua-CEDEX. SINAC (National Drinking Water Information System), which is a health information system that collects data on the characteristics of supplies and the quality of drinking water supplied to the resident population in Spain. SINAC is currently supported by a web application via the Internet. It is accessible to citizens. Hispagua-CEDEX focuses on water system indicators. Access to aggregated data in the form of indicators that reflect, in few values, the most important aspects of the water in Spain.
- Malta: Data collected by a central authority, hence easily available to policy makers and other actors in the water sector. A dedicated Water Information System is currently under development.
- Germany: Since 2007, institutions, corporations, companies and municipalities have had to provide the Federal Statistical Office with information on their water charges. The legal basis for this is provided by the Environmental Statistics Act, which was amended in 2005 and which collects data from: survey of public water supply and wastewater disposal, survey of sewage sludge, survey of non-public water supply and wastewater disposal, survey of water and wastewater charges. In the survey of public water supply, a distinction is made between private households (incl. small businesses), commercial enterprises (manufacturing, trade, transport, services) and other customers (e.g., hospitals and schools, public authorities and municipal facilities, the German armed forces, agriculture and other facilities for public purposes). However, the survey does not ask about individual characteristics such as water delivery to agriculture. Except for that, there are multiple water information systems on national and regional scales.

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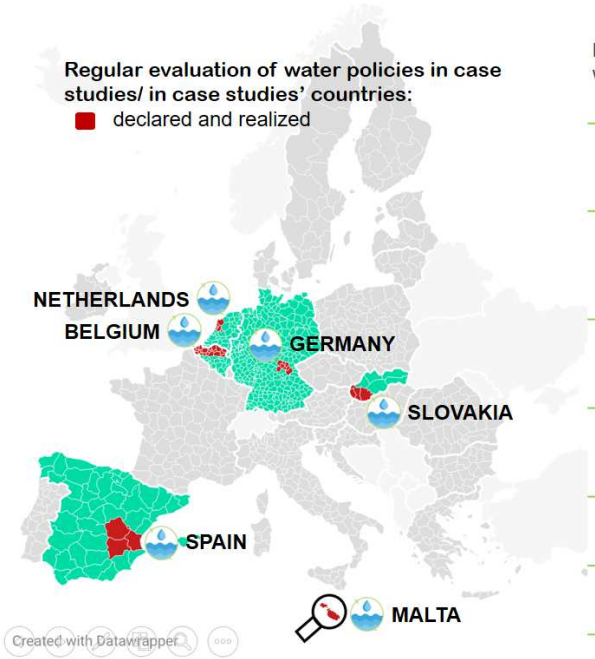
Screenshot 4. Water governance in RETOUCH NEXUS case studies – data and evaluation of water policies

RETOUCH NEXUS

D4.1 Dashboard on baseline governance practices and performance evaluation

For the RETOUCH NEXUS case studies, the dashboard below summarizes the main characteristics of their water governance systems. Water governance in the EU presents a comprehensive framework that aims to ensure sustainable use and management of water resources. Please click the buttons to learn about water governance structures, the main challenges to sustainable water governance and data and evaluation of water policies in the case studies.

water governance structure | challenges to sustainable water management | data and evaluation of water policies



Data and evaluation of water policies	legislative requirements for water policy monitoring and evaluation	data availability: water information system	data availability: diverse data sources	challenges for empirical evidence on water resources and water policies
SPAIN Jucar River Basin	☑	☑	☐	- gaps in data collection for groundwater use in regions with its quality or quantity problems - gaps in economic valuation of ecosystems and ecosystem services
NETHERLANDS North Holland	☑	☑	☑	- water-related environmental information publicly available, but interpretation may be complex; progress in the implementation of the WFD programmes of measures reported online at the level of regional water authorities
SLOVAKIA South-Western Slovakia	☑	☐	☑	- incomparable structure of information in fragmented data sources, some information only for actual time period, historical time series difficult to access, some data not publicly available
BELGIUM Flanders	☑	☐	☑	- gaps in temporal resolution of water abstraction data, real time data on water quality, data on measures taken by water users, digital water metering
GERMANY Upper Main District	☑	☐	☑	- gaps in survey of public water supply – it does not provide individual characteristics such as water delivery to agriculture
MALTA Malta River Basin	☑	☐	☑	- data collected by a central authority, a water information system is under development

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4 Discussion and conclusion

Differences in the availability of water, demand for water, policy objectives, climate, institutional structures, financial resources, culture, social norms and other characteristics among countries and regions cause that no single water governance practice qualifies for a universal best practice. Nevertheless, studies of water governance in different countries and/or at different scales are needed to describe and explain diverse water governance practices, some of which could be considered a good practice in specific, individual circumstances and whose careful adoption by policy makers would lead to an improved water governance. [Biswas – Tortajada, 2010].

Task T4.1 of the RETOUCH NEXUS project deals with current water governance schemes in the analysed case studies. According to the OECD Principles on Water Governance [OECD, 2015], water governance shall be effective, efficient and shall build trust and engagement. To support the implementation of the principles, the OECD compiled a set of indicators for a self-assessment of water governance and put together a bank of evolving practices [OECD, 2018]. RETOUCH NEXUS case studies contribute and extend the set of documented water governance practices by new countries and regions and by new objectives of water management. Acquired knowledge can boost mutual learning and a further development and improvement of water governance. Following the OECD [2022] methodology for water governance assessment and previous work in the RETOUCH NEXUS project, a 4-step roadmap to support the transfer of good practices by policy makers and practitioners in the water sector in order to improve water governance can be suggested:

1. Assessment of available water governance practices
   identify your needs and assess available water governance practices from your perspective; choose good practices, which could be incorporated into current water governance in your country/region
2. Evaluation of potential water governance practices
   identify the advances and drawbacks of each good practice and choose the features of good practices, which could be adopted in your setting; evaluate the replicability of a good practice in your conditions
3. Update of policies, strategies, processes
   formulate and implement the advantages of a new practice into your water policy/strategy or processes, deploy water-positive initiatives and inclusive engagement; set goals, measures, capacities and responsibilities
4. Implementation of updated policies, strategies, processes
   coordinate the actions; monitor and evaluate the impacts of a new policy/strategy or process in practice

Continuous improvements in water governance practices are expected to contribute to a more effective, coordinated and integrated water management aiming at sustainable use and renewal of water resources and at achieving sustainable development goals (SDG). In order to fine-tune water governance, FAO is supporting countries in the development of national water roadmaps towards 2030 Agenda where strategic water-related decisions can have an impact on SDG6 and other SDGs linked to water (FAO, 2022).

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Annex 1.

Milestone 3: Draft Report of Deliverable D4.1

CASE STUDIES DASHBOARD ON BASELINE, GOVERNANCE PRACTICES AND PERFORMANCE EVALUATION

(report on baseline and data requirements for case studies)

List of Tables

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A1. Introduction

To provide evidence on water governance in the EU, the Retouch Nexus project analysed current governance contexts, organisational models, and institutional settings for water governance at the level of six specific case studies (task T4.1 "Case study baseline for water governance schemes and institutional settings"). Obtained results contribute to the project result PR1 – a knowledge base for a robust monitoring framework and they will be reported in form of a dashboard presenting information for each case study by 31 December 2023. This report is an interim report summarising the main findings to reveal water governance baseline for each case study and to support further assessment of water governance fragmentation, of innovative governance practices and the identification of possible multi-level, multi-actor and cross-sectoral water governance schemes. The report is structured into chapters addressing water-related legislation and policies, water governance structure and institutional settings, cross-sectoral water management, and challenges and opportunities for a sustainable water governance in each case study.

Table A. 1. Case studies in Retouch Nexus

Case study	***WaterProof: Water and Climate Resilient Communities***	***Upper Main***	***Malta River Basin District***
Country	BELGIUM	GERMANY	MALTA
Geographical coverage	☐ national ☒ regional ☐ basin (whole or a part)	☐ national ☐ regional ☒ basin (whole or a part)	☒ national ☐ regional ☐ basin (whole or a part)
Case study focus	reuse of rainwater, resilient communities - business parks in Tielt and Keiberg, residential area Agnetenpark in Peer	improvement of water supply, mitigation of floods and droughts, nexus management for river basin	sustainable WEFE nexus water governance given the country's energy dependency for water supply
Relevant nexus components in the case study	☒ Water ☐ Energy ☒ Food ☐ Ecosystems	☒ Water ☒ Energy ☒ Food ☒ Ecosystems	☒ Water ☒ Energy ☒ Food ☐ Ecosystems
Case study	***Water Retention in South-Western Slovakia***	***Jucar River Basin***	***Hoogheemraadschap Hollands Noorderkwartier***
Country	SLOVAKIA	SPAIN	THE NETHERLANDS
Geographical coverage	☐ national ☒ regional ☐ basin (whole or a part)	☐ national ☐ regional ☒ basin (whole or a part)	☐ national ☒ regional ☐ basin (whole or a part)
Case study focus	water retention in landscape, irrigation for agriculture, ecosystems preservation	sustainable WEFE nexus management for river basin	environment scan instrument, waste water purification quality and fresh water distribution
Relevant nexus components in the case study	☒ Water ☐ Energy ☒ Food ☒ Ecosystems	☒ Water ☒ Energy ☒ Food ☒ Ecosystems	☒ Water ☐ Energy ☒ Food ☒ Ecosystems

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A2. Water-related legislation and policies

In the EU, a framework for the management of waters, the protection of surface waters and groundwater is set by the Water Framework Directive (supported by several targeted directives). The European legislation has to be transposed into the legislation of its Member States. This chapter (Tables 2-7) provides an overview on the main pieces of water-related legislation relevant for each case study in the Retouch Nexus project and on the procedures for setting and adopting water-related policies in the analysed countries.

