# Implementation of water allocation in the EU

09020200/2022/869340/SFRA/ENV.C.1

Framework Contract 'Water for the Green Deal' - Implementation and development of the EU water and marine policies

Specific Contract "Support to the Commission on water quantity management – follow up to the Fitness Check of EU water law conclusions, EU Strategy on Adaptation to Climate Change and Common Implementation Strategy Work Programme for the water directives (2022-2024)"

EUROPEAN COMMISSION

Directorate-General for Environment
Directorate Quality of Life
Unit C.1 Sustainable Freshwater Management

*E-mail: Env-Water@ec.europa.eu*

*European Commission*
*B-1049 Brussels*

Report prepared by Josselin Rouillard (Ecologic Institute) & Guido Schmidt (Fresh Thoughts Consulting GmbH). Please refer to it as "Rouillard & Schmidt (2023): Implementation of water allocation in the EU. Developed under the Framework Contract 'Water for the Green Deal' - Implementation and development of the EU water and marine policies (09020200/2022/869340/SFRA/ENV.C.1). Specific Contract "Support to the Commission on water quantity management – follow up to the Fitness Check of EU water law conclusions, EU Strategy on Adaptation to Climate Change and Common Implementation Strategy Work Programme for the water directives (2022-2024)""

# Index

## 1. Executive summary

A water allocation mechanism is the combination of institutions which enable water users and water uses to use, take or to receive water for beneficial use according to a recognised system of rights and priorities (Taylor, 2002). It defines who is allowed to access water, how much may be used or taken and when, how it must be returned, and the conditions attached to the use of the water (OECD, 2015).

Overall, little work has occurred on the topic at EU level, despite its relevance to water management, as highlighted by European Commission's 2007 Communication on water scarcity and drought, its 2019 Review of the second cycle RBMPs, and more recently the EU Biodiversity Strategy to 2030 and the EU Adaptation Strategy (issued in 2020 and 2021, respectively) under the European Green Deal.

This report, prepared in cooperation with members of the ad-hoc technical group on Droughts and Water Scarcity of the EU Common Implementation Strategy (CIS) for the Water Framework Directive (WFD), reviews the literature and practice for water allocation mechanisms. It identifies key challenges in EU Member States and highlights examples of methods in place.

Because of the lack of previous EU exchanges on the topic of water allocation, there are currently different understandings of the concept and of its role in water management under the WFD. Furthermore, national contexts vary significantly, as water allocation has been in place for a long time in some of the EU Member States, whilst for others it is a new field of water management. Sharing success stories and examples of progress is difficult, as often the process of implementing water allocation has just started or not yet ready for presentation to other water managers, experts and the public.

Member States face currently several challenges when implementing water allocation mechanisms.

**Establishing a supportive legal and policy framework:** Approaches to water allocation vary significantly between Member States. The characteristics of permitting regimes, such as the duration of validity of permits, and the flexibility in changing permit conditions, in order to for instance reflect changing hydrological conditions due to climate change, vary between Member States. In some, permits are the only tool to allocate water, while in others, systems of annual or shorter-term allowances have been established. There are also challenges in terms of governance, as not all interests may be sufficiently represented in decision-making on allocations, for instance non-abstractive and non-consumptive uses, such as the environment, navigation, recreational users, water-dependent tourism and fisheries.

**Matching allocations to the available water resources**: allocations must be based on sound water balances that integrate the pre-conditions set by the EU WFD regarding environmental needs (eflows), seasonal and interannual water availability under current (and future) management conditions, and infrastructure, climate and socioeconomic scenarios. Taking into account climate change is a major challenge when defining the amount of water that can be allocated now and in the future. Once an allocable pool is agreed upon, there are challenges regarding the capacity of authorities to address cases where pre-existing allocations must be reduced.

**Facilitating reallocation between uses:** Member States report facing challenges in terms of managing the impacts of reallocations and trade-offs between water uses. Strategies are sought by Member States on how to facilitate the exchange of allocations to minimise socio-economic impacts. There are challenges in establishing reallocation mechanisms to support more efficient water use and difficulties to ensure greater coherence between allocation policies and other sectoral and economic development policies.

**Ensuring compliance with allocations:** Member States report challenges with the timely identification of cases of overabstraction as well as effective sanctions to discourage non-compliance and illegal abstraction. While some examples exist of how to address this issue, there are questions on how to upscale and make them robust for the variety of contexts found in the European Union.

This report presents, for some of these challenges, illustrative examples on how to address them that have been collected from volunteering Member States. These examples could guide others that are still in the process of setting up water allocation mechanisms or struggling with implementation challenges.

Water scarcity and droughts have struck many regions in Europe over the past years, illustrating the need for urgent and transformative action to adapt to climate change – and for the implementation and use of effective water allocation mechanisms. In consequence, the following recommendations are made for improving water allocation policies as the knowledge basis for water allocation decision-making. Based on the review of cases and methods, it is recommended that Member State information exchanges on the implementation of water allocation mechanisms concentrate on the following topics:

1. To clarify the contribution of water allocation mechanisms to the WFD objectives and sustainable water management, in particular the relationship with ecological flows and water balances, as well as their role in the River Basin Management Plans (RBMPs) and the integration in other policies.
2. To clarify the role of water allocation mechanisms for mitigating climate change impacts, increasing resilience, and supporting the adaptation and transformation of economic sectors, infrastructures and land uses.
3. To identify and assess possible strategies available to water managers to tackle overallocation and reduce allocations to match the available water resources in the long term and during dry/drought conditions (for instance how to modify historical water use rights).
4. To explore the effectiveness of enforcement of water allocation decisions (e.g., compliance monitoring systems for different water uses, penalties/fines).
5. To better coordordinate with sectoral policies and to support investments to reduce trade-offs of water (re)allocation; sharing experiences in dealing with opposition from water users and on the use of relevant funding mechanisms at country level
6. To improve the understanding and acceptance of (changes in) water allocation by different stakeholders including consumptive and non-consumptive water users, and competent authorities.
7. To establish criteria to assess the implementation and performance of different water allocation policies.

These topics could be areas for work by the Ad-hoc technical Working Group on Water Scarcity and Droughts in the near future, to help to address ongoing challenges seen across Member States.

## 2. CONTEXT

In 2022-2023, the ad-hoc CIS technical group on water scarcity and drought has addressed several related topics. In particular, three interrelated background documents have been prepared to review and foster the implementation of key tools to better manage water scarcity and drought, on: water balances, water allocation mechanisms (the topic of this report) and ecological flows.

The topics of the three reports are closely related. The separate report on water balances takes stock of the available water resources and water use and conclude with a review statement of water supply feasibility and/or overexploitation. Water balances constitute a proper knowledge basis for the establishment and implementation of water allocation mechanisms, which allow water use in a certain area or time. Water allocation mechanisms are also key for ensuring that ecological flows are implemented, ensuring the achievement of good ecological status/potential under the Water Framework Directive and broader biodiversity and sustainability goals.

## 3. INTRODUCTION

### 3.1. Water Allocation

Allocation mechanisms can be defined as the combination of institutions which enable water users and water uses to take or to receive water for beneficial use according to a recognised system of rights and priorities (Taylor, 2002). These mechanisms define who is allowed to access water, how much may be taken and when, how it must be returned, and the conditions attached to the use of the water (OECD, 2015). In addition, allocations must account for the range of uses needing specific flows or levels of water in rivers and lakes such as the environment, navigation, recreational users including anglers, water-based tourism and fisheries. Allocations can be issued in different forms: permits, time-limited allowances or long or permanent entitlements – or a combination of those when for instance permits are modulated by annual or seasonal restrictions.

Under the EU WFD, Member States are required to establish controls on the use, abstraction and discharge of water (Art. 11.3) in the form of registers and prior authorisation through permitting regimes. Permits are a key tool to implement WFD-compliant allocations. Permits are defined as the right to use water, usually for abstractive and consumptive purposes, but they can also regulate certain non-consumptive uses, in particular when they affect the flow or morphology of surface water bodies. For consumptive purposes, water allocation mechanisms set out the right to extract a pre-defined volume of water at a certain time (e.g. annual, seasonal, monthly, daily) and location (point of abstraction and eventually point of discharge). Individuals and entities using water, encompassing industries, agriculture, and households, must secure permits or licenses to extract, redirect, or alter the flow of water from either surface water reservoirs or underground sources. Furthermore, these permits cover the disposal of treated or untreated wastewater. The WFD requires that these permits be periodically reviewed and updated to support the achievement of the WFD objectives.

The EC's 2007 Communication on water scarcity and drought identified the reform of water allocation regimes as one of the seven policy options to make water more 'fit for purpose' in light of the environmental and climate agenda of the EU. This calls for the adaptation of water allocation to consider the ecological needs of water-dependent ecosystems (EC, 2012). More recently, the Biodiversity Strategy to 2030 and the EU Adaptation Strategy under the EU Green Deal highlight the need to review water permitting regimes and allocation systems to achieve the combined objective to implement ecological flows and achieve WFD good status, and mitigate the impacts of climate change. The establishment and enforcement of water allocations in Europe is thus seen as an important tool for dealing efficiently with water scarcity and drought issues, for achieving good ecological status as required by the WFD, and for providing significant co-benefits for climate change mitigation and adaptation, nature and biodiversity.

In the global environmental policy context, water allocation mechanisms are notably relevant to achieve Sustainable Development Goal 6 (Ensure access to water and sanitation for all), which includes targets to protect and restore water-related ecosystems including rivers, wetlands, aquifers, and lakes (SDG6.6, SDG15.1). Water allocations are also relevant to a host of other targets such as SDG indicators 6.4.2 (Level of water stress).

Water allocation regimes in Europe are very diverse. Many were first developed between local communities and economic sectors (Ostrom, 1990). Others are now embedded in national and sub-national regulations and water management practices, largely influenced by distinct environmental conditions (e.g. climatology, hydrology, topographic), legal traditions, economic principles and social priorities. Overall, however, large differences exist between Member States regarding governance frameworks, water use hierarchies in the event of scarce water resources and droughts, strategies taken to carry out reallocations, institutional trajectories, etc. The search for good practice should account for the constraints and opportunities resulting from these different starting points.

Water allocation mechanisms must help deal with conflicting demands and trade-offs. Economic uses need long term certainty over their authorised access and use of water (e.g. to support productive investments), while ecosystems and the good status of water bodies must be safeguarded. This occurs in a context where, depending on regions in the European Union, water scarcity is increasing (e.g. the baseline is changing due to climate change) and/or drought conditions are becoming more intense and frequent. As available water resources are diminishing, decisions over who can use water and how much is becoming more contentious. Any changes to pre-existing water allocations have significant social, economic and environmental effects.

The latest Commission assessments of the RBMPs (EC, 2019) have shown that:

- Controls over the abstraction of surface water and groundwater and impoundment of fresh surface waters including a register or registers of water abstractions and a requirement for prior authorization of abstraction and impoundment (under Article 11(3)(e)) are used along all Member States, with certain differences regarding the existence of a register or of controls for all abstractions.

- Most Member States apply exemptions to permitting and/or registers for small abstractions. Though this lowers administrative burden it might be inconsistent, if groundwater bodies do not achieve good quantitative status due to the accumulation of such minor abstractions.

- Relevant action in extending metering, water abstraction controls and reviewing licenses has been found in some Member States, while in others water abstraction datasets have improved. In most Member States, small abstractions are exempted from controls and/or registering, even though water bodies suffering from significant abstraction pressures are not achieving good status.

- Existing permits are in place for very different timespans, ranging from short periods up to very long periods and even permanent rights. A balance must be found between the need for flexible abstraction permits responding to thresholds required for achieving the WFD objectives, while providing sufficient certainty to support investment by sectors in water infrastructures.

Overall, a limited number of studies have examined allocations practices EU-wide. A first study carried out during the Commission-funded Blue2 project (Berbel et al, 2018) examined in 2017 the economic impact of different water allocation mechanisms (e.g., state, user based, markets and pricing) and the conditions to support efficient reallocation of water rights. The Integrated Assessment of the 2nd RBMPs (Buchanan et al., 2019) showed that not all Member States link allocations to the assessment of renewable resources (e.g., water balances including e-flow constraints), and not all have set up a process to revise permits to match allocations to available water resources in a given catchment or river basin. The current pilot work on "Ensuring effective implementation of the EU water legislation on the ground" provides further insight into the permitting regimes set by Member States (EC, 2019).

A recent review of Drought Management Plans (DMPs) (EC, 2023) shows that a pre-defined prioritisation of water allocation between water uses, to be implemented in drought conditions, exists in 15 Member States, with the primary use usually being critical infrastructure (e.g. dykes, hospitals, nuclear power stations, fire protection), followed by drinking water and public water supply (which therefore can include not only domestic users but also smaller industries and livestock production) (EC, 2023). DMPs must also safeguard the environmental objectives under EU obligations (e.g., WFD, nature directives).

# 4. Aim and Scope of this Report

## 4.1. Scope and Purpose of this report

The purpose of this report is to elaborate good practices of measures implemented to support water allocation in EU Member States and to define actions in support of enhanced implementation of water allocation mechanisms. The overall objective is to support Member States' exchange of information on enhancing the implementation of water allocation as valuable measures to support the WFD objectives.