Table A. 2. Water-related legislation and policies – Belgium

Case study	***WaterProof: Water and Climate Resilient Communities***
Country	BELGIUM
Most relevant level of governance	Regional (Flemish legislation)
Dedicated water legislation	Water management is accredited to the Flemish government and as the Belgian Retouch Nexus case study and its three sub-cases are located in Flanders, all governance/policy/ relevant to the subcases is Flemish (only coastal and marine waters are governed by the Federal Government, Federal Government can get involved, however, in case of natural disasters or crisis management and there are coordination mechanisms in place to make sure there is cooperation with the other governments in Belgium). Transposition of the Water Framework Directive and the Floods Directive into Flemish legislation (under the decree of Integrated Water Policy) are the basis for the River Basin Management Plans of Flanders. River basin management plans and flood management plans are integrated documents. Added to this are the water scarcity and drought risk management plans, these aim to balance water demand and -supply and minimize the negative consequences of drought through proactive and reactive measures. Water sanitation plans are also included in the river basin management plans.
Specific governance arrangements	Belgium is a federal state composed of communities and regions. The power to make decisions is no longer the exclusive preserve of the federal government and the federal parliament. The leadership of the country is in the hands of various partners, who independently exercise their authority within their domains.
Water policy/ strategy setting	Coordination Commission for Integrated Water Policy (CIW) is the appointed authority in Flanders for the execution of the Water Framework and Floods Directive. Other Flemish Government departments and agencies that have responsibilities in water governance and management: VMM (Flemish Environmental Agency) is responsible for ground water and unnavigable waterways from the first category and they also measure and monitor the quantity and quality of water, coordinate the development of the sewage network and they are responsible for chairing the CIW; the Department of Environment supports and guides municipalities with erosion control, prepares the Flemish Climate Plan, supervises companies, spatial planning and the integration of ecology into infrastructure; The Agency for Nature and Forest (ANB) manages public outdoor spaces and the forests of Flanders; VLM (Flemish Land Agency) promotes sustainable fertilization to improve water quality and enters into agreements with farmers; OVAM (Public Waste Agency of Flanders) aims for sustainable waste and materials

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management and a clean soil in Flanders, it contributes to the policy and management of (contaminated) groundwater, (contaminated) water bodies, and dredged sediments; Department of Mobility and Public Works supports policies for integrated and efficient investment, management, and operation of transport and port infrastructure, including maritime access management. Scientific research, technical support, and advice on water systems, navigation, and infrastructure are also part of its responsibilities; De Vlaamse Waterweg (the Flemish Waterways Agency) manages and operates the waterways as a robust network; Agency for Maritime and Coastal Services ensures safe and smooth shipping traffic to and from Flemish ports, secures the coast against floods, and promotes sustainable coastal zone management; Agency for Transport and Mobility carries out investment works, manages regional roads and the ditches alongside them, making it an important partner in water-related projects; Department of Agriculture and Fisheries supports the development and implementation of a proactive, integrated, and sustainable agricultural, horticultural, and fisheries policy.

The provinces manage the non-navigable waterways of the second category (outside the jurisdiction of polders and water control boards). Provinces play a role in preventing waterlogging and make decisions regarding environmental permits. As waterway managers, they provide advice on urban development permit applications that could have a significant impact on water and issue authorizations for works on waterways. Municipalities also have various authorities concerning water. They are responsible for managing third-category waterways, public ditches, and municipal road ditches. Either themselves or through an appointed sewerage manager, municipalities handle the collection of domestic wastewater. Municipalities also take the lead in preparing local erosion control plans, granting environmental permits, applying water assessments, issuing authorizations for works on waterways, and more. As the primary organizer and manager of public spaces, municipalities are essential partners in water policy.

The port companies manage the parts of waterways that are not part of the maritime access routes.

Polders and wateringen: also manage waterways, within their jurisdiction, they are in charge of non-navigable watercourses of the second and third category, rather than the municipality or province. They also manage public ditches within their jurisdiction and play a role in preventing waterlogging. They provide advice on applications for environmental permits that could impact water and issue authorizations for works on watercourses.

The drinking water companies are responsible for the production, distribution, and transport of drinking water. Since 2005, the drinking water companies are also responsible for the sanitation of the supplied water in addition to providing drinking water.

Aquaflanders is the federation of drinking water companies and sewerage managers.

Aquafin: commissioned by the Flemish Region, constructs supra-municipal wastewater infrastructure and manages collectors, pumping stations, and wastewater treatment plants. Aquafin also acts as a sewerage manager if requested by a municipality.

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Table A. 3. Water-related legislation and policies – Germany

Case study	***Upper Main***
Country	GERMANY
Most relevant level of governance	Local (federal state Bavaria)
Dedicated water legislation	- Federal Water Act (WHG) transposes the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC) into national law. - Groundwater Ordinance (GwV) transposes Groundwater Directive (2006/118/EG) into national law. - Fertilizer Act (DüngG) and the Fertilizer Ordinance (DüV) transpose Nitrate Directive (91/676/EEC) into national law. - Surface Water Ordinance (OGewV) is a national law which implements the Environmental Quality Standards Directive (EQSD) (2008/105/EC). - Waste Water Charges Act (AbwAG) and Waste Water Ordinance (AbwV) transpose the Urban Waste Water Treatment Directive (91/271/EEC) into national law. - Drinking Water Ordinance (TrinkwV) transposes Drinking Water Directive (2020/2184/EU) into national law. - Federal Nature Conservation Act Law (BNatschG) transposes the Natura2000 (92/43/EWG) into national law. - Bavarian Water Act (BayWG) transposes the Federal Water Act (WHG) into regional law. - Bavarian Water Act (BayWG) and Bavarian Act on the Implementation of Wastewater Tax Act (BayAbwAG) transposes Water Framework Directive (2000/60/EC) into regional law. - Bavarian Nature Conservation Law (BayNatSchG) transposes the Natura2000 (92/43/EWG) into regional law. - Surface Water Ordinance (OGewV) is not transposed into regional law.
Specific governance arrangements	In Germany, water management and administration is usually regulated by the federal states. Although the allocation of tasks varies from state to state, for Bavaria it is organized as followed: - public drinking water supply: municipality, - sewage disposal: municipality, - river development and maintenance: municipality or federal state (here Bavaria).
Water policy/ strategy setting	In the field of water management, the federal state government has the right to issue framework regulations. The federal government can therefore provide the states with a legal regulatory framework. The states must implement this framework with their own state law and can issue supplementary regulations.

Table A. 4. Water-related legislation and policies – Malta

Case study	***Malta River Basin District***
Country	MALTA
Most relevant level of governance	National
Dedicated water legislation	Malta does not have a specific Water Act. The legal framework pertaining to water management is outlined under SL549.100 Water Policy Framework Regulations which transpose the EU Water Framework Directive (Dir 2000/60/EC) into National Legislation. The Water Policy Framework Regulations are implemented by two competent authorities, the Energy and Water Agency

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	and the Environment and Resources Authority. It is noted that due to the small size of the country, water management in Malta is addressed at the national level.
Specific governance arrangements	Water Management in Malta is addressed at the national level, reflecting the small size of the country. Local and regional authorities are however extensively consulted during the development of national water management plans.
Water policy/ strategy setting	The Ministry with responsibility for Water Policy is the Ministry for the Environment, Energy and Enterprise. In the development of water policies and management frameworks, the Ministry is supported at a technical level by the Energy and Water Agency. The Energy and Water Agency is responsible for drafting and actioning the Government's national policies for the energy and water sectors, and abiding by EU legislation for energy and water sustainability. The River Basin Management Plan is considered as the dedicated national water management strategy.

Table A. 5. Water-related legislation and policies – Slovakia

Case study	***Water Retention in South-Western Slovakia***
Country	SLOVAKIA
Most relevant level of governance	National
Dedicated water legislation	Water law in Slovakia is set by the Act nr. 364/2004 Coll. on water. The Water Act's level of implementation is the whole territory of Slovakia. The Act considers water a strategic, essential, and vital commodity (hence, owned by the State). The Water Act sets a general framework for comprehensive water protection, including protection of water and water dependent ecosystems, preservation and improvement of water resources, purposeful, prioritised, economical and sustainable use of water. The Act deals also with river basins management, protection of the environment protection, including minimisation of flood and drought risks and reductions of the negative effects of floods and droughts maintenance of the functions of water flows, safety of water constructions, and use of water with respect to its strategic and security importance for the state, public interest, food security of the state and prioritizing of the water uses. The Water Act defines rights and responsibilities of natural persons and legal persons with respect to water and related physical properties, with respect to protection of water, effective and efficient use of water. It defines the rights and duties of organs of state water administration and management and responsibilities when duties are not complied with. There are also other pieces of legislation addressing more specific issues like public water supply and sewerage, drinking water quality, or flood protection. The most important EU Directives for the south-western Slovakian case study are: Water Framework Directive (transposed in the Slovak Water Act), Floods Directive, Urban Wastewater Treatment Directive, Groundwater Directive, Environmental Quality Standards Directive, Directive on the Assessment and Management of Flood Risks, Nitrates Directive. All of these directives have been transposed and are applied at the national level.
Specific governance arrangements	Specific governance arrangements are connected to the Danube river. Slovakia is a contracting party to the Danube River Protection Convention and a member of the International Commission for the Protection of the Danube River.

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Water policy/ strategy setting	The Ministry of Environment of SR is the main authority responsible for water policy. It ensures and supervises a comprehensive care, preservation and use of domestic water resources. Other ministries (Ministry of Agriculture and Rural Development, of Economy, of Transport etc.) set supplementary policies in range of their competences. In particular, the Ministry of Agriculture and Rural Development of SR sets water for irrigation and conditions for its use, manages a system for irrigation of agricultural land and makes an effort to establish a system for water retention in soils. The main strategic document for water policy in Slovakia is the Water Policy Concept for 2021-2030 (with prospects till 2050). To implement water policy, the Water Plan of the Slovak Republic – consisting of water management plans of the Danube and Vistula river basins – has been prepared and is updated every 6 years (current version from 2021 for 2022-2027). The territory covered by the Slovak case study belongs to the Danube river basin.

Table A. 6. Water-related legislation and policies – Spain

Case study	***Jucar River Basin***
Country	SPAIN
Most relevant level of governance	Combination of national, regional, local governance.
Dedicated water legislation	The 1985 Water Law (ley de las Aguas 1985) establishes a legal framework for the management, protection, and sustainable use of water resources in Spain. It recognizes water as a public good, which implies that the State is responsible for managing it efficiently and equitably, guaranteeing access to quality water for all citizens and protecting aquatic ecosystems. The regulation promotes hydrological planning at the basin level, involving local authorities, users, and other stakeholders in elaborating specific management plans for each basin. It also establishes the principle of priority of use, prioritizing domestic and public uses over agricultural, industrial, and recreational uses. The law also regulates water concessions, granting use rights under certain conditions and reviewable terms to ensure efficient resource use. It addresses the protection of aquatic ecosystems and prevents pollution through regulations for the conservation of watercourses, riverbanks, and wetlands, as well as the management of discharges and water quality. The law also regulates water concessions, granting rights of use under certain conditions and reviewable terms to ensure efficient resource use. It addresses the protection of aquatic ecosystems and prevents pollution through regulations for the conservation of watercourses, riverbanks, and wetlands, as well as the management of discharges and water quality. To finance water infrastructures, the law establishes that users contribute financially through fees earmarked for hydraulic development projects and infrastructure improvement. The legislation recognizes the rights of autonomous communities in managing water resources in their territories as long as the general principles of the law are respected, allowing for adaptation to regional particularities. EU regulations have been transposed into the country's legislation. The Water Framework Directive (WFD) aims to achieve and maintain a good status for all water bodies, including rivers, lakes, coastal waters, and

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	groundwater. Spain has implemented the WFD and has adopted specific measures to comply with its requirements. Drinking Water Directive sets standards for the quality of water intended for human consumption and requires member states to comply with these standards. Spain has adopted this directive and is in the process of transposing it into national law. The deadline for compliance is set for January 12, 2023. Floods Directive requires member states to develop flood risk management plans and take appropriate measures to prevent, protect, and prepare for flood events. Spain has implemented the Floods Directive and has adopted measures to address flood risks. Nitrates Directive aims to prevent and reduce water pollution from agricultural sources, particularly from the excessive use of nitrates from agricultural fertilizers. It sets requirements for the management of agricultural activities and the control of nitrate pollution in vulnerable areas.
Specific governance arrangements	The Alarcón Agreement is a governance mechanism linked to the Alarcón reservoir, the largest and most important reservoir of the Jucar river basin with more than 1100 Mm^3 of capacity. The reservoir was built between 1941 and 1952 and it was paid by the traditional farmers in the lower basin, near Valencia. This was a unique initiative in Spanish history, because farmers assumed the total cost of the project instead of the State. They organized under the Unidad Sindical de Usuarios del Jucar (USUJ, Jucar Users' Coalition), an alliance of irrigation communities. Approved in 2001, the Alarcon Agreement exemplifies a governance agreement between water users and the water authority in the Jucar Basin. Under this accord, the United Syndicate of Jucar Users (USUJ) successfully ensured compliance with a 1983 Supreme Court ruling. This ruling mandated USUJ to transfer part of the control of the reservoir to the administration. In return, USUJ relinquished management responsibilities and secured several benefits, including the execution of irrigation modernization projects by public administrations, and a 60-year exemption from the expenses associated with the reservoir's management, maintenance, and operation. The agreement defines a rule curve for dividing Alarcón reservoir into two zones: one for irrigation and one for environmental flows. The USUJ has the right to use the water stored in the irrigation zone, while the administration has the responsibility to ensure the environmental flows and the water supply to other users. The agreement also guarantees the use of extraordinary resources in case of drought and sets a compensation mechanism for the farmers. Therefore, the Alarcón reservoir is not controlled by a single entity, but by a cooperative arrangement between the USUJ and the administration.
Water policy/ strategy setting	Ministry for the Ecological Transition and the Demographic Challenge (formerly the Ministry of Agriculture, Food and Environment): This is the national government ministry responsible for water policy at the national level. It sets overarching water policy goals and strategies and oversees the implementation of national water plans. Spanish National Water Agency (Agencia Española de Agua - AEAgua) operates under the Ministry for the Ecological Transition and the Demographic Challenge and is responsible for planning, managing, and regulating Spain's water resources at the national level. It plays a crucial role in coordinating water-related activities across Spain.

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	Autonomous Communities are regional authorities that develop and implement water policies and strategies specific to their regions, considering local needs and conditions. River Basin Authorities (Confederaciones Hidrográficas) – Spain is divided into several river basin districts, each with its own River Basin Authority responsible for managing water resources. Local municipalities also have water management responsibilities, particularly providing residents with drinking water and wastewater treatment services. In addition, various environmental organizations and NGOs in Spain actively engage in water-related issues, advocating for sustainable water management practices and raising awareness about water conservation and protection.

Table A. 7. Water-related legislation and policies – The Netherlands

Case study	***Hoogheemraadschap Hollands Noorderkwartier***
Country	THE NETHERLANDS
Most relevant level of governance	Regional and local
Dedicated water legislation	At the national level, there is a dedicated water legislation, the Water Act (in force since December 2009), which combines and replaces eight previous laws. At regional level, there is the 'Waterschapsverordening' and the 'Bestuursakkoorden Water' (Administrative agreement on water) which translate legislation to regional levels. Framework directives of the EU related to water are transposed into Dutch legislation. In particular, the Water Framework Directive, Floods Directive, Urban Wastewater Directive, and Habitats Directive.
Specific governance arrangements	The 'omgevingsscan' instrument (environment/surroundings scan) – internal instrument for environment and surrounding scanning on water quality and quantity/distribution options around wastewater treatment plants (WWTP's) from the water authority.
Water policy/ strategy setting	At the national level, the Ministry of Infrastructure and Water Management has the primary responsibility for water policy in almost all areas. However, the Ministry of Economic Affairs and Climate Policy is responsible for climate mitigation policy, and the Ministry of Agriculture, Nature and Food Quality for issues related to nature protection and agriculture.

A3. Water governance structure and institutional settings

Water governance includes social, economic, political and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society and among different water-using sectors (as defined in the Retouch Nexus project). Since the adoption of the EU Water Framework Directive, EU countries use a river basin approach to govern and manage water. Water governance is implemented by a range of institutions/actors within their competences. Effective water governance requires cooperation of these institutions/actors in both the horizontal and vertical direction to ensure a sustainable, efficient and equitable allocation, distribution, use and renewal of water resources. The structure of water governance, implementing institutions as well as prerequisites for a cooperative governance in the Retouch Nexus case studies are presented in Tables 8-13.