## 4.2. Methodology

This report has been developed in a stepwise process, driven by the consultants, steered by the European Commission and engaging the members of the ad-hoc technical group on Droughts and Water Scarcity of the EU Common Implementation Strategy (CIS) for the Water Framework Directive. The main steps of the process have been:

- Analysis of literature, including scientific publications, planning documents, evaluation reports and other sources by the consultants to identify challenges in the implementation of water allocation.
- Development of good practice criteria for each of the challenges identified
- Consultation of the group at the autumn 2022 meeting on previous steps
- Development and responses from 19 Member States (AT, BE-FL, CY, CZ, DE, DK, ES, FI, HU, IE, IT, LT, LU, MT, NL, PL, PT, SE, SK) on a self-assessment questionnaire aiming at identifying the situation of challenges and good practice across the EU
- Integration of responses and discussion with the group at the spring 2023 meeting on preliminary findings and priorities set for the further work
- Development and responses by ATG WSD members on a good practice example template
- Validation of good practice examples and identification of recommendations at the autumn 2023 ATG meeting
- Finalisation of the technical report

# 5. KEY CHALLENGES FOR IMPLEMENTING WATER ALLOCATION MECHANISMS

The key constraints and challenges for the implementation of water allocation mechanisms have been identified based on information from the assessment of the RBMPs and other literature (scientific publications, grey literature, e.g. OECD, 2015; GWP, 2019). The constraints and challenges have been grouped into four themes for the purpose of this report, taking into account issues that can contribute to (or hinder) the achievement of WFD objectives and of sustainable and climate resilient water management. The four themes are:

- Establishing a supportive legal and policy framework;
- Matching allocations to the allocable pool
- Facilitating reallocation amongst users
- Ensuring compliance with allocations

These four themes are elaborated in more detail in a number of specific implementation challenges in the following sections. The list of specific challenges was discussed with the Ad-hoc Task Group on water scarcity & droughts at its autumn 2022 meeting and adapted based on feedback received from the ATG members.

The challenges are considered to be broadly applicable to the whole of the EU, and therefore more or less relevant to the individual Member States.

## 5.1. Establishing a supportive legal and policy framework

**Decision-making regarding how to allocate water may not involve all relevant stakeholders** including authorities, consumptive and non-consumptive users (e.g., urban water supply, energy, agriculture, navigation, tourism, fisheries) and other stakeholders (e.g., anglers, environmental NGOs). In Europe, River Basin Management Planning under the WFD brings many actors active on water management together, making these arenas particularly relevant for allocation decision-making. However, some users may not have previously been closely associated with water allocation decisions or their interests may not have been well represented in the decision-making process. Challenges also arise when **considering allocation priorities at multiple governance levels** (e.g., international, transboundary, national, river basin, catchment).

Allocation regimes are characterized by **historical water usage, reflecting past societal priorities and institutional trajectories**. Furthermore, they were based on historical conditions which have either changed over time due to climate and land use changes, or were poorly understood. Therefore, establishing an allocation regime that works for achieving WFD objectives requires modifying historical rights. In particular, water use rights in many EU countries are based on riparian right of access, or were issued according to a first—come, first-served basis (Berbel et al., 2018). For instance, in Austria, public interests and existing water rights must not be interfered by new water rights, placing clear priority on users with older permits.

Furthermore, there may be legal constraints due to the **ownership of water resources**, as some water resources may be private (e.g. some groundwater in ES, PT, SE) or perceived as such (e.g. groundwater in many cases, springwater, harvested rainwater). Other resources are increasingly exploited, such as reused water, desalinated water or recharged groundwater, have unclear or mixed ownership (OECD, 2015).

There may also be constraints linked to **the characteristics of the allocations**, such as the duration of their validity which can be in some cases of several decades (e.g. hydropower concessions) or even without time limits (OECD, 2015). Allocations that are valid for longer durations provide security to users, and support investments. However, long duration permits and the difficulty of revising them means that in several countries ecological flow requirements may not yet be reflected in permits (e.g. ES, IE, SE).

## 5.2. Matching allocations to the allocable pool

To be environmentally effective, allocations must be based on sound **water balances** taking into account water needed to sustain **ecological flows,** and reflecting requirements of the instream ecology as well as other interdependent ecosystems (e.g. wetland, peatlands, re-naturalized areas, biodiversity refuge hotspots, artificial wetlands, etc.). The theory then calls for agreeing on a sustainable abstraction cap and matching total allocations to the **sustainable abstraction cap** (OECD, 2015). Where pre-existing allocations **surpasses** the estimated sustainable abstraction cap, individual allocations may need to be ramped down so as to reach the environmental objectives of water bodies and preserve groundwater dependent ecosystems.

However, defining the abstraction cap is fraught with scientific, technical, political and social difficulties – as examined in the reports on water balances and eflows. Translating a sustainable cap into water allocations adds another layer of complexity, as not only the quantity of water benefiting consumptive and non-consumptive users must be considered but also their timing. In other words, allocations must ensure that the **cumulative use of water is coherent with water balances** at different time steps (instantaneous flow, monthly, annual, inter-annual average). In groundwater systems with low annual variability, regulating use through long term averages may be efficient. In some cases, simply matching the total sum of allocations with the long-term average water resources will lead to sub-optimal economic outcomes, as allocations may not be fully exploited at the same time. This is particularly relevant in dynamic systems such as rivers with low water storage.

Allocation systems must also account for change in the allocable pool. Where Member States have estimated an abstraction cap, this was done on the basis of historical data. However, in the context of **climate change**, these estimations are no longer valid. Water allocation regimes must plan for increasing scarcity and variability in precipitation patterns, including extreme droughts and floods.

Current permitting regimes in Europe establish individual water allocations in a variety of ways. For uses abstracting, diverting and consuming water (such as urban water supply, irrigation, thermal power stations and industrial units), allocations tend to be expressed as a maximum instantaneous flow that can be abstracted (and eventually must be discharged) and/or a maximum annual volume, sometimes sub-divided into seasonal, monthly, weekly or daily timesteps. Innovative allocation rules may also be designed (Rouillard et al., 2020). To account for the needs of non-consumptive uses such as hydropower, navigation, recreation activities, targets may be set as river flows or levels, or lake/reservoir level. One main disadvantage of expressing allocations in river flows and volumes is that they do not communicate well how **hydrological variability affect the allocation**. For instance, cases now exist, such as in Australia, where allocations are expressed as a share of available resource (GWP, 2019). This reinforces the understanding that the allocation is not an absolute use right but is ultimately dependent on the availability of the resource.

In addition, most current permitting systems in the EU issue all permits with the same level of priority. A permit in itself does not communicate well **the level of water security** it offers to a user (GWP, 2019). However, users are inter-dependent, and use of water by one user will increasingly impact the security fo supply of another where water resources are increasingly exploited. This has led to escalated conflicts during droughts, amplifying the adverse environmental, societal, and economic effects. Many Member States have now a prioritization scheme for water use during drought conditions to clarify the order in which use restrictions will apply.

Within a single catchment area, water abstraction commonly takes place from different sources, such as rivers, lakes, reservoirs, groundwater, reclaimed water, desalinated water, etc. Allocation frameworks frequently treat these sources in isolation, although they are closely **interconnected** through e.g. return flows in the form of wastewater discharge or non-consumed irrigation water returning into surface water and groundwater bodies through soil infiltration. To address these issues, there's a need for allocation reforms that incorporate **responsibilities related to return flows** and discharges, encompassing factors like temperature and water quality. Alternatively, a shift could be made toward defining the net amount of water available for **consumption**, rather than focusing solely on the gross amount abstracted. A more ambitious approach involves the 'conjunctive use' of surface water and groundwater within the same basin, though reshaping existing abstraction patterns **to optimize the utilization of diverse water resources** encounters notable technical and legal obstacles (OECD, 2015; GWO, 2019).

## 5.3. Facilitating reallocation between uses

Reducing or removing one's allocation can have economic impacts, such as reduced economic activity, production and trade, as well as social impact on employment and livelihoods. A major challenge is therefore **how to better understand the environmental and socioeconomic value of water and water user requirements**, and **manage trade-offs between competing users**. Mechanisms are needed to facilitate water reallocation, including ways to do so in *fair, just and economically efficient ways*. In this space, one first challenge is to appropriately understand the value of water for society and individual interests, and adequately model the impact and trade-offs of different reallocation scenarios between water uses, including the broader social costs and benefits of allocations.

Authorities may lack the adequate **decision-support tools, knowledge, information and data** to assess the impact of different allocation scenarios on the river basin and catchment water balances, as well as the reaching of e-flows and good status of individual water bodies.

There are also questions regarding the **appropriate mechanisms to facilitate the transfer of allocations**. Various forms of (re)allocations are currently present within the European Union:

- In most instances, these allocations are primarily orchestrated centrally by public administrations through permitting regimes.

- Several countries, such as France, Portugal, Italy and Spain, have also community of users, water user associations or community groups involved in allocating water.

- Water pricing and the total cost of using water may play a role as it influences its usage.

- Another approach seen in Spain involves the utilization of various mechanisms to encourage the transfer of water use rights through temporary agreements, exchange of right centers and occasionally the public acquisition of water use rights.

Each of these strategies comes with distinct challenges. Decisions made centrally can be impacted by political factors, potentially resulting in outcomes that are suboptimal or inequitable (CIS, 2006). The implementation of stakeholder or user-oriented (re)allocations can prove to be intricate, particularly when diverse interests are at odds, and dominant water users have the potential to steer the process (CIS, 2006). Similarly, (re)allocations driven by pricing and market mechanisms can also yield imbalanced outcomes, potentially marginalizing more vulnerable water users.

There are also questions regarding the **mechanisms to mitigate the immediate negative impact of reallocating water,** for instance grants and subsidies to support investments in more water efficient technologies in return of a reduction in the allocation. In other cases, countries aim to **incentivize more sustainable water use in the long term**. This may be supported by incorporating water efficiency targets in allocations, or adjusting abstraction charges to reflect the impact of the abstraction on resource availability for other users and the environment, thereby encouraging an efficient use of water (OECD, 2015). Removing water use rights to some sectors may require compensation to users. In Finland for instance, changes in hydropower permits for increasing in ecological flows may need to be compensated to the permit holder. In contract, in France, water use rights can be modified without compensation (Rouillard et al., 2020).

More broadly, water allocation cannot operate in isolation and **coordination may be needed between water allocations and strategies influencing the development of urban areas and economic sectors**. Public policies such as urban planning and the Common Agriculture Policy play an important role in supporting greater coordination and integration (Rouillard et al., 2022).

### 5.4. Ensuring compliance with allocations

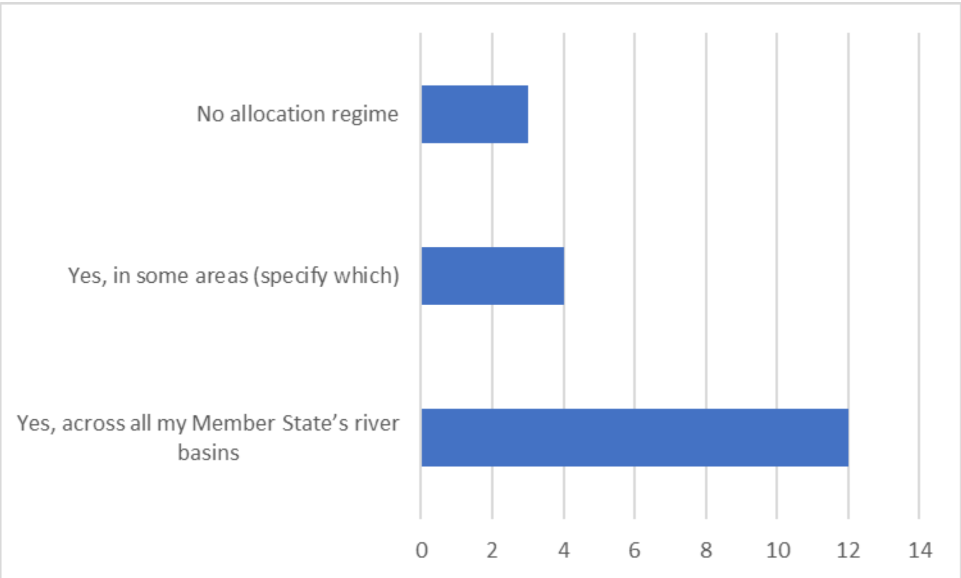
Many Member States have faced challenges in implementing appropriate compliance mechanisms on water allocations, in particular compliance to permit conditions. There are challenges with regards to **registering and metering abstraction points**, especially in real-time, to improve the speed at which illegal water use is identified (Schmidt et al., 2020). As a result, reporting of infringement is not identified on time or even not recorded at all. The potential for technologies to improve compliance monitoring (e.g. through ICT and satellite technologies) is not yet tapped fully into. Furthermore, **penalties for non-compliance** are often limited in scope and are not discouraging non-compliance (i.e., benefit of transgression higher than penalty).

## 6. Measures to Implement Water Allocation Mechanisms in the MS

In the water allocation implementation questionnaire circulated to ATG WSD members in 2022, Member States were asked whether a water allocation regime was in place and at what level (Figure below). Most Member States have a water allocation regime across the whole Member State's river basins, though in some countries the practice is limited only to some areas/regions. Water allocation are:

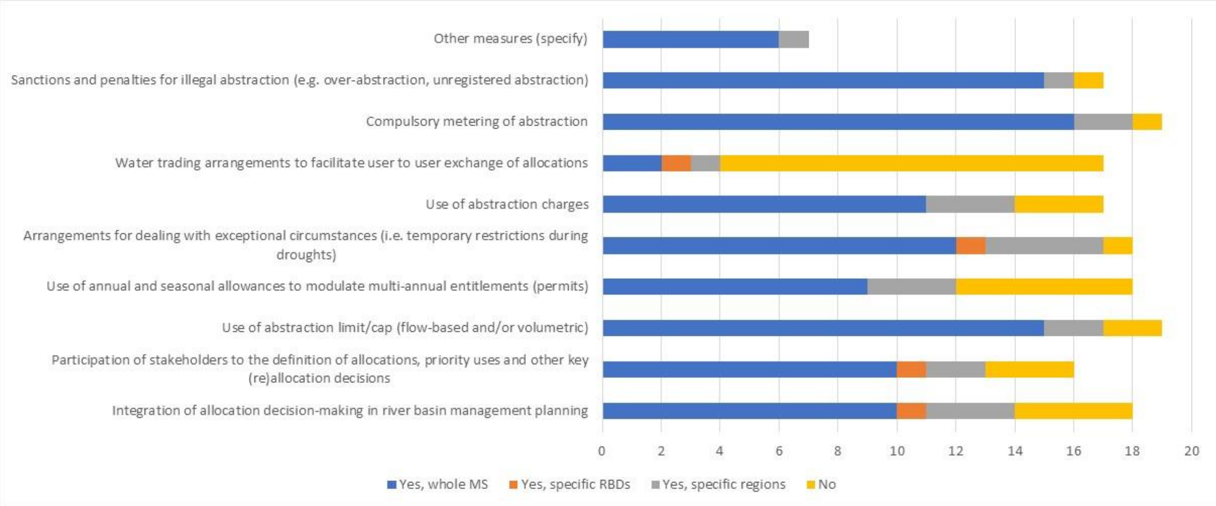
- Developed in the whole Member State: AT, CY, CZ, DK, ES, FI, IT, LT, LU, NL, PT, SK
- Developed in some areas: BE-FL, DE, HU, SE
- No allocation regime (but have a permitting regime in place): IE, MT, PL

Some countries report having a permitting regime controlling water abstraction that's designed only for large or specific users (e.g. LT, LU). It is important to note that some countries assimilate permitting regimes with allocation regimes, while others differentiate the two systems. For instance, BE-WL has a permitting regime for water abstraction and implements restrictions to abstraction during droughts, but also notes that it does not have a water allocation system to the same extent as can be seen in Southern Europe where annual and seasonal allocations modulate allowances authorised through permits depending on hydrological conditions.



In the questionnaire, Member States were also asked to indicate the specific measures which they use to implement water allocation mechanisms, and to indicate at what scale they do so (whole MS, specific regions, other) (Figure below). Overall:

- A majority of Member States report implementing the various instruments at MS level or for specific regions, except for the use of water trading arrangements which is reported only in four MS
- The most frequently reported instrument is the use of compulsory metering and of abstraction limit/cap (flow based and/or volumetric) as well as sanctions and penalties for illegal abstraction
- The use of annual and seasonal allowances to modulate multi-annual entitlements (permits) is implemented in nine Member States at MS level and an additional three MS in specific regions
- The use of arrangements for dealing with exceptional circumstances (e.g. drought restrictions and water use prioritisation) is also frequently reported at whole MS level, yet more MS implement them in specific regions and river basins
- Participation of stakeholders is organised at national level in the majority of responding MS, although four MS also indicate participation only in specific RBS and regions. It is unclear from the responses if the participation of all relevant stakeholders occur, including consumptive and non consumptive users.




| Specific measure | Yes, whole MS | Yes, specific RBDs | Yes, specific regions | No |
|---|---|---|---|---|
| Integration of allocation decision-making in river basin management planning | AT, CY, CZ, DK, ES, HU, IT, NL, PT, SK | LU | BE-FL, SE, DE (local site) | DE, IE, LT, MT |
| Participation of stakeholders to the definition of allocations, priority uses and other key (re)allocation decisions | AT, CY, CZ, DK, ES, IT, LT, NL, PT, SK | HU (some catchments) | BE-FL, LU | IE, MT, SE |
| Use of abstraction limit/cap (flow-based and/or volumetric) | AT, CY, CZ, DE, DK, ES, FI, HU, IT, LT, LU, NL, PT, SE, SK | | BE-FL, HU | IE, MT |
| Use of annual and seasonal allowances to modulate multi-annual entitlements (permits) | CY, CZ, ES, HU, IT, NL, PL, PT, SE | | AT, BE-FL, SK | IE, DK, LT, LU, MT, DE |
| Arrangements for dealing with exceptional circumstances (i.e. | IE, CY, CZ, DK, ES, IT, LT, LU, NL, PL, PT, SE | HU (some catchments) | AT; BE-FL, SK, DE | MT |

| Specific measure | Yes, whole MS | Yes, specific RBDs | Yes, specific regions | No |
|---|---|---|---|---|
| temporary restrictions during droughts) | | | | |
| Use of abstraction charges | CY, CZ, DK, ES, HU, IT, LT, LU, PT, SE, SK | | BE-FL, NL, DE | AT, IE, MT |
| Water trading arrangements to facilitate user to user exchange of allocations | ES, PT | IT | NL | AT, BE-FL, CY, CZ, DE, DK, IE, LT, LU, HU, MT, SE, SK |
| Compulsory metering of abstraction | AT, CY, CZ, DK, ES, FI, HU, IT, LT, LU, MT, NL(groundwater only) , PL, PT, SE, SK | | BE-FL, DE | IE |
| Sanctions and penalties for illegal abstraction (e.g. over-abstraction, unregistered abstraction) | AT, CY, CZ, DE, DK, ES, HU, IT, LT, LU, MT, NL (rarely) , PL, SE, SK | | BE-FL | IE |
| Other measures (specify) | CY, DK, ES, LU, PT, SE | | BE-FL | |

Based on the additional information provided by MS, the following observations can be made:

- The integration of WFD objectives and decisions over allocations usually occur via the permitting system. This includes an assessment of environmental restrictions and its impact on water bodies and other water uses (e.g. ES, PT, SE). Some Member States specify that river basin management plans include an overview of water demand from permits and entitlements (e.g. ES, HU).

- Stakeholder participation occur at different points, for instance during the preparation of RBMPs and the priorisation of water uses (e.g. ES), annually when prioritising allocations based on the year's hydrological conditions (e.g. in agricultural user associations in FR), before issuing a permit (e.g. CZ, DK, FI, IT) and during droughts in drought management groups.

- Member States report different types of caps, at the level of individual permits (e.g. CY, SE for some permits) and collectively at resource level (e.g. ES). Some limitations are set annually (e.g. SE), seasonally (e.g. PT) or monthly (e.g. CZ). In some cases, conditions can differ in surface water and groundwater (e.g. CY where surface water in Governmental Water Works is allocated annually while groundwater is long term)

- Most Member States report time-limited permits, although the timespan can range from a few years up to 50+ years. Some Member States report having set in place legal tools allowing the revisions of permits based on e.g. changes in water availability or new knowledge without compensation to users, giving more flexibility to state authorities in adapting permits (e.g. IT, PT).

- Most Member States only have curtailment according to drought emergency procedures (e.g. FI, DK, SE). Some Member States establish an additional process modulating each year the volumes and timing set in permits, season or even monthly, according to various criteria including the year's forecasted water availability (e.g. CY, ES, PT).

- Four MS report using trading arrangements. However, from the responses, only ES appear to use monetary exchanges. IT specifies allowing exchange of allocations from different use types (e.g. hydropower production to irrigation); Portugal reports using user associations to support exchange of allocations; in The Netherlands, water treaties between Rijkswaterstaat (manager of large rivers and lakes) and regional water authorities (manager of regional waters) negotiate and agree upon water allocation.

- Compulsory metering is common but not systematic. Sometimes it only concerns abstraction above a specific threshold (e.g. 1000m$^3$ in CZ per year or 100m$^3$ per month from 2022 onwards; in PT, 5m$^3$ per day; only large abstraction in Finland).

## 7. Towards Good Practice to Address Challenges in Implementing Water Allocation Mechanisms

### 7.1. What could good practice look like for each implementation challenge?

In order to be able to actively promote the exchange on challenges and good practice in the implementation of water allocation, a detailed set of challenges and corresponding good practices was prepared. For each of the 20 detailed challenges, 24 good practice options have been defined, including a justification, as shown in the below table. They were identified and defined based on the review of key publications in the field of water allocation (see reference list at the end of this report).

The proposed good practice options should be seen as a starting point to be further elaborated and improved as the collection of good practice on the implementation of water allocation mechanisms in Member States builds up in the CIS process.

**Table 1 Challenges and good practice options for the implementation of water allocation**

| | Design/implementation dimension | Challenge | Good practice options | Justification |
|---|---|---|---|---|
| A1 | Establishing a supportive legal and policy framework | Allocation decisions do not include all relevant stakeholders | Participation of all relevant (users and) stakeholders occurs (including drinking water, civil security, agriculture, hydropower, navigation, fisheries and anglers, recreation, environmental NGOs, etc) | To ensure allocations reflect societal priorities and user needs |
| A2 | Establishing a supportive legal and policy framework | Decisions on allocation do not match hydrological units | Decisions over allocations are primarily set for WFD hydrologically relevant units (river basin, catchments, aquifers, including considering transboundary requirements), but they integrate priorities eventually set at higher and lower levels | To ensure allocations are based on units relevant for river basin management planning under the WFD |
| A3 | Establishing a supportive legal and policy framework | Ownership of water (public, private, commonly owned) and authority over access and use of water is unclear, leading to delay and blockage over changes in allocations | Ownership of water and authority over access and use of water resources is clear, including the scope to which an authority can change existing water use rights and allocations | To increase the capacity of institutions and authorities to design effective reallocation strategies |
| A4 | Establishing a supportive legal and policy framework | Allocations are based on historical rights | Allocations are issued for limited timespan | To phase out existing prior-appropriation systems and senior water rights based on "first come, first served", and open opportunities to new users and uses |
| A5 | Establishing a supportive legal and policy framework | Allocations reflect past societal priorities and institutional trajectories | Reviews of allocations are carried out regularly, taking into account water availability (including latest estimates of climate change impacts), economic analysis of water use and enforcement issues | To provide regular opportunities to adapt allocations to new knowledge and conditions of the river basin, and balance this with users long term management priorities and security of supply |

| | | | | |
|---|---|---|---|---|
| A6 | Establishing a supportive legal and policy framework | Not all users are regulated through allocations | No exemptions to requiring an allocation to use water exist. Where it is not cost-efficient to issue an allocation for all abstractions (i.e. very small individual abstraction points), the estimated abstracted volumes are removed from the allocable resource pool | To ensure all abstractions are equally controlled and that total abstraction remain within sustainable limits |
| A7 | Establishing a supportive legal and policy framework | Allocations are issued for free or for a price that does not reflect the total costs of supplying the water | Allocations are issued with a price that reflects investment, operational, environmental and resources costs of supplying the resource | To provide users with the right 'scarcity' signal, in particular the cost of supplying a specified security of water supply |
| A8 | Matching allocations to the allocable pool | Long term allocations (e.g. permits) are not capped at the level of available resources | Long term allocations (e.g. permits) are capped at the estimated sustainable abstraction limit (based on water balances including eflow requirements, broader environmental flow requirements, and/or flows as agreed under international treaties as well as the impacts of climate change). If not yet achieved, a process for ramping down allocations has been agreed upon | To reduce long term overallocation and reduce the likelihood of competition between uses and between uses and the environment |
| A9 | Matching allocations to the allocable pool | Allocations are issued as volumetric entitlements, which does not indicate how this allocation will change with reduced water availability. | Long term allocations (e.g. entitlements in the form of permits) are modulated by annual or seasonal allocations that take into account the recent and expected hydrological conditions of the river basin or catchment. Alternatively, entitlements are issued with a pre-specified supply guarantee or as shares of the available resource. | To provide users with the right 'scarcity' signal, in particular the degree of water security their allocation provides |
| A10 | Matching allocations to the allocable pool | Allocations do not account for the temporal variability of water resources | Allocations are modulated at any one time to take into account available resources, safeguard the meeting of e-flows (including of minimum flows for different seasons and flood pulses for riverbed definition) and preserve the ecological integrity of other dependent ecosystems | To ensure achievement of required flows and aquifer levels at any time during the year to preserve ecosystem resilience |
| A11 | Matching allocations to the allocable pool | No pre-specified plan exists on allocating scarce resources in the event of a drought, restrictions on water uses | A hierarchy of water uses is established to prioritise environmental needs and essential uses (e.g. civil security) in the event of dry and drought conditions | To reduce the potential for conflict and blockage during crisis, intensifying environmental, social and economic impacts |
| A12 | Matching allocations to the allocable pool | Allocations do not account for the interconnectedness of water resources | Allocations take into account linkages between resource pools (as identified in water balances), in particular between surface water and linked groundwater, as well as changes in return flows and discharge points | To reduce the risk of unintended consequences such as increasing allocations in groundwater impacting surface water bodies |