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Table A. 8. Water governance structure and institutional settings – Belgium

Case study	***WaterProof: Water and Climate Resilient Communities***
Country	BELGIUM
Most relevant level of governance	Regional (Flemish legislation)
Water governance authorities and implementing institutions	There are waterways managers (not a very clear hierarchical structure, each has their own responsibilities).
Water governance at hydrological scale	Waterways managers apply basin approach.
Vertical coordination in water governance	Not relevant for the Belgian case study, most entities in Flanders have responsibilities linked to the level of waterbody (not a very strict hierarchy).
Horizontal coordination in water governance	Mainly two types of horizontal cooperation take place under the lead of the Committee on Integrated Water Policy and basin secretaries: Coordination Committee on Integrated Water Policy (CIW): This commission is responsible for the coordination of the integrated water policy on the level of the Flemish Region. The CIW is composed of the leading officials of all administrative entities involved in water management. The basin secretariat is responsible for day-to-day operations within the basin and preparatory work for the basin board, area and thematic consultations and the basin council.

Table A. 9. Water governance structure and institutional settings – Germany

Case study	***Upper Main***
Country	GERMANY
Most relevant level of governance	Local (federal state Bavaria)
Water governance authorities and implementing institutions	In the field of water management, the federal government has the right to issue framework regulations and can provide the states with a legal regulatory framework. The administrative enforcement of all water legislation, including federal laws, and thus in particular the issuing of official permits, is the responsibility of the federal states. The water management administrations of the federal states are predominantly integrated into the general state administration. In most federal states, the water management administration follows the three-level structure of the general administration, although the allocation of tasks varies from state to state. 1st level: Supreme authority: State ministry with the water management division (usually this is the Ministry of Environment). Tasks: Control of water management and higher-level administrative procedures. 2nd level: Intermediate authority: District governments. Tasks: Regional water management planning, significant water law procedures, administrative procedures. 3rd level: Lower authority: Lower water agencies are the municipalities and cities. Tasks: Water law procedures, monitoring of water bodies and official decisions, for example on wastewater discharges. Exceptions are some smaller states that have a two-level administration without a middle level as well as city states with only one water management level.

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	A distinction has to be made between the water authorities that make water law decisions and the technical offices (state offices, state institutes, environmental offices, water management offices). They primarily perform advisory and expert functions. In order to coordinate common issues, the highest state authorities in the field of water management have joined together to form the State Working Group on Water (LAWA).
Water governance at hydrological scale	The basin approach is applied by the district governments (middle authority), the counties, the independent cities (lower authority) and the water management agencies.
Vertical coordination in water governance	The organisation of federal states ensures vertical coordination in water management (see above).
Horizontal coordination in water governance	There is cooperation among federal states, district governments of the federal states as well as river basin communities.

Table A. 10. Water governance structure and institutional settings – Malta

Case study	***Malta River Basin District***
Country	MALTA
Most relevant level of governance	National
Water governance authorities and implementing institutions	The Governance system identifies clear institutional roles at the Policy, Regulatory and Implementation levels within a comprehensive water management framework addressing the implementation of the EU Water Acquis. Within this context the Energy and Water Agency (within the Ministry for the Environment, Energy and Enterprise) is the lead agency at the policy level, supported at the regulatory level by the Environment and Resources Authority and the Regulator for Energy and Water Services. Coordination across government is ensured through an Inter-Ministerial Committee addressing the implementation process of the Water Framework and daughter Directives.
Water governance at hydrological scale	The Maltese Islands have been declared as a single River Basin District, and hence water management is addressed at the national level.
Vertical coordination in water governance	Not applicable, as competencies in water management are addressed at the national level.
Horizontal coordination in water governance	Coordination between the Ministry with competence on water policy and other sectoral ministries is ensured through the establishment of an inter-ministerial committee coordinating the implementation of Malta's River Basin Management Plan (National Water Management Plan). Representatives of the different ministries and key entities with a role in the management of the water sector meet regularly to review the implementation of the RBMP, identify and address implementation bottlenecks.

Table A. 11. Water governance structure and institutional settings – Slovakia

Case study	***Water Retention in South-Western Slovakia***
Country	SLOVAKIA
Most relevant level of governance	National

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Water governance authorities and implementing institutions	The core authority for water management is the Ministry of Environment of SR, which manages water at the national level, creates water policies and frameworks for care, preservation and use of national water resources, their quantity and quality. There are several state enterprises subordinate to the Ministry of Environment of SR with specific competences and responsibilities, mainly: - Slovak Water Management Enterprise: cares of watercourses and of material investment property, ensures the supply of water from waterways and reservoirs, arranges flood protection, plots sailing routes, takes care of the quantity and quality of surface and underground waters, maintains water in ecosystems and preserve original biotopes; - Water-Management Construction: operates hydroelectric power plants; - Water Research Institute: water management research, preparation of materials for strategy development and long-term prospective of water management in Slovakia, expertise, solutions for water management and ecological problems, development of database systems of water management, flood protection concepts; - Slovak Hydrometeorological Institute: hydrological and meteorological services including forecasts and warnings, monitoring and collecting of quantitative and qualitative parameters of air and water; - State Nature Conservancy of the Slovak Republic and National Parks (9) Administrations: nature and landscape protection (including cave management), monitoring of natural ecosystems; - The Slovak Environment Inspectorate: monitors compliance with environmental regulations, the status of surface waters and groundwater and wastewater discharges and their impacts on the recipient bodies. Apart from the Ministry of Environment of SR, there is also the Ministry of Agriculture and Rural Development of SR at the same level of governance with competences related to agriculture including irrigation systems, drainage systems and common blue infrastructure for agricultural purposes, organising land consolidation, forming agricultural policy and programmes for land improvement and ecosystem services. A subordinate state enterprise to the Ministry of Agriculture and Rural Development of SR responsible for irrigation and drainage systems is the enterprise Hydromeliorations. Self-governance regions and municipalities can influence water management via their spatial planning, land consolidation programmes and environmental protection programmes. Municipalities and districts grant also permits for water abstraction and discharge of waste water. Municipalities coordinate and are responsible for drinking water supply for inhabitants and waste water management.
Water governance at hydrological scale	The Slovak Water Management Enterprise manages and realises the care of watercourses (except for some small watercourses in forests and natural parks) according to natural river basins. The territory of the Slovak Republic is part of the international Danube basin and the Vistula basin. The Slovak part of the Danube basin is divided into 9 sub-basins of Danube's tributaries. The Slovak part of the Vistula basin is divided into 2 sub-basins of Vistula's tributaries. The Slovak Water Management Enterprise administers and takes care of watercourses through its 6 organisational units, each being responsible for a sub-basin or its part.

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	The territory covered by the Slovak case study belongs to the Danube river basin.
Vertical coordination in water governance	Water management policies are prepared at the national level in Slovakia, the core authority is the Ministry of Environment of SR. However, the Water Act explicitly asks for cooperation of the Ministry with other institutions. Cooperation with self-governing regions and municipalities takes place in form of working groups, workshops, consultations, negotiation, feedback treatment and similar. The procedure of preparing the Water Policy Concept for 2021-2030 (with prospects till 2050) was coordinated by a steering committee with water experts from the Ministry of Environment of SR. There was also a working group consisting of stakeholders from the sector serving as an advisory body. There were representatives of various ministries, research institutes, academia, water-related state enterprises and organizations, representatives of municipalities and non-governmental organizations in the working group. The procedure of preparing the Water Plan of Slovakia (and its two parts for the Danube and Vistula river basin) was led by the Ministry of Environment of SR and the Water Management Enterprise in cooperation with state administration bodies, self-governing regions, municipalities, the industrial sphere, the agricultural sphere, water companies, fisheries and organisations protecting aquatic ecosystems. Then it was made public for active participation and comments from stakeholders. First, basin management plans were approved by the Ministry and then, the Water Plan of Slovakia and its measures were developed. Basin management plans are reviewed and updated every six years.
Horizontal coordination in water governance	There is guidance from national authorities (ministries) about the implementation of water policies and measures for subordinate units (e.g. state enterprises) and for administration at the subnational level (e.g. municipalities). As water resources, waterbodies, water needs, water problems, ecosystem services, etc. are not equally distributed and cross the borders of areas administered by a particular subnational unit, cooperation among them takes place. Also conferences on water issues where subnational units can share their knowledge are organised. International cooperation complements cooperation of national and subnational level.