| | | | | |
|---|---|---|---|---|
| A13 | Matching allocations to the allocable pool | Allocations do not account for the interconnectedness of water resources | Allocations include obligations regarding the return flows and discharges (both in quantity and quality), or integrate an authorised net amount of water consumed (instead of only a gross amount of water that can be abstracted) | To avoid the rebound effect, whereby a reduction in return flows to the environment are not accompanied by a reduction in the permitted abstraction |
| A14 | Matching allocations to the allocable pool | Allocations do not account for the interconnectedness of water resources | Allocations include arrangements to encourage conjunctive management of surface water and groundwater, including artificial recharge or augmentation of groundwater bodies (taking into account water quality requirements) | To optimise the use of surface water and groundwater according to supply and demand, and take advantage of their respective strength in building resilience against climate fluctuations |
| A15 | Matching allocations to the allocable pool | Allocations do not account for the winter flows to maintain good hydromorphological conditions in rivers | Allocations are modulated to safeguard the meeting of e-flows for different seasons including flood pulses for riverbed definition | To ensure achievement of e-flows in different seasons to preserve ecosystem resilience |
| A16 | Facilitating reallocation between uses | There is a lack of understanding on how to reallocate water to minimise trade-offs between water users | Decision-support tools such as models are used to assess the impact of different allocation scenarios water users, reallocation trade-offs and identify social welfare optimal and robust solutions | To reduce trade-offs of reallocation between water users while meeting the environmental obligations under the WFD and building social-ecological resilience |
| A17 | Facilitating reallocation between uses | Reallocation between users is not flexible and decisions are not facilitated by clear mechanisms to all | The reallocation of water is facilitated by a pre-defined mechanism allowing the transfer of the allocation between users. This can be through decisions by public authorities (involving societal and user representatives), user associations, or by means of a trading mechanism which allows the transfer to be associated with a monetary exchange | To support reallocations according to collective priorities, or according to price signals that reallocate water towards higher value uses |
| A18 | Facilitating reallocation between uses | The economic and financial impact of reallocations blocks any transfer of allocation between water users | Mechanisms are used to mitigate the negative impact of reallocating water, such as grants and subsidies to support investments in more water efficient technologies in return of a reduction in the allocation | To reduce opposition to long term reallocation efforts towards more sustainable water uses |
| A19 | Facilitating reallocation between uses | Allocations do not encourage efficient water use | Allocations integrate mechanisms (obligations) that incentivize more efficient use of water of the use associated with the allocation, for instance through water use efficiency targets, or through the use of economic instruments such as abstraction charges | To promote more sustainable water use in the long term |
| A20 | Facilitating reallocation between uses | Sectoral policies do not sufficiently take into | A link is made between priorities set in the allocation regime and other public planning processes and | To prioritise allocations for more sustainable uses and ensure that public policies are coordinated into |

| | | | | |
|---|---|---|---|---|
| | | account water allocation plans and policies | funding (e.g. EAFRD, Recovery Funds) | supporting sustainable water use |
| A21 | Facilitating reallocation between uses | Sectoral policies do not sufficiently take into account water allocation plans and policies | Private investments in sectors and value chains are aligned with allocable water resources/water stress in basin (link with the Taxonomy Regulation and recommendations of technical group of sustainable finance) | To ensure that economic development is coherent with water resources in the given hydrological unit |
| A22 | Compliance checking and enforcement | Timely identification of cases of overabstraction is not systematic | All abstraction points are registered with their coordinates and users are required to monitor and keep a record of abstracted volumes | To tackle illegal abstraction and provide a stronger basis for compliance checking through field visits to users |
| A23 | Compliance checking and enforcement | Timely identification of cases of overabstraction is not systematic | Real-time monitoring of abstraction is implemented, with the use of connected flowmeters, ICT and/or satellite technologies | To tackle illegal abstraction by enhancing regulators capacity to act rapidly on over-abstraction levels |
| A24 | Compliance checking and enforcement | Sanctions are not discouraging (benefit of transgression higher than penalty), and reported cases of non-compliance are not appropriately penalized | Penalties effectively prevent illegal abstraction and provide sufficient funding to remedy environmental damage (link with REFIT agenda and revision of the Liability Directive) | To tackle illegal abstraction by enhancing legal and financial deterrents |

## 7.2. Progress of MS in tackling challenges and developing good practice

For each specific challenge in the implementation of water allocation and good practice option, Member States were asked in a questionnaire to indicate whether they face such implementation challenges or have such good practice in place. This aimed to allow identifying the key challenges that need addressing in this good practice report on implementing water allocation and potential exemplary cases for the good practices.

20 EU Member States responded to the questionnaire. The main findings are presented in the two tables below which provide a summary of the status of implementation, and in particular challenges faced, good practice developed and ambitions for improvement according to the self-assessment of Member States participating actively in the exercise. The responses have not been validated or double-checked with other stakeholders. In addition, the overviews only display the acronyms of those Member States which indicated they can provide good practice examples.

In Table 2, major and operational challenges relevant for five or more MS have been marked in red and those relevant for eight or more MS in bold. Good practices in place (specific areas, whole MS) in eight or more MS are in green.

Table 3 adds information on the EU Member States which have developed good practices and could share such specific examples which are either in progress or in place in some areas or the whole country with interested parties. It also includes the previously mentioned information about how many Member States are planning to address such specific challenge within the next 1-3 years.

Overall, more than six EU Member States have self-assessed having made good progress in the following topics:

- A1 Participation of stakeholders
- A2 Allocations made at hydrological units

- A3 Ownership and authority over water set out clearly
- A4 Time-limited allocations
- A5 Regular reviews of allocations (incl. Climate change)
- A6 No exemptions to e.g. small users
- A9 Annual or seasonal allocations in place and/or issued with pre-specified supply guarantee or as shares of the available resource
- A11 Pre-defined priority of uses in case of drought
- A19 Incentives for more efficient use of water associated with allocations
- A22 Registration of all abstraction and recording of abstracted volumes

However, there are several topics where more than five Member States face challenges:

- A1 Allocation decisions do not include all relevant stakeholders
- A7 Total costs of supplying water not reflected in allocations
- A8 Long term allocations (e.g. permits) are not capped at the level of available resources
- A9 Allocations do not indicate how it will change with reduced water availability
- A10 Allocations do not account for the temporal variability of water resources
- A11 No pre-specified plan exists on allocating scarce resources in the event of a drought
- A12-A14 Allocations do not account for for the interconnectedness of water resources
- A15 Allocations do not account for winter flows
- A16 There is a lack of understanding on how to reallocate water to minimise trade-offs between water users
- A17 Reallocation between users is not flexible
- A19 Allocations do not encourage efficient water use
- A20 Sectoral policies do not sufficiently take into account water allocation plans and policies
- A23 Timely identification of cases of overabstraction is not systematic
- A24 Sanctions are not discouraging and non-compliance not appropriately penalized

Specifically, more than eight Member States reported those topics as challenges:

- A10 Allocations do not account for the temporal variability of water resources
- A15 Allocations do not account for winter flows
- A17 Reallocation between users is not flexible
- A23 Timely identification of cases of overabstraction is not systematic
- A24 Sanctions are not discouraging and non-compliance not appropriately penalized

Member States indicated that progress will occur during the coming 1-3 years most frequently (more than three MS) on the following topics:

- A22-A23 No timely identification of cases of over-abstraction
- A9 Allocations do not indicate how this allocation will change with reduced water availability
- A6 Not all users are regulated through allocations
- A8 Long term allocations (e.g. permits) are not capped at the level of available resources
- A4 Allocations are based on historical rights

**Table 2: Simplified overview on addressing water allocation implementation challenges and developing good practices.** Columns indicate: 1. Not applicable, 2. Major implementation challenges (e.g. institutional, governance, regulation, data) to develop this good practice, 3. In the MS, there are operational implementation challenges (of methodologies, tools, resources, capacity, rules or regulation) to develop this good practice, 4. In the whole MS or some areas, such specific good practice is in the process of being implemented, 5. In some MS areas (e.g. RBDs, regions or pilots), such specific good practice is in place, 6. In the whole MS, such specific good practice is in place

| | | | From challenges.... | | ... To good practice | | | |
|---|---|---|---|---|---|---|---|---|
| | Challenges.... | 1 | 2 | 3 | 4 | 5 | 6 | Good practices |
| | | **Not applicable** | **Major challenges** | **Operational challenges** | **In process** | **In place in some areas** | **In place in whole MS** | |
| A1 | Do not include all relevant stakeholders | 3 | 2 | 3 | 1 | 1 | 9 | Participation of stakeholders |
| A2 | Do not match hydrological units | 3 | | 2 | 2 | 3 | 8 | Allocations made at hydrological units |
| A3 | Ownership of water and authority unclear leading to delay and blockage | 2 | | 1 | 1 | 1 | 14 | Ownership and authority over water set out clearly |
| A4 | Based on historical rights | 4 | 1 | 1 | 3 | 1 | 11 | Time-limited allocations |
| A5 | Reflect past societal priorities and institutional trajectories | 3 | 1 | 1 | 5 | 2 | 6 | Regular reviews of allocations (incl. Climate change) |
| A6 | Not all users regulated | 3 | 2 | 2 | 3 | 3 | 6 | No exemptions to e.g. small users |
| A7 | Total costs of supplying water not reflected in allocations | 4 | 3 | 4 | 1 | 2 | 4 | Full cost pricing of allocations |
| A8 | Not capped at the level of available resources | 3 | 1 | 4 | 4 | 4 | 3 | Allocation cap match abstraction limits (long term) |
| A9 | Does not indicate how this allocation will change with reduced water availability. | 2 | 2 | 4 | 3 | 5 | 3 | Annual or seasonal allocations in place and/or issued with pre-specified supply guarantee or as shares of the available resource |
| A10 | **Do not account for the temporal variability of water resources** | 2 | **3** | **6** | 1 | 3 | 3 | Allocations modulated to safeguard e-flows and preserve the ecological integrity of other dependent ecosystems |
| A11 | No pre-specified plan exists in the event of a drought | 4 | | 6 | | 1 | 8 | Pre-defined priority of uses in case of drought |
| A12 | Do not account for the interconnectedness of water resources | 3 | 1 | 5 | 3 | 2 | 5 | Return flows and surface-groundwater interaction taken into account in allocations |
| A13 | Do not account for the interconnectedness of water resources | 4 | 2 | 3 | 2 | 1 | 4 | Obligations in allocations regarding return flows and/or net consumptive use |
| A14 | Do not account for the interconnectedness of water resources | 3 | 1 | 4 | 2 | 3 | 3 | Conjunctive management of surface and ground water allocations |
| A15 | **Do not account for the winter flows** | 4 | **4** | **5** | 2 | 1 | 3 | Allocations are modulated to safeguard the meeting of e-flows for different seasons including flood pulses for riverbed definition |
| A16 | Lack of understanding on trade-offs between water users | 5 | 2 | 4 | 3 | 3 | 1 | Decision-support tools support allocation decisions |

| | | | From challenges.... | | ... To good practice | | | |
|---|---|---|---|---|---|---|---|---|
| | Challenges.... | 1 | 2 | 3 | 4 | 5 | 6 | Good practices |
| A17 | **Re-allocation not flexible** | 8 | **3** | **5** | | | 2 | Transfer of allocations possible between users (administrative, user based or market) |
| A18 | Impact of reallocations blocks transfer of allocation | 8 | 2 | 2 | 1 | 3 | 2 | Compensation for reallocation associated with support for investment in efficient water used |
| A19 | Do not encourage efficient water use | 4 | 4 | 1 | 2 | 2 | 7 | Incentives for more efficient use of water associated with allocations |
| A20 | Sectoral policies do not sufficiently take into account allocations | 3 | 2 | 3 | 2 | 1 | 4 | Integration of allocations in other public policies |
| A21 | Sectoral policies do not sufficiently take into account allocations | 5 | 2 | 4 | 4 | | 1 | Private investments in sectors and value chains aligned with allocable water resources/water stress |
| A22 | No timely identification of over-abstraction | 2 | 2 | | 7 | 3 | 6 | Registration of all abstraction and recording of abstracted volumes |
| A23 | **No timely identification of over-abstraction** | 4 | **4** | **5** | 2 | 1 | 2 | Real-time monitoring of abstraction |
| A24 | **Sanctions not discouraging and non-compliance not appropriately penalized** | 5 | **3** | **5** | 1 | 1 | 4 | Penalties on illegal abstraction and support remedies |

Note: Challenges relevant for a larger number of MS (>5) have been marked in red and additionally in bold when >8 (left side of table)

Good practices in place in a larger number of MS (>6) have been marked green

.

**Table 3: Simplified overview on improving good practices for water allocation implementation.** Column ACT indicates number of MS aiming to improve this area in the next 1-3 years. Columns indicate: 1. Major and operational challenges relevant for a number of MS (>5) have been marked in red and in bold (>8). Good practices in place (specific areas, whole MS) in a larger number of MS (>8) are in green. Not applicable, 2. Major implementation challenges (e.g. institutional, governance, regulation, data) to develop this good practice, 3. In the MS, there are operational implementation challenges (of methodologies, tools, resources, capacity, rules or regulation) to develop this good practice, 4. In the whole MS or some areas, such specific good practice is in the process of being implemented, 5. In some MS areas (e.g. RBDs, regions or pilots), such specific good practice is in place, 6. In the whole MS, such specific good practice is in place.

| | From Challenges…. | 2 | 3 | ACT | 4 | 5 | 6 | … to good practice |
|---|---|---|---|---|---|---|---|---|
| | | | | | **In process** | **In place in some MS areas** | **In place in the whole MS** | |
| A1 | Do not include all relevant stakeholders | **2** | **3** | | NL | LU | AT, BE-FL, CY, CZ, DK, ES, FI, IT, PT | Participation of stakeholders |
| A2 | Do not match hydrological units | | 2 | | HU, SK | BE-FL, DE, NL | AT, CY, CZ, DK, ES, FI, IT, PT | Allocations made at hydrological units |
| A3 | Ownership of water and authority unclear leading to delay and blockage | | 1 | | HU | PL (The Water Law Act regulates these issues) | AT, BE-FL, CY, CZ, DE, DK, ES, FI, IT, LT, LU, NL, PT, SK | Ownership and authority over water set out clearly |
| A4 | Based on historical rights | 1 | 1 | 3 | BE-FL (surface water), CZ, SK | NL | AT, BE-FL (groundwater), CY, DE, DK, ES, FI (abstraction), HU, IT, LU, PT | Time-limited allocations |
| A5 | Reflect past societal priorities and institutional trajectories | 1 | 1 | 1 | AT, DE, BE-FL, CZ, SK | IT, PT | CY, DK, ES, FI, LU, NL | Regular reviews of allocations (incl. Climate change) |
| A6 | Not all users regulated | 2 | 2 | 4 | BE-FL, LT (from 2024) SK | CY, DK, HU | AT, CZ, ES, IT, LU, PT | No exemptions to e.g. small users |
| A7 | Total costs of supplying water not reflected in allocations | **3** | **4** | 2 | PT | DE, IT | CY, DK, ES, LU | Full cost pricing of allocations |
| A8 | Not capped at the level of available resources | 1 | 4 | 3 | AT, BE-FL, CZ, SK | CY, DE, HU, PT | DK, ES, IT | Allocation cap match abstraction limits (long term) |
| A9 | Does not indicate how this allocation will change with reduced water availability. | **2** | **4** | 5 | BE-FL, IT, LT | AT, CY, DK, HU, PT | ES, FI, NL | Annual or seasonal allocations in place and/or issued with pre-specified supply guarantee or as shares of the available resource |
| A10 | **Do not account for the temporal variability of water resources** | **3** | **6** | 2 | BE-FL | HU, IT, NL | CY, ES, PT | Allocations modulated to safeguard e-flows and preserve the ecological integrity of other dependent ecosystems |
| A11 | No pre-specified plan exists in the event of a drought | | 6 | 1 | | HU | BE-FL, CY, CZ, ES, IT, LU, NL, PT | Pre-defined priority of uses in case of drought |
| A12 | Do not account for the interconnectedness of water resources | 1 | 5 | 1 | CZ, SE, SK | NL, PT | AT, BE-FL, CY, DK, ES | Return flows and surface-groundwater interaction taken into account in allocations |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A13 | Do not account for the interconnectedness of water resources | 2 | 3 | | SE, SK | PT | AT, DE, ES, HU | Obligations in allocations regarding return flows and/or net consumptive use |
| A14 | Do not account for the interconnectedness of water resources | 1 | 4 | 1 | FI, SK | AT, NL, PT | BE-FL, CY, ES | Conjunctive management of surface and ground water allocations |
| A15 | **Do not account for the winter flows** | **4** | **5** | | BE-FL, PT | DK | AT, ES, IT | Allocations are modulated to safeguard the meeting of e-flows for different seasons including flood pulses for riverbed definition |
| A16 | Lack of understanding on trade-offs between water users | 2 | **4** | 1 | BE-FL, CZ, PT | FI, HU, NL | ES | Decision-support tools support allocation decisions |
| A17 | **Re-allocation not flexible** | **3** | **5** | | | | ES, NL | Transfer of allocations possible between users (administrative, user based or market) |
| A18 | Impact of reallocations blocks transfer of allocation | **2** | **2** | | DE | FI, HU, NL | ES, LU, | Compensation for reallocation associated with support for investment in efficient water used |
| A19 | Do not encourage efficient water use | **4** | **1** | 2 | BE-FL (surface water) , NL | DE, HU | BE-FL (groundwater), CY, DK, ES, IT, LU, PT | Incentives for more efficient use of water associated with allocations |
| A20 | Sectoral policies do not sufficiently take into account allocations | 2 | 3 | | CZ, SE | FI | AT, DK, ES, IT | Integration of allocations in other public policies |
| A21 | Sectoral policies do not sufficiently take into account allocations | **2** | **4** | 1 | CZ, FI, IT, SE | | ES | Private investments in sectors and value chains aligned with allocable water resources/water stress |
| A22 | No timely identification of over-abstraction | 2 | | 6 | BE-FL (surface water), CZ, FI, IT, LT (from 2024), LU, NL | CY, DE, PT | AT, BE-FL (groundwater), DK, ES, HU, MT | Registration of all abstraction and recording of abstracted volumes |
| A23 | **No timely identification of over-abstraction** | **4** | **5** | 3 | BE-FL (surface water), IT | LU | ES, MT | Real-time monitoring of abstraction |
| A24 | **Sanctions not discouraging and non-compliance not appropriately penalized** | **3** | **5** | | MT | CY | AT, DK, ES, IT | Penalties on illegal abstraction and support remedies |

Note: Challenges relevant for a larger number of MS (>5) have been marked in red and additionally in bold when >8 (left side of table)

Good practices in place in a larger number of MS (>6) have been marked green

### 7.3. Examples of implemented water allocation mechanisms for priority key challenges

The priority challenges identified in the section above indicate the most urgent needs for accessing good practice of implementation to overcome existing challenges across the EU. Member States with available good practice examples on these priority challenges have been requested to share information on their good practice in this report. Examples on the implementation of water allocation mechanisms have been collected in summer 2023 using a template, including information about the case study location, the implementation time and duration, the objectives and main actions taken, the current situation, lessons learned in the process and contact information for gathering further details.

For the implementation of water allocations, eight examples have been shared and an overview is given in the table below.

| Implementation challenge | Implementation example from MS |
|---|---|
| A2 Decisions on allocation do not match hydrological units | An international treaty for the Meuse between Flanders and the Netherlands regulate discharges between the two countries, including series of incrementally ambitious measures to achieve these discharges. The amount of water used by each of the parties is shared through a *joint information system*. The application also provides insight into the measures taken on both sides of the taken on both sides of the border. The information system is an important stimulus for mutual cooperation. |
| A3 Ownership of water (public, private, commonly owned) and authority over access and use of water is unclear, leading to delay and blockage over changes in allocations | In Portugal, the development of a unique permitting system for water resources uses for the mainland river basin districts with a dynamic interface has improved the efficiency and effectiveness of the permitting regime, and help systematize the water pressure information and maintain it updated. A GIS tool is integrated into the platform which can be used in the technical analysis of requests, allowing a report to be drawn up with all existing environmental restrictions, namely the status of the affected water bodies, water balances, water scarcity index, other licensing water uses, protected areas, constrains established in existing plans. |
| A5 Allocations reflect past societal priorities and institutional trajectories | Many hydropower plants in Sweden are small-scale with very old permits. Many older permits for hydropower lack or have very limited environmental considerations, especially regarding water flows and fish passages. This is a particularly important challenge since small-scale hydropower can have significant environmental impact despite low electricity production. A national plan is implemented to reassess the environmental conditions of permits for hydropower production with the aim of achieving the greatest possible benefit for the aquatic environment while maintaining a nationally efficient access to hydropower-generated electricity. According to the plan, the work on reassessments of permits will commence in 2022 and is expected to continue for a period of 20 years.<br>*Good practice is available in the accompanying report on implementing eflows.* |
| A8 Long term allocations (e.g. permits) are not capped at the level of available resources | Water rights in Spain are allocated through a concessional system, and water allocation is managed throughout the hydrological year (October to September) by the RBAs according to water availability. For planning purposes, hydrological variability and its impacts on water availability is assessed in the River Basin Management Plans (RBMP), based on SIMPA rainfall-runoff model and hydraulic simulation model AQUATOOL, considering limitations or restrictions and the operating rules of the system. These restrictions may be environmental, socio-economic, or geopolitical in nature. It is an institutional approach to water allocation, under public control, but partially open to participation and negotiation with users. |
| A10 Allocations do not account for the temporal variability of water resources | The Government of Cyprus manages several Government Water Projects on surface water to cover the main domestic and irrigation needs all over the island. Various procedures are in place to allocate water from this infrastructure network. In addition, ongoing work focuses on managing groundwater use. |
| A11 No pre-specified plan exists on allocating scarce resources in the event of a drought, restrictions on water uses | In the Netherlands, water managers use a hierarchy of water uses laid down by law to distribute the available freshwater. Water shortage occurs when the demand for water from the various social and ecological needs exceeds the supply of water of a quality suitable for the various needs. The hierarchy indicates the order of social and environmental needs that is taken into account in the distribution of available water. |
| A19 Allocations do not encourage efficient water use | The fee aims to implement the user pays principle in order to promote better use of water contributing to water management costs and also allow the financing of measures defined in the RBMP. The fee integrates six components including one on use of water, which now represents 42% of total revenues. This component is dependent on the volume |

| | |
|---|---|
| | captured or used, as well as a scarcity coefficient applicable in each river basin. |
| A20 Sectoral policies do not sufficiently take into account water allocation plans and policies | The overarching goal of the Delta Program Freshwater in the Netherlands is to ensure that the Netherlands is resilient to water shortages by 2050. Quantified objectives have been developed as well as a list of actions that are being implemented. They address multiple facets of managing water shortages including allocations. |

In addition, a recent publication on transboundary cooperation on water quantity management in the EU (Schmidt et al., 2022) provides more detail on the Dutch-Flamish example regarding the transboundary management of the Meuse River, as well as insight into the management of low flows and navigation.

## 7.4. Additional information on the implementation of water allocation

The textboxes below provide insight into specific dimensions of the permitting and allocation regimes of Member States. The information was provided as notes and comments in the questionnaire on water allocation.

**Insight into the Danish permitting regime**

The permitting regime is determined in the water supply act (Vandforsyningsloven, lbkg. nr. 602 af 10. maj 2022). Apart from the very few cases where a permit is not required all permits are given by the municipalities based on each municipality's water supply plan. In this plan the municipalities must describe how water is to be allocated between the different interest in the municipality. Ownership of water is not an issue as water is a common resource. There are always abstraction limits. A municipality may in some instances recall a permit: 1) from a common water supplier, if the water may be delivered by a different water supplier; 2) decide that an owner of a private well instead should receive water from a common water supplier; 3) recall a permit due to important societal considerations. Long term permits are issued with water abstraction limits per hour or maximum lowering of the water table. A permit may be recalled or changed due to important societal considerations. There are however not modulated annual or seasonal allocations. When a permit expires and a new permit is to be issued the municipality must make a reassessment based on, amongst other things, the water resources, the stakeholders needs, environmental protection and protection of nature. Practically all abstraction requires a permit except: Abstraction for household purposes where water may not be supplied by a common water supplier and watering animals by surface water on landowners property. All abstraction points are registered in the national well database JUPITER. Users are required to annually monitor the abstracted volumes and report it to JUPITER

**Insight into Hungary's multi-level water allocation regime**

The water allocation mechanism is 3-tiered in Hungary. The 1st (upper) level gives framework to the 2nd and the second one to the 3rd level.

1st level: The OVF No. 00698/2000 Amendment of OVF Measure 152/4/93 on the Allocation of the Water Resources of the Danube River Sub-basin (covers the Drava and Balaton Sub-basin as tributaries of Danube). The VKKI-226-0001/2007 Amendment of OVF Measure 00698/1/2000 on the Allocation of Tisa River Sub-basin Water Resources. Both measures establish the framework amount resulting from the low flow water resource sharing agreements stipulated in the international frontier water agreements or, in the absence of an agreement determined by the OVF (General Directorate of Water Management) for the regional water management directorates (WMDs). There are 12 WMDs in Hungary and framework figures give a recommendation for the distribution of water resources between them. It specifies how much water can be abstracted by all users in the sections of that WMD and how much water the WMD should release to the downstream river section/channel. The measures also include e-flow figures for natural rivers. The Measures are regularly amended, taking into account trends in water use and current water infrastructure development plans (climate change or resource depletion not mentioned as reason of modification).

2nd level: Water Management Directorate internal instructions how water infrastructures should operate to ensure allocation mechanism in the territory of the WMD. This operating procedure is concluded in the water permits of the WMD issued by the water authority.

3rd level: water allocation of individual water users: In case of exceptional water scarce periods, the water directorates (responsible for agricultural water supply) use a temporary water allocation system. The agreement among farmers approved by the directorates on the timing of water withdrawals ensures that during a water shortage period, huge water demand does not occur at the same time in order to avoid situations when the water service is threatened.