Table A. 12. Water governance structure and institutional settings – Spain

Case study	***Jucar River Basin***
Country	SPAIN
Most relevant level of governance	Combination of national, regional, local governance: - National administration: Spanish Government, - River Basin District: Jucar River Basin Authority, - Regional administrations: Valencian and Castilla la Mancha Governments, - Some local municipalities (Valencia and Albacete) are also relevant for urban water supply and the management of ecosystems (la Albufera de Valencia).
Water governance authorities and implementing institutions	In Spain, the primary authority responsible for water governance and management at the national level is the Ministry for the Ecologic Transition, particularly its freshwater management division. This ministry holds the authority to make decisions regarding freshwater, endorse River Basin Management Plans (RBMPs) and Flood Risk Management Plans (FRMPs)

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	developed by regional or river basin authorities, and handle conflicts between River Basin Authorities and other national-level issues. Additionally, they engage in international cooperation with neighbouring nations and oversee extensive civil protection strategies and coastal areas susceptible to flooding. At the sub-national level, the water governance and management responsibility are divided between River Basin Authorities and regional authorities. River Basin Authorities oversee inter-regional river basins, which entails managing the basins, formulating and executing RBMPs and FRMPs, and supervising major water consumers like agriculture and power generation. They also support municipalities implementing water-related projects and planning and constructing infrastructure per the Central Government's directives. Regional authorities, on the other hand, manage intra-regional river basins, encompassing tasks such as basin management, RBMPs, and FRMPs execution, land and freshwater resource management, and civil protection measures. They collaborate closely with the central Government and River Basin Authorities to ensure comprehensive and efficient water governance and management at the sub-national level. It is worth noting that municipalities also play a pivotal role in local water governance and management. They oversee urban water supply and wastewater treatment, establish regulations and pricing for water users, manage water supply and wastewater treatment infrastructure, and formulate urban plans and civil protection strategies related to flood risk.
Water governance at hydrological scale	There are river basin authorities (confederaciones hidrográficas) in Spain. Their main role is the preparation of the basin hydrological plan, as well as its monitoring and revision; administration and control of the Public Hydraulic Domain; Administration and control of the uses of hydric resources.
Vertical coordination in water governance	There are vertical coordination, cooperation, and decision-making mechanisms between the central and subnational levels of Government in Spain. Some examples: - Third Cycle Hydrological Plans: Define the lines of action for managing water resources in the country, ensuring coordination between the central and subnational levels of Government. They provide a framework for coordination and cooperation in water management, including the allocation of water resources, protection of water quality, and conservation measures. - River Basin Authorities are responsible for managing inter-regional and intra-regional river basins. These authorities are key in coordinating water management activities at the regional and sub-national levels. - The National Council on Water brings together representatives from the central Government and the regions to discuss and make decisions on water-related issues. This council ensures vertical coordination and cooperation between the central and subnational levels of Government in Spain. - In terms of policies, the Spanish Government has implemented the National Hydrological Plan, which addresses water management at both the central and subnational levels. This plan includes measures for water allocation, flood management, and international cooperation. It provides a framework for vertical coordination in water management and helps ensure a balanced approach to water governance.

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Horizontal coordination in water governance	There are various examples of horizontal coordination mechanisms, such as interdepartmental groups or meetings, comprehensive policy assessments, collaborative efforts among government ministries or agencies or interdisciplinary research initiatives. In the context of Spain, these coordination mechanisms are notably observed in sector-specific environmental conferences, flood risk management plans (which involve cooperation among different sectors), emergency response plans (also entailing cross-sector collaboration), the Water Councils in different regions, and the National Water Council. In the context of managing water policies and the collaboration between regional authorities to handle interconnected issues, there are two main levels of coordination: The National Water Council ("Consejo Nacional del Agua - CNA") that deals with water management and policies at the national level and the Demarcation Water Councils ("Consejos del Agua de la Demarcación - CAD") focusing on river basin district-level matters. Examples of collaboration between municipalities and metropolitan areas, primarily related to water services, include the joint management of services through metropolitan regions, consortia, or other legal entities, like "mancomunidades," defined in the Law on Local Regime Bases. Examples of this collaboration include the Bilbao Bizkaia Water Consortium, Mancomunidad del Añarbe, Mancomunidad de Canales del Taibilla, and the Metropolitan Area of Barcelona. Another form of horizontal cooperation is informal collaboration on specific projects that unite various institutions and sectors within a single working group, including universities, irrigation communities, basin organizations, and regional and local administrations. Regarding conflict resolution mechanisms, Water Councils can serve this role. Civil and administrative courts and traditional institutions, like Water Tribunals, also play significant roles. One of the weakest areas of horizontal coordination among water authorities is cooperation between Autonomous Communities.

Table A. 13. Water governance structure and institutional settings – The Netherlands

Case study	***Hoogheemraadschap Hollands Noorderkwartier***
Country	THE NETHERLANDS
Most relevant level of governance	Regional and local
Water governance authorities and implementing institutions	Lead authority is the Ministry of Infrastructure and Water Management; subnational/ regional authorities are the water authorities. The Ministry of Infrastructure and Water Management has the primary responsibility for water policy at the national level in almost all areas. However, the Ministry of Economic Affairs and Climate Policy is responsible for climate mitigation policy, and the Ministry of Agriculture, Nature and Food Quality for issues related to nature protection and agriculture. Rijkswaterstaat is the executive body of the Ministry of Infrastructure and Water Management, responsible for implementing water related policies and regulations.

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	At the regional level, provinces and regional water authorities play important roles, whilst municipalities are responsible for the implementation of water-related local policies. Provinces are regional governmental layers that function as legislation translators into regional implementation. Municipalities are executing water policies at a local level. Water authorities act as regional legislators, policy developers and executers of water policy.
Water governance at hydrological scale	The Netherlands is located in a delta that is formed by four river basins: the Rhine, the Meuse, the Scheldt and the Ems. The regional water authorities manage water at hydrological scale.
Vertical coordination in water governance	Cooperation and administrative agreements between water authorities and provinces/municipalities. Moreover, we have representative bodies such as the 'Unie van Waterschappen' (Union of water authorities) that operate as a spokesperson towards the national government on water related issues and stakes. There are also representative bodies for all municipalities (regarding transport and distribution of (drinking) water (Vereniging Nederlandse Gemeenten and RioNED) and for the drinking water companies (Vewin).
Horizontal coordination in water governance	There are consultation structures in place for specific catchment areas (for example; catchment Rijn-West / Rijn Noord) where we have horizontal discussions and agreements regarding water related issues in the catchment.

A4. Cross-sectoral water management

Cross-sectoral water management refers to the integrated approach to address water-related challenges across various sectors, such as agriculture, energy, industry, environment, and urban development. This concept admits that water is a finite and essential resource that is interconnected with many aspects of society and the economy. Cross-sectoral water management in the EU aims to balance the competing demands for water resources while ensuring the protection of the environment and the long-term sustainability of water supplies. The Water Framework Directive is a key piece of EU legislation emphasizing an integrated and holistic approach to water management, taking into account environmental, social, and economic considerations. Other policies and initiatives that aim to address the nexus between water, energy, food and the environmental sector in the Retouch Nexus case studies are described in Tables 14-19.

Table A. 14. Cross-sectoral water management – Belgium

Case study	***WaterProof: Water and Climate Resilient Communities***
Country	BELGIUM
Most relevant level of governance	Regional (Flemish legislation)
Cross-sectoral water management	Cross-sectoral policies and strategies promoting policy coherence between water and key related areas, in particular environment, agriculture, energy, health, land use and spatial planning do not exist in a very structural way. However, there is political support for water as an element interlinking economic sectors – The Flemish Water Policy Note.
Frameworks for competing water uses	Consideration framework for priority water use during drought and water scarcity: In order to be able to react resiliently to a water scarcity, the Flemish Government worked out an assessment framework with the social actors

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	involved that can determine precautionary measures and priority water use leading up to or during water scarcity. The assessment framework is a tool for decision-makers to take well-considered and scientifically substantiated measures during periods of extreme drought and impending water scarcity to reduce the likelihood of water scarcity and its consequences. It thus constitutes a major step forward in underpinning the reactive drought policy in Flanders. There is also a Drought commission and licensing framework.

Table A. 15. Cross-sectoral water management – Germany

Case study	***Upper Main***
Country	GERMANY
Most relevant level of governance	Local (federal state Bavaria)
Cross-sectoral water management	Cross-sectoral cooperation on national scale: 1) "National Water Dialogue": Together with the Federal Environment Agency in the first year of the UN Water Decade the Federal Environment Ministry initiated the National Water Dialogue. It is a multi-year dialog process with experts from water management, science, practice, administration and various interest groups started in October 2018. It was followed in 2021 by the National Citizens' Dialogue "Water" and a youth workshop to record further ideas and the demands of the population for policy. In a two-year consultation process, more than 200 participants from the water industry, science, agriculture and research, as well as from associations, states and municipalities, developed and discussed the main challenges, goals and possible measures for the sustainable safeguarding of water resources. As a dialog process, the National Water Dialogue was characterized by an open and constructive discussion aimed at developing positions - which the majority of participants could support. Core messages summarize the most important content from the National Water Dialogue conducted by the Federal Environment Ministry together with the Federal Environment Agency. The final document on the National Water Dialogue was published at the 2nd National Water Forum on October 8, 2020. 2) National Water Strategy: The results of the National Water Dialogue form the basis for the National Water Strategy. For the first time, the National Water Strategy bundles water-related measures in all relevant sectors: agriculture and nature conservation, administration and transport, urban development and industry. More than 300 participants from the water industry, agriculture and research, from associations, the states and municipalities worked with the Federal Environment Ministry to compile the most important challenges and goals for the development of water management. To achieve the goals, it relies on a mix of funding, legal regulations, knowledge building and dialog. The water strategy is designed for the period up to 2050. The first draft has been published on 8th of June 2021. Cross-sectoral cooperation on regional scale: 1) In order to maintain the good quality of drinking water in Bavaria, the Bavarian state government, together with farmers, water suppliers, associations and institutions signed the Bavarian Water Pact. The aim is to combine all forces in order to voluntarily, in addition to the legal requirements, improve the condition of the water bodies in accordance with the targets set out in the Water Framework Directive. The focus is on the input of nutrients (e.g. nitrogen and