**Insight into Spain's water use rights and concesion system, including temporary exchange and trading schemes**

Water in Spain is a public property and the right to a private use is obtained by law (rainwater flowing by a property and water from springs and groundwater in a property with a limitation of 7 000 m3/year) or by an administrative concession. Water concessions shall be granted by the water administration on a discretionary basis and in accordance with the provisions of the Hydrological Plans. Under Spanish Regulation, these plans are intended to achieve the WFD environmental objectives but also the meeting of (sustainable) water demands.

Administrative concession does not guarantee the availability of the granted flows (Art. 59.2 TRLA). There are legal mechanisms to adjust supply to availability, both "structurally" (review of concessions, Art. 65 TRLA) and " temporally" (management measures of the DMP, including restrictions, provision of alternative resources, exchange mechanisms). Water concessions may be exchanged between water users under some strict conditions set in the law. Two different situations are considered in Spanish Water Act[1]:

1. Temporary water right exchanges may be formalised by a contract between the holders. Contracts are authorised by the administration. They should be respectful with the condition of from a minor to an equal or higher water use rank.

2. The administration and the Council of Ministers may establish so-called water rights trading centres. They are used to offer a price for the acquisition of rights. This is conditioned to the occurrence of exceptional circumstances such as droughts, the risk of achieving good status of groundwater bodies, the recovery of overexploited aquifers and any other urgent and necessary situation. The River Basin Authorities set the conditions of the trade and act as intermediaries.

**Insight into Malta's water resources and implications for abstractions and allocations**

The small size of the Maltese islands precludes the formation of economically exploitable surface water resources, which can sustain abstractions for domestic, agricultural and commercial purposes. Hence Malta does not have the need for regulating abstractions from surface water resources. Utilization of natural freshwater resources is limited to groundwater resources, groundwater being an important resource for municipal and agricultural activities. In the case of agricultural irrigation, self-abstraction at the point of use prevails and users are required to cover all the capital and operational costs related to the development and eventual use of the abstraction point. Existing groundwater abstraction sources need to be registered with the regulatory authority for resources, and legislation precludes new permits for additional groundwater abstraction stations. Furthermore the natural characteristics of the aquifer systems place a natural limit on groundwater abstractions levels particularly in the perched (high level) aquifer systems which sustain a relatively thin saturated zone over the bounding clay layer. These aquifer systems are predominantly used for agricultural irrigation. Similarly, sea-level aquifer systems are vulnerable to sea-water intrusion and the quality of the abstracted groundwater can only be guaranteed for low abstraction rates. Additionally, due to the depth of these groundwater bodies, abstraction entails high operational costs which also serve as an important enabler for efficient use

**Challenges regarding permit duration in Sweden**

All water abstractions with an impact on water conditions must have permission for the water abstraction according to Swedish environmental legislation. In the permissions, extraction quantities are regulated based on, among other things, the general rules of consideration (chapter 2 in Miljöbalken) and environmental considerations. In newer permissions, there are requirements that the water abstractions are adapted to the surrounding area and take sufficient environmental consideration. However, there are many water abstractions that have old permissions and because they have no time limit, they are still valid. These extraction permissions sometimes lack adequate environmental consideration, which means that they need to be reconsidered. Sweden sees that the methodology and basis for the distribution of water resources can be improved

**Setting up Observatories to improve knowledge on water use in Italy**

The discipline of water abstraction is governed by national state regulations, primarily the Testo Unico (consolidated act) 1775/1933 and the Legislative Decree 152/2006, which includes WFD transposition, and by regional regulations. Indeed, RBMPs are implemented and downscaled at the Regional level through regional water protection plans, which specifies provisions on water abstractions.

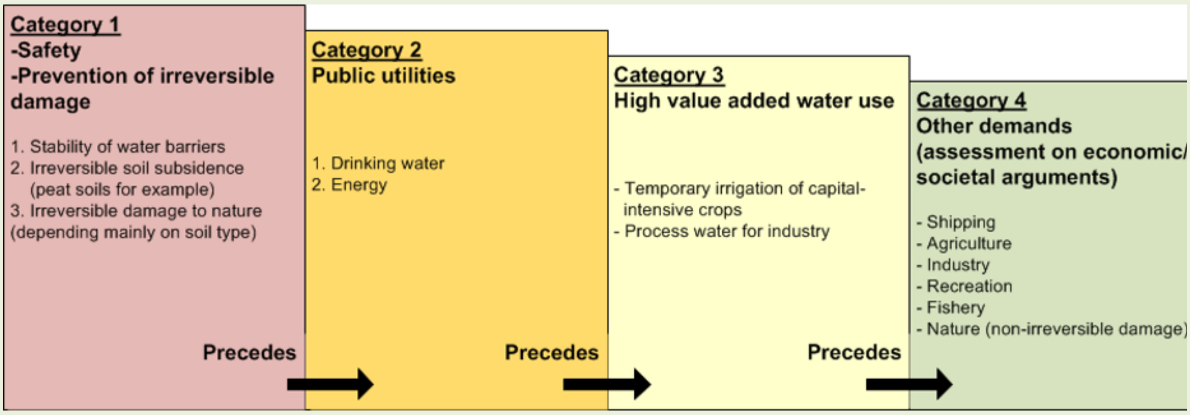
In addition, in 2016, the Permanent RBD Observatories for water uses were established, one for each Italian river basin district (sensu WFD). The Observatories pursue the aim of: i) strengthening cooperation and dialogue between subjects belonging to the water resource governance system within each river basin district, ii) promoting the effective, efficient, fair, and sustainable use of water resources, iii) implementing the proactive management of extreme droughts and water scarcity events, and iv) implementing measures for adaptation to climate change. The Observatories operate as a control room ("cabina di regia") for the management of drought and water scarcity events in case of high or medium level of water severity (see "Procolli d'intesa", acts establishing the Permanent RBD Observatories).

In order to boost the knowledge framework and tools available to support efficient water allocation mechanisms, initiatives are ongoing within the Environment Operational Plan (Piano Operativo Ambiente) to strength water balance plan, by also considering climate change impacts

**Prioritisation of water uses in the Netherlands**

- In normal conditions : Due to the specific situation of the water system in the Netherlands (polders), almost 65% of the surface area can be supplied with water from the rivers. Especially for the Rhine, there is a water distribution issue more than a water allocation issue. Permits (for large abstractions) and water agreements (for intakes to regional waters) have been established for water use from rivers and canals. Permits and levies are also in place for large groundwater abstractions.

- In case of severe water shortages : Water managers use a hierarchy of water uses laid down by law to distribute the available freshwater. Water shortage occurs when the demand for water from the various social and ecological needs exceeds the supply of water of a quality suitable for the various needs. The hierarchy indicates the order of social and environmental needs that is taken into account in the distribution of available water. The hierarchy consists of four categories. The ranking of interests within categories 1 and 2 is established at the national level. Within categories 3 and 4, no ranking has been established at the national level. Within those categories, further ranking can be done by provincial regulation.



**Water use rights and permits in Portugal: conditions of issuance and modifications**

The main objective of the Portuguese Water Law is the sustainable management of water and its protection, which is why, under the principle of precaution and prevention, it is required that activities that have a significant impact on the state of water can only be carried out through a title of use, as stipulated in article 56º of the Water Law. So, any use of water resources, which is not included in article 58º of the Water Law (common use and enjoyment), implies the submission of an application to the licensing entity that will assess the respective impact and which title is most appropriate for its licensing . These titles grant the right to use water resources, for a limited period in the case of using water resources in the public domain, also establishing the necessary conditions for the purpose, namely the maximum volume allocated and the purposes for which it is intended, in the case of water abstractions, as defined in Ordinance No. 1450/2007, of November 12.

Water allocations are assessed considering the best knowledge of the actual water uses, water balances and the right to use it. If we consider the right to access and use water, we can highlight the following:

1. Surface Water in Portugal is mainly from the public domain, and only a small fraction is private (when it is rainwater falling on a property).
2. Groundwater has ownership of the land and is therefore mostly private water, which makes management difficult.
3. Permits for the use of water resources are issued by the Portuguese Environment Agency, I.P., through its Departments of Administration of the Hydrographic Region territorially competent for licensing and inspection of the use of water resources (cfr. article 12 of Decree-Law n. 226-A/2007, of May 31).
4. Permits for the use of water resources can be of three types: authorization, license or concession. **Authorizations** are permits used for water resources which are private, with no associated deadline. **Licenses** are permits used for some uses of public and private water resources. Licenses may have a maximum term of 10 years, which must be fixed, on a case-by-case basis, considering the type of use and the period necessary for the amortization of the associated investments. License includes mentions the rights and obligations. **Concessions** are permits used for public water resources. The concession contract mentions the rights and obligations of the contracting parties - terms, conditions and technical requirements and may have a maximum period of 75 years, which must be fixed, on a case-by-case basis, taking into account the type of use, the nature and size of the investments associated, as well as their economic and environmental relevance.
5. In order to monitor the use and impact on the receiving environment, the licensing entity may require in the respective title that a self-control system and/or adequate monitoring programs be installed, in accordance with article 5 of Decree-Law no. 226-A/2007, of May 31.
6. During the period of validity of the permit, various eventualities may occur, at the initiative of the user or by determination of the licensing entity, which imply changes to the permits issued, such as revision (temporally or until the end of the permit), alteration at the request of the user or revocation by water authority.
7. Permits may be modified at the initiative of the competent authority, even if on a temporary basis, whenever:
    a. There is a change in the circumstances existing on the date of granted the permit and determinants thereof, namely the degradation of the conditions of the water environment;
    b. Substantial and permanent changes occur in the qualitative and quantitative composition of the wastewaters or after treatment, as a result, in particular, of the replacement of raw materials, changes in manufacturing processes or increases in production capacity that justify it, or in case changing the best available technique;
    c. Monitoring or other data indicate that it is not possible to achieve the environmental objectives, as provided for in article 55º of Law nº. 58/2005, of December 29;
    d. It is necessary to adapt it to the territorial management instruments and the applicable hydrographic basin management plans;
    e. There is a drought, natural disaster or other case of force majeure.
8. The competent authority may also modify the permits when it is unequivocal that the respective purposes can be pursued with smaller amounts of water or with more effective techniques for using and preserving the resource and provided that the revision does not involve an excessive cost in relation to the environmental benefit achieved.
9. As define in article 32º of Decree-Law no. 226-A/2007, of May 31, and article 69º. of Law n.º 58/2005, of December 29, the total or partial revocation of permits may occur when any of the following situations occur:
    a. Failure to comply with the requirements and essential elements of the permit;
    b. Failure to install a self-control system or to send self-control data, according to the required periodicity;
    c. Failure to provide or maintain an environmental insurance policy under the terms set by the competent authority;
    d. The invasion of areas of the public domain does not license
    e. Occurrence of natural causes that place at serious risk the safety of people and goods or the environment if use continues
    f. Non-payment of the water resources fee, whenever the delay lasts for more than one semester.

## 8. Concluding remarks

The compilation of examples of water allocation implementation has, however, also shown:

- The overall difficulty of sharing success stories and progress results, as often the process of implementing good practices has just started, is still in place or not ready for sharing with other water managers, experts and the public.
- Whilst some examples illustrate comprehensive addressing of the good practice options outlined previously, not all examples address all specific and relevant aspects.
- Some of the practices shared have been in place for several decades. For those MS addressing such topics newly and with time pressure, the shared examples might be of limited added value. A few practices illustrate action taken as a consequence of the recent droughts in Europe.
- There are few or a lack of examples on several challenges of priority to MS, e.g. A17 on managing reallocations between water uses, A15 on how to integrate winter flows in allocation decisions, A23 & A24 on how to identify cases of overabstraction and implement sanctions on illegal abstraction.
- In addition to these challenges, more examples would be needed on how to address other challenges MS indicated will work upon in the coming years, e.g. A8 on how to cap allocations on water resource availability, A9 on how allocation changes with reduced water availability, A6 on how to regulate all users through allocations and A4 on how to manage historical water use rights.

## 9. References and further reading


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

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

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

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

EC (2011). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Roadmap to a Resource Efficient Europe.

EC (2012). Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. Report on the review of the European water scarcity and droughts policy.

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

GWP (Global Water Partnership) (2019). Sharing water: The role of robust water-sharing arrangements in integrated water resources management. Perspectives paper.

Molle, F., & Closas, A. (2020). Groundwater licensing and its challenges. Hydrogeology Journal, 28(6), 1961-1974.

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

OECD (2017), Groundwater Allocation: Managing Growing Pressures on Quantity and Quality, OECD Studies on Water, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264281554-en

Rey D., Pérez-Blanco C. D., Escriva-Bou A., Girard C. and Veldkamp T. I. (2019). Role of economic instruments in water allocation reform: lessons from Europe. International Journal of Water Resources Development, 35(2), 206–239.

Rouillard, J., Babbitt, C., Challies, E., Rinaudo, JD. (2022). Water resources allocation and agriculture – Transitioning from open to regulated access. IWA Publishing, 300pp. ISBN: 9781789062786 (eBook)

Schmidt, G., De Stefano, L., Bea, M., Carmody, E., van Dyk, G., Fernandez-Lop, A., Fuentelsaz, F., Hatcher, C., Hernandez, E., O'Donnell, E., Rouillard, J.J. (2020). How to tackle illegal water abstractions? Taking stock of experience and lessons learned. Fundacion Botin. https://www.fundacionbotin.org/89dguuytdfr276ed_uploads/Observatorio%20Tendencias/How%20to...ok_enlaces.pdf

Schmidt, G.; T. Geidel, E. Kampa & J. Cools (2022): Transboundary cooperation in European water quantity management.