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	phosphorus). In addition, suitable measures must be taken jointly to minimize the total input of substances into surface waters and groundwater. 2) In order to motivate companies, entrepreneurs and state institutions to implement operational environmental protection the Bavarian Environmental Pact was first agreed in 1995. Partners are the Bavarian State Government and its partners, the Association of Bavarian Business e.V. (vbw), the Bavarian Chambers of Industry and Commerce (BIHK) and the Bavarian Crafts Day (BHT). The aim is to develop solutions for dealing with outstanding environmental and sustainability issues, in order to promote environmental and climate protection in companies and businesses. Cross-sectoral cooperation on local scale: The campaign "Aktion Grundwasserschutz" (Groundwater Protection Campaign) serves to ensure a flawless drinking water supply. The campaign is based on the idea of sustainability and precautionary measures and breaks new ground for integrated groundwater protection in various fields of action. Since 2008, the campaign has also been implemented in the administrative district of Upper Franconia with its own focal points. In model projects the implementation of groundwater-compatible agriculture is being tested, with the help of partnerships between farmers, water suppliers and water suppliers and other contractual partners as well as on-site consultations on groundwater-compatible cultivation methods. Guidance documents provide recommendations for expanding this initiative to other areas. Groundbreaking communication and public relations activities as well as education for sustainable development have been developed. Since 2015, the Bavarian State Office for the Environment has supported the federal governances in contributing their ideas to the campaign and to develop new projects.
Frameworks for competing water uses	With regard to drinking water: There is the regulation of the Bavarian State Development Programme (LEP) as a multidisciplinary concept for the future, which indicates that groundwater should preferably be used for drinking water supply. From a legal point of view, this is a principle. Principles are to be considered in weighing or discretionary decisions, but they are not binding (like statutory objectives, for example). Thus, there is no (uniform) binding law for prioritizing water in the case of water stress. Prioritization is also discussed in the framework of the National Water Strategy. Furthermore, it is pointed out that public drinking water supply has priority over other uses. With regard to ecosystem: Heat and dry periods, can put a lot of strain on the aquatic ecology. There is an alarm plan for the Main river ("Main Aquatic Ecology Alarm Plan" (AMÖ)). In contrast to the usual river alert plans, which regulate action in the event of damage events or accidents involving toxic, water-polluting substances the AMÖ focuses on critical ecological conditions with heat periods and low discharges. Because especially under these circumstances, the Main as impounded river is highly vulnerable: impoundments significantly reduce the flow rate, which means that the water can heat up more – with possible damage to flora and fauna. The AMÖ considers the quality goals of the European Water Framework Directive (WFD) and the new Surface Water Ordinance (OGewV).

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Table A. 16. Cross-sectoral water management – Malta

Case study	***Malta River Basin District***
Country	MALTA
Most relevant level of governance	National
Cross-sectoral water management	Article 4(a) of SL595.08 establishing the Energy and Water Agency sets as one of the functions of the Agency "the design, development and cohesive coordination of conventional and alternative energy policies and measures together with water policy and secure governance across and within Ministries, Departments and government entities." In the water sector, coordination is ensured through an Inter-Ministerial Committee addressing the implementation of the River Basin Management Plan. The River Basin Management Plan includes an economic analysis of water use, which assesses the role of water in the economy – in relation to both water services and water uses.
Frameworks for competing water uses	Whilst a formal framework/mechanism to solve conflicts is not established, an effective engagement with stakeholders is ensured through the establishment of a National Water Table which brings together stakeholders from the public and private sector to follow the implementation of key water management planning documents such as the River Basin Management Plans and the Flood Risk Management Plan, as well as any other arising water management issues. The outcome of the discussions of the National Water Table help inform policy decisions at the national level.

Table A. 17. Cross-sectoral water management – Slovakia

Case study	***Water Retention in South-Western Slovakia***
Country	SLOVAKIA
Most relevant level of governance	National
Cross-sectoral water management	Water-related policy documents (Water Policy Concept for 2021-2030, Water Plan of Slovakia; Water is the Value – Action Plan to address the consequences of droughts and water scarcity) recognise the importance of water for a sustainable development and stress the contribution to SDG6 (Clean water and sanitation). The Ministry of Agriculture and Rural Development of SR initiated a new water paradigm (called Water for Climate Healing) based on the nexus of water, energy and carbon cycles, integrating hydrology, food, ecosystems, and climate connection. It was presented at the 2023 UN Water Conference. An integrated approach is considered to have more synergies for the achievement of SDG6 (Clean water and sanitation), SDG7 (Affordable and clean energy), SDG2 (Zero hunger), SDG13 (Climate action) and SDG15 (Life on land).
Frameworks for competing water uses	There is an Action Plan to address the consequences of droughts and water scarcity in Slovakia called Water is the Value. It distinguishes three groups of measures: preventive, operative and crisis measures. However, for some of the measures a time plan and/or allocation of financial resources are not specified. In the update of the Water Plan of Slovakia for the third planning period (2021 to 2027), drought has been identified as a significant water management problem for the first time. In a situation of extreme droughts, the Ministry of the Environment of SR prioritises the supply of drinking water to citizens, as well as

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	the protection of the environment (habitats and animals bound to water). Specific measures can be applied by municipalities taking into account local conditions. Municipalities are allowed and are responsible for restricting the use of drinking water from public water supply if there is water shortage and for providing an alternative water supply for inhabitants in emergency situations (for example they can set binding regulations for using water for human consumption and drinking, showering, filling pools, watering lawns and crops).

Table A. 18. Cross-sectoral water management – Spain

Case study	***Jucar River Basin***
Country	SPAIN
Most relevant level of governance	Combination of national, regional, local governance.
Cross-sectoral water management	Several mechanisms are in place in Spain to ensure coordination and collaboration across subnational authorities from different sectors for the design, decision-making, and implementation of water policies. For example, one of the key coordination mechanisms is the Central Government, which is responsible for designing and developing water policies and resource allocation. At the regional level, the various Regional Water Authorities (Confederaciones Hidrográficas) coordinate with the Central Government and manage water resources within their respective regions. Furthermore, the OECD provides a framework called the Water Governance Indicator Framework, which assesses the level of coordination between different levels of Government in water policy design and implementation. This framework emphasizes the importance of horizontal coordination across subnational authorities. In addition, other coordination mechanisms and forums at the national and regional levels facilitate collaboration and decision-making in the water sector. For example, there are sectoral conferences on energy that bring together different stakeholders to discuss and coordinate energy policies, including those related to water. The Consultative Commission of Energy Saving and Efficiency is another coordination mechanism where stakeholders discuss and coordinate energy efficiency measures. To develop the regional water management plans collaboration between various government departments and agencies, including those related to environment, agriculture, energy, health, land use and spatial planning are required.
Frameworks for competing water uses	Spanish Water Law (Ley de Aguas) sets out the principles and rules for water allocation, use, and protection. This law provides the basis for resolving conflicts and establishing water-use priorities. The management of water resources in Spain is highly decentralized, with significant regional autonomy in water policy. The hydrological plans developed by the river basin authority include provisions for allocating water among different uses, setting environmental flow requirements, and ways to addressing potential conflicts. These plans are subject to public consultation. Also, there are mechanisms to prioritize water use during water-scarcity situations. These priorities are generally defined in the hydrological plans and may give precedence to uses like drinking water supply, agriculture, or industry, depending on regional priorities and specific circumstances. Additionally, in many regions of Spain, water users, particularly in the agricultural sector, are organized into water users' associations. These associations often play a role in

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	managing and distributing water resources locally. They may be involved in resolving conflicts among members and ensuring efficient water use. Spain has developed drought management plans to address water scarcity. These plans outline measures to be taken during droughts, including water conservation measures, restrictions on water use, and the allocation of water to essential uses.