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

Taylor P. (2002). Some principles for development and implementation of water-allocation schemes. ACIAR PROCEEDINGS, pp. 62–74. ACIAR; 1998

UNECE (2021) Handbook on water allocation in a transboundary context

# 10. ANNEX

## 10.1. Water allocation in Spain for water planning

### 10.1.1. General information

| | |
|---|---|
| Member State(s) | Spain |
| RBD(s) | Inter-community river basin districts (ES010 - Minho-Sil, ES017 - Eastern Cantabrian, ES018 - Western Cantabrian, ES020 - Douro, ES030 - Tagus, ES040 - Guadiana, ES050 - Guadalquivir, ES070 - Segura, ES080 - Jucar, ES091 - Ebro) |
| Location | Inter-community river basin districts (listed above) |
| Time period (start - end) | Legal framework starting in 19th century |
| Good practice example promoter | Directorate General for Water (DGA) - River Basin Authorities (RBAs) |

### 10.1.2. Challenge(s) faced

Code of the challenge(s):

- A8: Long term allocations (e.g., permits) are not capped at the level of available resources.

If water allocation policies or regulations do not adequately account for the natural availability of water, their seasonal and interannual variations, and the interrelationships between the various components of the hydrological cycle, it can lead to overuse of water resources.

Economic activities become unsustainable in the long term and severe ecological consequences may arise, such as reduced streamflow, damage to aquatic habitats, and impacts on biodiversity. Thus, overallocation result in water scarcity and conflicts among users, including agricultural, industrial, and domestic sectors.

### 10.1.3. Good practice(s) developed

Code of the good practice(s):

- A8: Long term allocations (e.g., permits) are capped at the estimated sustainable abstraction limit (based on water balances including e-flow requirements, broader environmental flow requirements, or flows as agreed under international treaties as well as the impacts of climate change). If not yet achieved, a process for ramping down allocations has been agreed upon.

**Table 2 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| | Regulatory[1] | Water Acts: 1866, 1879, 1985, 2001 (in force).<br>Regulation of the Public Hydraulic Domain (RDPH).<br>Hydrological Planning Regulation (RPH).<br>Hydrological Planning Instruction (IPH).<br>Regulatory documents of the RBMPs. |
| | Technical | Water accounting through modelling and water metering. |
| | Economic | Most of the tasks involved are the common tasks of RBAs: RBMP drafting (including compilation of datasets and modeling for water allocation purposes), metering and registration, control, monitoring and |

[1] Detailed references and weblinks in section **Error! Reference source not found.**.

| | Type of actions | Characteristics |
|---|---|---|
| | | enforcement. PERTE aims to mobilize financial resources for the improvement and water registers and the digitalization of the water cycle.<br><br>In special circumstances, the exchange of water rights can be activated, involving public price offers or monetary transactions between users. |
| | Research | Relevant research is limited to efforts to improve knowledge and understanding of the hydrological cycle, water resources and how to optimize the use of hydraulic systems. |
| | Governance | A strict application of the law, based on the provisions of the RBMP, is required for the practical implementation of the Spanish concession system. In situations of overexploitation, it is advisable to seek consensus with users and social agents, but also to take measures to reverse the problems. |
| | Others | |

Description of the good practice:

Water rights in Spain are allocated through a concessional system, and water allocation is managed throughout the hydrological year (October to September) by the RBAs according to water availability. According to Spanish Water Act, a rational joint exploitation of surface and groundwater resources should be arranged, without the concession title guaranteeing the availability of the flows granted. For planning purposes, hydrological variability and its impacts on water availability is assessed in the River Basin Management Plans (RBMP), based on SIMPA rainfall-runoff model[2] and hydraulic simulation model AQUATOOL[3], considering limitations or restrictions and the operating rules of the system. These restrictions may be environmental, socio-economic, or geopolitical in nature: prioritisation of uses, e-flows, scarcity scenarios, extraordinary droughts, overexploitation of aquifers, international treaties. It is an institutional approach to water allocation, under public control, but partially open to participation and negotiation with users, based on technical criteria and supported by RBMP water balances (current and future scenarios).

Reasons for initiating action(s) / Selection of the action(s):

Traditionally, Spain had a dual model of water rights, formulated in the 19th century (Water Acts of 1866 and 1879): on the one hand, surface water was public and governed by a concessionary regime; on the other hand, groundwater has historically been considered a private resource and remained outside public control for a long time, although 1985 Water Act extended eligibility for the concession regime to groundwaters.

In practice, these concessions establish the annual maximum volume of water that each user can receive, but the final allocation of water is always decided by the River Basin Authorities (RBA) – through RBM planning instruments or through negotiation with users (Sanchis-Ibor et al 2022). Thus, the fundamental difference between allocation and concession is (MIMAM, 2000):

- The concession grants the right to the use of the water. It is completely individualized in character (user or community of users) and has detailed conditions and procedures to be granted.
- Allocation does not by itself confer the right to use water. It has a more general character (may comprise several concessions), and do not have a formally regulated procedure beyond their mandatory establishment in RBMPs.

Description of the action(s): Regulatory / Technical & Governance):

In 1999, the Water Act was reformed without altering its legal essence or main articles. The reform sought to address some shortcomings and provide the highest level of protection for water as an environmental asset. Furthermore, a certain degree of flexibility was introduced by enabling mechanisms for temporary transfer of water rights. This law was revised in 2000 by Royal Legislative

---

2 https://www.miteco.gob.es/es/agua/temas/evaluacion-de-los-recursos-hidricos/evaluacion-recursos-hidricos-regimen-natural/

3 https://aquatool.webs.upv.es/aqt/

Decree 1/2001 of 20 July 2001 (TRLA) in force to this day. According to TRLA (section 6), RBAs are required to maintain a Water Register to keep a record of water concessions and any authorised changes to their ownership or characteristics.

However, the Water Register alone cannot be used for planning, as there are still uncertainties regarding its updating, completeness, or errors. In fact, the improvement of the water register is one of the tasks in which the RBAs are more actively involved, but it is not yet sufficiently reliable. It is therefore supplemented by a variety of sources to obtain the most accurate picture possible of water use and demand for allocation purposes, including:

- The history of water use and demand in successive planning exercises, starting with the 1998 RBMPs.
- Information known from the actual functioning of the user committees.
- The consolidated data that can be extracted from the water registers.
- Data from quantitative monitoring networks (river flows; inflows, outflows, and storage in reservoirs) where available.
- Known water uses in the process of regularization.
- Projections of water use based on knowledge of drivers. For example, demographic projections, changing cropping and irrigation patterns, evolution of livestock and industrial use, planned efficiency improvements...
- Indirect estimates of water use in irrigation[4] and related to other land uses, usually using remote sensing techniques.
- Any other information on prospects for change or development. For example, arising from agricultural or energy planning.
- The state of water quality and its impact on supply sources.
- The potential evolution of availability, through forecasts of surface regulation, improvements in aquifer management and the use of non-conventional resources.
- Restrictions of any kind, resulting from the implementation of ecological flow regimes or the water needs of lakes and wetlands, or from transboundary agreements.

Water allocations are linked to specific sources: reservoirs, river intakes, groundwater bodies, desalination, or reuse facilities. They are not constant, but variable terms that are adjusted in each planning cycle, not without certain level of uncertainty. For example, they may decrease if available resources are revised downwards (e.g., due to climate change), environmental or legal restrictions increase, or measures are implemented to reduce abstraction. On the other hand, their guarantee can also vary over time, depending on changes in water availability and residual demands in the system.

The Spanish RBMPs must reconcile the satisfaction of socio-economic demands with the needs of ecosystems (environmental flows and water requirements of lakes and wetlands) and thus support the achievement of the environmental objectives of the WFD. These analyses are carried out through the coupled use of rainfall-runoff modelling and hydraulic simulation in both current and future scenarios, accounting for the expected effects of climate change. In this way, the real possibilities of water supply are consolidated in the regulatory documents of RBMPs in terms of the allocation and reservation of water resources to the uses. These analyses are essential to set limits and guide decisions on granting new concessions.

In the case of *surface water bodies*, ecological flows must be considered as a general restriction on use, subject only to the priority of use for the supply of the population if no reasonable alternative is available (art. 59 TRLA, art. 17 RPH).

In the case of *groundwater bodies*, the concept of available resource comes into play, defined in the RPH as the inter-annual average of the total recharge minus the flow required to achieve the ecological quality objectives for the associated surface water and to avoid further deterioration or significant damage to the associated terrestrial ecosystems. DGA 2021a has established a methodology for estimating available resources and assessing quantitative status through four tests

---

[4] The SPIDER-SIAR project uses temporal sequences of satellite imagery to monitor crops and track their water requirements, particularly irrigated crops, across the peninsular Spain. http://maps.spiderwebgis.org/login/?custom=spider-siar

(water balance, associated surface water bodies, dependent ecosystems, salinization risk) which have already been applied in the third cycle RBMPs (Figure 1).

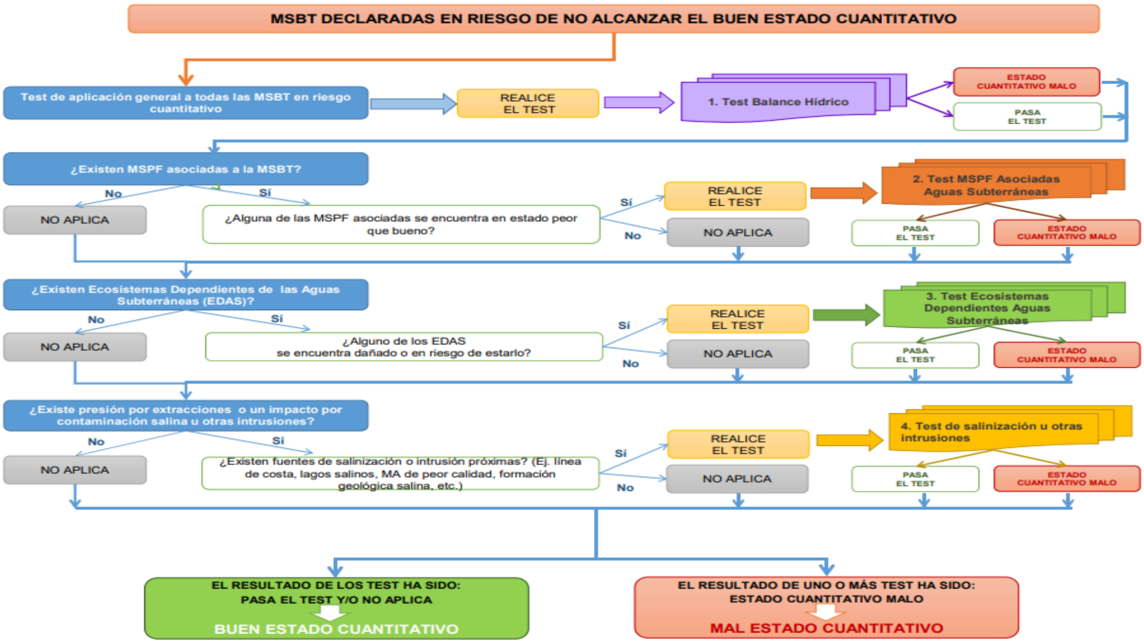



**Figure 1 Outline of the assessment of the quantitative status of groundwater bodies.**

Following the results of the RBMP status assessment, RBAs can declare that a *groundwater body is at risk of not achieving a good quantitative or chemical status*. In this event, the RBA shall constitute a community of users within 6 months and its Governing Board shall approve an action programme for recovery within a maximum period of one year from the date of the declaration. Although these periods have rarely been met, the approval of this action programme and the creation of the community of users have taken place in all the overexploited groundwater bodies.

In the framework of these action plans, concessions and private rights can be reduced to meet sustainable exploitation, blocking all new groundwater abstraction concessions. The action programme may establish the replacement of pre-existing individual intakes with community intakes and transform the individual titles with their inherent rights into a collective one. It may also provide the contribution of external resources and can define protection areas where water usage and other activities are restricted to certain conditions under public surveillance.

<u>Effort of the action(s):</u>

In the three planning cycles completed so far, the preparation of the RBMPs has involved the production of water balances - both at the level of the groundwater body and at the level of the exploitation system - and the subsequent development of regulatory provisions for the allocation and reservation of water in the different planning horizons. Water allocation protocols are the result of extensive work on data processing, hydrological modelling, definition and characterisation of exploitation systems and scenario simulation, updated and revised every six years in line with the RBM planning cycle.

The efforts made by the RBAs to implement the concession regime and ensure that the water allocation is respected in practice are also considerable: monitoring and control of water use, surveillance of the public water domain, drawing up action plans for water bodies at risk and DMPs to determine water supply reductions to overcome droughts, supervision of contracts for the transfer of water rights, and activation of water trading centres.

<u>Result(s) achieved so far:</u>

The allocation and reservation of water resources for 2021, as determined in the 2nd cycle RBMPs, amounts to 30,797.16 hm3/year in the whole of Spain, of which 27,144.89 hm3/year correspond to the inter-community basins (DGA-CEDEX 2019).