Table A. 19. Cross-sectoral water management – The Netherlands

Case study	***Hoogheemraadschap Hollands Noorderkwartier***
Country	THE NETHERLANDS
Most relevant level of governance	Regional and local
Cross-sectoral water management	Water is key in reaching sustainable development goals (SDG). Their implementation in The Netherlands is overseen by a high-level SDG coordinator. Focal points for SDG implementation exist at each ministry. In 2013, authorities and societal actors concluded the Agreement on Energy for Sustainable Growth (Energieakkoord voor Duurzame Groei) at the national level. As a follow up, stakeholders from five economic sectors including electricity, built environment, industry, agriculture and land use, and mobility concluded the Agreement on Climate (Klimaatakkoord) in 2019. Its successor was recently launched as National Climate Platform (Nationaal Klimaat Platform). In these latter initiatives, the regional water authorities have been, and still are, represented by their umbrella organization Union of Regional Water Authorities (Unie van Waterschappen). In 2022, the national government (the cabinet) wrote a so called 'Kamerbrief Water en Bodem sturend' (letter by Ministry of Infrastructure and Water Management to Parliament explaining the new water and soil central approach). This is a national call to put natural water systems and infrastructure as well as soil quality central to all other decision making (such as where to build houses, develop nature, etc.)
Frameworks for competing water uses	There is a national framework for prioritisation in the distribution of fresh (drinking) water in periods of droughts. This is called the 'Rijkswaterstaat verdringingsreeks'

A5. Challenges and opportunities for sustainable water governance

Sustainable water governance in the EU faces various challenges and opportunities. Prevention of problems with water quantity and quality is crucial for ensuring a sustainable and reliable water supply. Sustainable agriculture and urban planning, education, awareness and knowledge-based policies, innovative water governance and last but not least monitoring and data collection represent some of the ways to address and prevent these issues. Tables 20-25 review capacities for a sustainable water governance in each case study and assess the possibilities for informed evidence-based policies to protect water resources and to achieve other intended policy outcomes.

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Table A. 20. Challenges and opportunities for sustainable water governance – Belgium

Case study	***WaterProof: Water and Climate Resilient Communities***
Country	BELGIUM
Most relevant level of governance	Regional (Flemish legislation)
Capacities of institutions	Lack of a structural, long-term funding mechanism for water systems management.
Prevention of problems with water quantity and quality	In general costs of measures besides sanitation (covered by tariffs) are covered by public budget funding. Charges to manage water quantity and quality are: - A groundwater abstraction charge for all users that abstract more than 500 cubic meters of groundwater each year. Levied by the Flemish government. - A surface water abstraction charge for all users that abstract more than 500 cubic meters of surface water in navigable waterways each year. The charge is levied by the different responsible authorities of navigable waterways. - A levy on the discharge of wastewater in surface water for industry and agriculture based on pollution load and a fixed unit rate. Levied by the responsible authorities. - Annual contributions to polders and waterways. The size of the contribution depends on the amount of land situated in the specific basin. The charges are levied by the different responsible authorities of navigable waterways. The integrated water bill is the most important financing instrument in Flanders. The revenues are used for financing public water supply (production and distribution), public sewage systems (collection of wastewater) and public wastewater treatment systems. Every individual service is financed by a specific component which is part of the water bill. Revenues are earmarked for all 3 components. This new tariff structure was set up to improve cost recovery levels and simultaneously take into account other motivations such as sustainability, fairness, affordability and administrative complexity. The integrated water bill is also applied for consumers with private water provisioning and private wastewater treatment. All costs on flood risk prevention are financed by public budget funding in all three regions. Investments in rainwater storage and infiltration on private land are enforced by law and financed by the private sector.
Knowledge-based policy making	Exact data and scientific knowledge are used to estimate water accounts and to model water availability and water allocation strategies (example: in the Scheldt River Basin or in the different river basins in Flanders). The Drinking Water Supervisor and the Water Regulator request quantitative data on drinking water production and distribution, resulting in the water balance of each water company and in a water balance of the drinking water sector in Flanders.
Monitoring of water policies	Implementation of the Water Framework directive in the River Basin Management Plans and the Water Policy note of the Flemish government.
Innovative water governance	There are several rainwater collection and purification systems being integrated in new building complexes. In Agnetenpark Peer, the investment of the collection and distribution of this rainwater system, is financed by the sales of the new

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	apartments. The investment of the purification system will be financed by the water tariff for using the rainwater, set at a somewhat lower fee than the fee per cubic meter to use drinking water. The COOCK project on water-conscious building encourages companies from the entire construction chain to apply and integrate individual and collective innovative technologies in the field of water-conscious building into their operations. This project aims to strengthen the resilience of the built environment to drought and water scarcity through the application of individual and collective innovative technologies in the field of smart water use, circular water use with rainwater and grey water and local groundwater recharge. A potentially new instrument, not in place yet (studies are still ongoing), is the Infiltration bonus. Those who drain stormwater directly to public property pay for stormwater infrastructure, drainage and treatment. Those who thus keep rainwater on their own property will be rewarded.
Availability of data	More sources providing information on water-related issues exist. Although data on integrated water resources management, on risk management and on water and sanitation services are available, gaps have been identified in temporal resolution of water abstraction (currently on a year basis); real time data on water quality; data on measures taken by households/companies; digital water metering (still in testing phase).

Table A. 21. Challenges and opportunities for sustainable water governance – Germany

Case study	***Upper Main***
Country	GERMANY
Most relevant level of governance	Local (federal state Bavaria)
Capacities of institutions	All institutions involved (central organizations, catchment area organizations or municipalities) have already reached their capacity limits. More complex relationships and processes require more staff and more budget.
Prevention of problems with water quantity and quality	Instruments to manage problems related to water quantity: - Three federal states in Germany (Bavaria, Thuringia and Hesse) do not levy water withdrawal charges. The remaining 13 have each enacted their own laws on the levying of a water abstraction charge. - Eight federal states have separate levy rates for public drinking water supplies. - Early warning systems for disasters (e.g. flood intelligence service). - Emergency aid and hardship funds. Instruments to manage too polluted water: - The charges of wastewater disposal depend - among other things - on the level of pollution of the wastewater to be treated. This applies nationwide. - Some components of the implementation of the EU's Common Agricultural Policy are becoming indirect economic tools for water management. For example, under the first pillar of the main features of the Common Agricultural Policy, water protection measures (e.g. establishment of buffer zones, protection of groundwater from pollution) are also eligible under agricultural subsidies.
Knowledge-based policy making	Empirical data, scientific knowledge and projections on water reserves, renewal and water demanded from agriculture, industry and households are used in decision making.

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Monitoring of water policies	The main problem of monitoring water policy is the individual interest groups. Mainly for political reasons, the approach to action is very restrained.
Innovative water governance	Innovative financing/funding within the case study area is provided by the Bavarian State Office for Environment (STMUV). To foster feedback sharing there are: - Neighborhoods (e.g. neighborhoods of water plants and sewage treatment plants). Such neighborhoods are voluntary associations of operators of water and waste water management facilities or of those responsible for the maintenance of water bodies. They serve to promote water protection, water development and the professional and safe operation of facilities. The sponsorship is taken over by the regionally responsible state association. - In addition, there is also the benchmarking for water suppliers and wastewater disposal companies ("Benchmarking wastewater Bavaria"), which is funded by the Bavarian State Office for Environment (STMUV). In Bavaria there are already around 200 different forms of cooperation between water suppliers and farmers. Their common goal is groundwater-friendly farming in order to keep the drinking water pure. This voluntary cooperation is regulated by private law contracts. The content of the agreements must be developed from the local hydrological and climatic site conditions and adapted to the respective forms of management. In addition to the contractual agreement on forms of management, agricultural advice from experts is also used in order to achieve the most environmentally friendly management possible. The Bavarian State Office for the Environment supported these activities by the water suppliers by compiling the cooperation in Bavaria and evaluating their content. Such cooperation mainly appears in water protection areas. In many cases, adverse substance inputs from agriculture have been successfully reduced or their further increase avoided. In this way, the quality of the drinking water resources could be maintained and additional drinking water treatment avoided. In order to coordinate common issues, the highest state authorities in the field of water management have joined forces to form the State Working Group on Water (LAWA). They primarily perform advisory and expert functions. The LAWA Groups meets frequently for discussion during which they may also discuss failures in water policy and governance.
Availability of data	Since 2007, institutions, corporations, companies and municipalities have had to provide the Federal Statistical Office with information on their water charges. The legal basis for this is provided by the Environmental Statistics Act, which was amended in 2005: survey of public water supply and wastewater disposal, survey of sewage sludge, survey of non-public water supply and wastewater disposal, survey of water and wastewater charges. In the survey of public water supply, a distinction is made between private households (incl. small businesses), commercial enterprises (manufacturing, trade, transport, services) and other customers (e.g., hospitals and schools, public authorities and municipal facilities, the German armed forces, agriculture and other facilities for public purposes). However, the survey does not ask about individual characteristics such as water delivery to agriculture. There are multiple water information systems on national and regional scales.

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Table A. 22. Challenges and opportunities for sustainable water governance – Malta

Case study	***Malta River Basin District***
Country	MALTA
Most relevant level of governance	National
Capacities of institutions	Malta's River Basin Management Plan is implemented jointly by the Energy and Water Agency and the Environment and Resources Authority. Both entities do have a sufficient level of autonomy and adequate capacities (human and financial resources) to carry out their function.
Prevention of problems with water quantity and quality	The main instrument to manage water related problems is the River Basin Management Plan, which given the climatic characteristics of the Maltese Islands is considered to act as a Drought Risk Management Plan in its own right. The River Basin Management Plan is complemented with the Flood Risk Management Plan. Economic Instruments are applied with the objective to incentivise efficient water use in the provision of water services, where a rising block tariff applies. Furthermore one of the key issues under the 3rd River Basin Management Plan looks at opportunities for the establishment of economic instruments which protect bona-fide water uses, whilst disincentivising inefficient water use.
Knowledge-based policy making	The Energy and Water Agency strives in the collection and generation of the necessary data to ensure the development of information-based policy. As proof of this, information on features such as the status and development of groundwater resources and production capacity of non-conventional water resources, and trends in sectoral water demands is included in the River Basin Management Plan.
Monitoring of water policies	The River Basin Management Plan is formulated on a 7-year cycle, and the drafting of each new plan includes a process of evaluation and extensive stakeholder consultation. However, through the establishment of the National Water Table a continuous evaluation process is in place which enables the assessment of the implementation of key measures under the River Basin Management Plan and introduces a feedback loop for the optimisation of the measures impact where so required.
Innovative water governance	The setting up of the National Water Table has proved to be an important discussion forum in support of water policy development. The Water Table brings about an equal number of representatives from the public and private (such as water user representatives and environmental NGOs) sectors to openly discuss the implementation of key water management measures and provide recommendations and suggestions for improving implementation effectiveness. The outcomes of the discussion are presented to policy makers during the decision making process. In order to support the development of information-based policies a national R&I Scheme has been launched which supports research initiatives from local industry and academia to address arising challenges in the energy and water sectors. The outcomes of these research initiatives also inform the development of future policies for facilitating the adoption of innovative technologies.
Availability of data	A dedicated Water Information System is currently under development.

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Table A. 23. Challenges and opportunities for sustainable water governance – Slovakia

Case study	***Water Retention in South-Western Slovakia***
Country	SLOVAKIA
Most relevant level of governance	National
Capacities of institutions	Capacities of central as well as catchment-based organisations are not sufficient. One of the goals of The Water Policy Concept for 2021-2030 is to ensure an efficient and transparent water management with clearly defined competences (state administration, local government, other entities). The Concept proposes a review and update of the competence and organizational structure within the water management and it sets several measures to stabilise the financing of state water administration at all levels, state enterprises and organizations in the water sector, and to develop personal and material capacities of institutions.
Prevention of problems with water quantity and quality	To control water quantity and quality, economic instruments represented by fees often combined with a permission licence are used (for water abstraction, for polluting water, for discharge of waste water, for final water demand). Other instruments include procedures and regulations following the legislation and the Water Plan of the Slovak Republic (consisting of water management plans of the Danube and Vistula river basins). There is also a warning system for droughts and floods risks.
Knowledge-based policy making	Data are collected by several state enterprises and institutions and supporting documents for policy making are being prepared.
Monitoring of water policies	The Water Policy Concept for 2021-2030 directly states that its implementation will be evaluated in the second third of the programming period (2027) and at the end of the Concept's validity (in 2030), when an update of the Water Policy Concept of Slovakia is planned. The evaluation will be carried out by a guarantor in cooperation with partners and representatives of interested parties. Controlling authorities remind that the impact of measures taken is often not evaluated and an overview of their financing is missing.
Innovative water governance	The Ministry of Agriculture and Rural Development of SR is developing a new agenda called Soil – the Carbon and Water Bank of the Landscape. Its aim is to protect and restore soils and their water retention capacity. The new concept promotes an integrated nexus approach to the management of water resources and soil at the level of municipalities, regions, basins and the country. Expected impact is that health status of soil will be improved, its production capacity will be increased, water retention in the country will be improved and climate change impacts will be mitigated. Implementation tools include a certification system Carbon and Water Bank for land owners and land users applying sustainable agricultural and forest managing methods and the creation of a fund for soil, which will finance ecosystem services. Improved status of soils and increased water retention capacity will help to restore water circulation, restore small water cycles in the country, recover groundwater sources, increase soil moisture and agricultural production, create sustainable cycles of carbon, nutrients and solar energy flows, decrease the risk of biodiversity loss, floods and droughts. This concept represents an innovative approach to water management in Slovakia. However, its implementation in practise is hindered by administrative and financial issues, different interests of relevant parties and very long bureaucratic procedures.
Availability of data	A comprehensive water information system does not exist yet. The Water Policy Concept for 2021-2030 calls for a consolidation of data and information on water collected by different professional organizations and entities, for support of

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	compatibility of source data, for creating a water information system (IS Water) integrating existing information systems and linking data from other sectors and departments to ensure an accessible comprehensive database of relevant data and information about water. The Water Act divides the evidence on water into four parts: records about water bodies of surface and underground water, quantities and quality of water in water bodies, rights and obligations resulting from the decisions of the state water administration bodies, protected areas. Water-related information is fragmented in many sources, so sometimes it is difficult for users to get a complete overview of data. Moreover, some of the information is available only for the actual time period, historical time series are difficult to access for the public (but usually can be obtained from state authorities free of charge or for a fee).

Table A. 24. Challenges and opportunities for sustainable water governance – Spain

Case study	***Jucar River Basin***
Country	SPAIN
Most relevant level of governance	Combination of national, regional, local governance.
Capacities of institutions	Declared capacities, staff, budget and level of autonomy of central and catchment-based organisations should be sufficient to carry out their functions. However, interviews with stakeholders representing different levels of governance will be required to get more insight.
Prevention of problems with water quantity and quality	Instruments to manage too much, too little and too polluted water include for example: - Public funding to maintain and conserving watercourses. - Public investments to enhance hydrological plans, to be aligned with key European policies such as the Green Pact, the Zero Pollution Plan, and the recent European Directive concerning water quality for human consumption. These measures are designed to mitigate the risks associated with floods and droughts and make significant contributions towards achieving environmental goals, preserving biodiversity, and advancing climate change adaptation efforts. - Payment for ecosystem services: Spain is making considerable investments, amounting to €829.9 million from 2007-2027, to implement buyback schemes in the Upper Jucar River basin, Segura River basin, and Upper Guadiana River basin. These schemes have the purpose of restoring environmental flows while also compensating farmers for any potential negative effects through financial compensation. - Ecotax: It considers environmental and recovery cost. - Subsidies.
Knowledge-based policy making	Mechanisms are established to collect data to formulate, for example, hydrological and drought management plans.
Monitoring of water policies	Monitoring mechanisms are established for the evaluation of water policies and governance.
Innovative water governance	Spanish Water Technology Platform (PTEA - Plataforma Tecnológica Española del Agua) is a public-private partnership that aims to promote innovation in the water sector. It brings together various stakeholders, including government agencies, research institutions, and companies, to support research and development initiatives.

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	Some regions in Spain have implemented water markets or water rights trading systems to allocate water resources more efficiently. These markets allow water users to buy and sell water rights, promoting flexibility in water use.
Availability of data	There is a National Water Information System in Spain – a national database able to integrate and cross-relate all relevant data on water management. Other sources of information include: - SINAC (Sistema de Información Nacional de Agua de Consumo): The National Drinking Water Information System is a health information system that collects data on the characteristics of supplies and the quality of drinking water supplied to the resident population in Spain. SINAC is currently supported by a web application via the Internet. It is accessible to citizens. - Hispagua-CEDEX: Water System Indicators. Access to aggregated data in the form of indicators that reflect, in few values, the more important aspects of the water in Spain.

Table A. 25. Challenges and opportunities for sustainable water governance – The Netherlands

Case study	***Hoogheemraadschap Hollands Noorderkwartier***
Country	THE NETHERLANDS
Most relevant level of governance	Regional and local
Capacities of institutions	When argued from the narrow judicial responsibility point of view, Dutch institutions are adequately equipped. However, societal demand is shifting towards a broader interpretation of their water tasks, so capacities may not be sufficient to meet this new societal demand.
Prevention of problems with water quantity and quality	There are both national and regional policy and economic instruments in place to manage too much, too little and too polluted water, such as duties of care, water agreements, water permits and a ranking system in case of competing uses.
Knowledge-based policy making	Empirical data, scientific knowledge and projections on water reserves, renewal and water demanded from agriculture, industry and households are used in decision making.
Monitoring of water policies	With respect to the Water Framework Directive, the Dutch government presents each year a report to the House of Representatives on the state of implementation of water policy in The Netherlands. This is done through reports "The state of our waters".
Innovative water governance	On all levels (national, regional, catchment based and local) Dutch governmental bodies are equipped both in policy as well as in resources to foster innovation and experimentation. Moreover, The Netherlands builds upon a broad history of water management expertise as well as excellent knowledge infrastructure in terms of universities as well as (technological) innovation hubs. There is a platform STOWA (Stichting Toegepast Onderzoek Water) to perform joint research on water related issues with all water authorities and drinking water companies. This includes Communities of Practice where research results, best practices, etc. are shared. Moreover, cooperation and knowledge sharing is common practice amongst the different water authorities.
Availability of data	There is a comprehensive water information system providing information on integrated water resources management, on risk management and also on water and sanitation services.

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