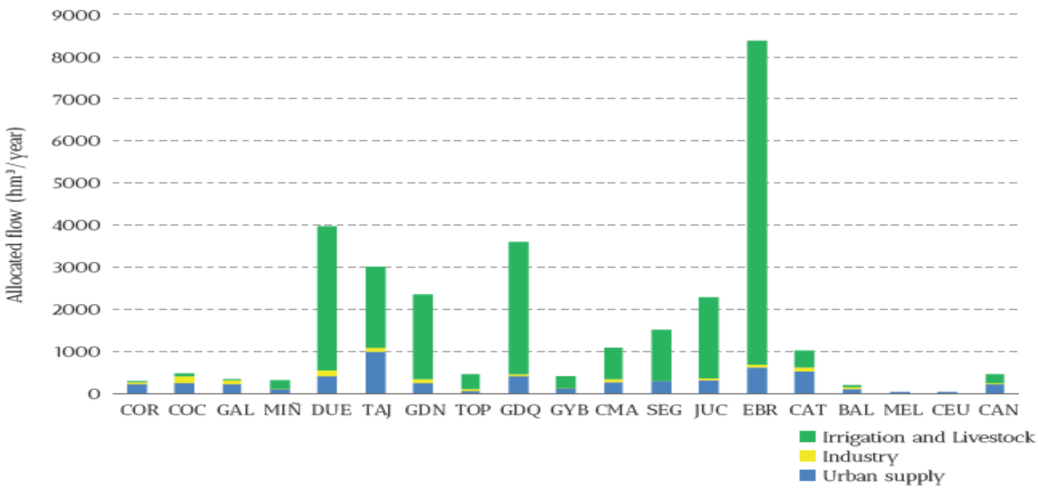



**Figure 2 Flow allocated for 2021 in each RBD.**

Difficulties faced and remaining constraints:

The modelling architecture and information base for assessing and updating water allocations has been developed in previous RBMP cycles. In addition, DMPs have also developed consistent systems of indicators and thresholds to redefine water allocation during droughts. However, there are still important shortcomings in practice for sustainable water allocation:

The overexploitation of water resources is still a major problem in some RBDs. The 2nd cycle RBMPs reported poor groundwater quantitative status in 185 out of 577 Spanish groundwater bodies (32.1%), 108 out of 408 (26.5%) in intercommunity RBDs. Furthermore, 22.9% of surface water bodies with effective monitoring (98 points out of 428) show some non-compliance with the eflows regime (DGA 2021b).

A significant part of private well owners have not yet joined the public concession regime, contributing to uncertainty about the illegal component of groundwater use (WWF, 2020). Whilst the measures already implemented in groundwater bodies at risk of not achieving a good status have been successful in some cases, they have been insufficient in others (Sanchis-Ibor et al., 2022)[5].

Once a practice of overexploitation has been established, its reversal has social and economic repercussions that make it difficult to find a consensual solution with the local and regional stakeholders. It is necessary to activate programmes for the management of land and water use and global intervention in the territory (Junta de Andalucía 2014, MITECO 2022), and to adopt vigorous and difficult measures by the competent administrations, such as the closure of wells[6].

Planned next step(s):

---

5 In the Eastern Mancha, groundwater pumping for agriculture has been efficiently controlled through annual remote sensing campaigns. The water users' association of this aquifer has played a key role, cooperating with the RBA to stabilise the water tables. This has been an example of a collective action successfully imposing common interest over individual short-sighted decisions on groundwater management.
On the other hand, in the Western Mancha, overexploitation began in the mid-1970s when new irrigation systems were introduced under the private regime of groundwater extractions prior to the 1986 Water Law, causing the degradation of the National Park of the Tablas de Daimiel wetland. During the last 30 years, the RBA has launched various programmes with different formulae, but the aquifer levels have not yet recovered, and most of the Tablas de Daimiel wetland currently remains dry.

6 https://www.laverdad.es/murcia/expediento-desalobradoras-ilegales-20230227204630-nt.html

https://www.publico.es/politica/gobierno-clausura-220-pozos-ilegales-donana-preve-cerrar-otros-496-pp-insiste-ley-amplia-regadios.html

https://www.eldiario.es/andalucia/sostenibilidad/diez-anos-cerrar-pozo-ilegal-donana-carrera-obstaculos-evitar-marisma-quede-agua_1_10128769.html

Work is currently underway to establish user communities and develop action programmes to restore water bodies at risk of failing good quantitative status[7]. The aim is to overcome the problems of unsustainability within this planning horizon.

PERTE for digitization of the water cycle has planned to mobilize 3.06 billion euros in public and private investments to promote the use of new information technologies, including support to complete public Water Registers, as well as water metering by users and monitoring by water authorities.

Transferability:

Some elements of the Spanish system are transferable, though not without adaptation to local conditions, in particular the water accounting system and the DMPs to manage water reallocation in situations of temporary scarcity.

The legal framework is the result of a long tradition and responds to Spain's own history. The main lesson learnt is the importance of preventing and avoiding situations of overexploitation, because once they have arisen, they are complex to deal with and involve significant economic, social, and environmental costs.

### 10.1.4. Further information

Websites:

Albufeira Convention website: http://www.cadc-albufeira.eu/es/

Drought Management Plans section on the MITECO website: https://www.miteco.gob.es/es/agua/temas/observatorio-nacional-de-la-sequia/planificacion-gestion-sequias/

Management of water bodies at risk (MITECO): https://www.miteco.gob.es/es/agua/temas/estado-y-calidad-de-las-aguas/aguas-subterraneas/masas-de-agua-declaradas-en-riesgo/Gestion-masas-de-agua-en-riesgo.aspx

PERTE plan for the Digitization of the Water Cycle: https://www.prtr.miteco.gob.es/es/perte/perte-digitalizacion-ciclo-agua.html. Access to information and documents on the Strategic Plan for Economic Recovery and Transformation (PERTE) framed within Spain's Recovery and Resilience Plan.

River Basin Management Plans in force section on the Ministry for Ecological Transition and Demographic Challenge (MITECO): https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/planificacion-hidrologica/planes-cuenca/default.aspx

Water Registry on the MITECO website:https://www.miteco.gob.es/es/agua/temas/concesiones-y-autorizaciones/uso-privativo-del-agua-registro-del-aguas/

Main Regulations:

Royal Legislative Decree 1/2001 of 20 July 2001, approving the revised text of the Water Act. Real Decreto Legislativo 1/2001, de 20 de julio, por el que se aprueba el texto refundido de la Ley de Aguas [TRLA]: https://www.boe.es/eli/es/rdlg/2001/07/20/1/con

Royal Decree 907/2007, of 6 July 2007, approving the Hydrological Planning Regulation. Real Decreto 907/2007, de 6 de julio, por el que se aprueba el Reglamento de la Planificación Hidrológica [RPH]: https://www.boe.es/eli/es/rd/2007/07/06/907/con

Order ARM/2656/2008, of 10 September, approving the hydrological planning instruction. Orden ARM/2656/2008, de 10 de septiembre, por la que se aprueba la instrucción de planificación hidrológica [IPH]: https://www.boe.es/eli/es/o/2008/09/10/arm2656

Regulatory documents of the RBMPs, accessible at:https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/planificacion-hidrologica/PPHH_tercer_ciclo.aspx

Royal Decree 849/1986, of April 11, 1986, approving the Regulations of the Public Hydraulic Domain, which develops the preliminary titles I, IV, V, VI and VII of Law 29/1985, of August 2, 1985, on Water [RDPH]: https://www.boe.es/buscar/doc.php?id=BOE-A-1986-10638

Law 10/2001, of July 5, 2001, of the National Hydrological Plan [NWP]: https://www.boe.es/buscar/doc.php?id=BOE-A-2001-13042

---

[7] See for instance:
https://www.chj.es/es-es/medioambiente/Paginas/Masas-en-riesgo.aspx
https://www.chguadiana.es/servicio-al-ciudadano/comunidades-de-usuarios/mas-en-riesgo

## Other publications/documents:


Directorate-General of Water (DGA) (2021a). Guía para la evaluación del estado de las aguas superficiales y subterráneas: https://www.miteco.gob.es/es/agua/temas/estado-y-calidad-de-las-aguas/guia-para-evaluacion-del-estado-aguas-superficiales-y-subterraneas_tcm30-514230.pdf

Directorate-General of Water (DGA) (2021b). Informe de seguimiento de los planes hidrológicos de cuenca y de los recursos hídricos en España 2020:https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/memoria_infoseg_2020_tcm30-531935.pdf

Directorate-General of Water (DGA) and Centre for Public Works Studies and Experimentation (CEDEX) (2019). Summary of Spanish river basin management plans. Second cycle of the WFD (2015-2021) available at: https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/summary_book_rbmp_2nd_cycle_tcm30-508614.pdf

Junta de Andalucía (2014). Plan Especial de ordenación de las zonas de regadío ubicadas al norte de la corona forestal de Doñana https://www.juntadeandalucia.es/organismos/fomentoarticulaciondelterritorioyvivienda/areas/ordenacion/actuaciones-supramunicipales/paginas/plan-corona-forestal-donana.html

MIMAM (2000) El Libro Blanco del Agua en España. Ministerio de Medio Ambiente. Secretaría de Estado de Aguas y Costas. Dirección General de Obras Hidráulicas y Calidad de las Aguas. Diciembre. Madrid, España. English version available at:https://www.miteco.gob.es/es/agua/temas/planificacion-hidrologica/water-in-spain_tcm30-527170.pdf

MITECO (2022). Marco de Actuaciones Prioritarias para Recuperar el Mar Menor, en particular, las medidas de Ordenación y vigilancia del dominio público hidráulico: https://www.miteco.gob.es/es/ministerio/planes-estrategias/mar-menor/marco-actuaciones-prioritarias/

OECD, 2015. Water Resources Allocation: https://www.oecd.org/spain/Water-Resources-Allocation-Spain.pdf

WWF, 2020. Guía de WWF para verificar el uso legal del agua en agricultura: https://www.wwf.es/?56520/Guia-uso-legal-del-agua-en-agricultura

Sanchis-Ibor, C., et al. (2022). "Water allocation in Spain. Legal framework, instruments and emerging debates", Water Resources Allocation and Agriculture: Transitioning from Open to Regulated Access, Josselin Rouillard, Christina Babbitt, Edward Challies, Jean-Daniel Rinaudo: https://iwaponline.com/ebooks/book/857/chapter/2992977/Water-allocation-in-Spain-Legal-framework


## Contact:


Directorate-General of Water, Secretary of State for the Environment, Ministry for the Ecological Transition and the Demographic Challenge.

Contact email: bzn-sgph@miteco.es.

## 10.2. Water allocation in Cyprus

### 10.2.1. General information

| | |
|---|---|
| Member State(s) | Cyprus |
| RBD(s) | Cyprus RBD (Only one RBD) |
| Location | Area under the effective control of the Republic of Cyprus |
| Time period (start - end) | Since late 80s /early 90s |
| Good practice example promoter | Water Development Department of the Ministry of Agriculture, Rural Development and Environment |

### 10.2.2. Challenge(s) faced

Code of the challenge(s):

- A 10: Allocations are modulated at any one time to take into account available resources, safeguard the meeting of e-flows (including of minimum flows for different seasons and flood pulses for riverbed definition) and preserve the ecological integrity of other dependent ecosystems

Description of the challenge:

One of the long-standing problems of Cyprus is water scarcity. Droughts are very common and many times through the centuries, the island was nearly deserted. The situation has deteriorated in recent decades, as a result of climate change, with frequent and gradually increasing droughts, having a negative impact on development, the environment, agriculture, and public health.

It is noted that domestic use (including tourism) and agriculture are the two most important water consuming sectors, both in terms of significance to the economy and the society and in terms of the costs associated with the provision of the water services.

In view of these challenges, the Government of Cyprus has adopted an integrated approach to water resources management, tackling the water issue in terms of quantity, quality, health, conservation and protection and economics.

In order to cope with annual drought events, the Government applies a Drought Mitigation and Response Plan in all Government Water Works (GWW) on a yearly basis, depending on prevailing climatic conditions. It includes different restrictions to water use and other water demand and supply management measures.

Water from the GWW is allocated to different uses, giving priority to the domestic water sector (including tourism) due to its great importance for the welfare and public health. The remaining quantity is allocated to agriculture using a quota system, in combination with penalty charges for over-consumption. According to the scenarios applied, the available quantity is allocated to farms depending on the crop and area irrigated. Over-consumption is charged at a rate that is a multiple of the usual tariff and in cases of further use, the supply is disconnected. The measure is applied almost every year, with the exemption of some rare years of satisfactory rainfall-inflow to the dams.

### 10.2.3. Good practice(s) developed

Code of the good practice(s):

- B5: Water balances are using reliable datasets, including updated metered data on water abstractions, storage, consumption and return flows by all water uses, especially of those with the largest use, as well as of cumulative minor abstractions (which might not require permitting)

Description of the good practice(s):

In its effort to mitigate the effects of water scarcity and drought, in the late 60's the Government of Cyprus embarked on an ambitious program whereby reservoirs were constructed on almost all major watercourses, in order to tap the surface water flowing to the sea. Many irrigation and domestic water supply schemes were also implemented utilizing mainly the water resources stored in the reservoirs through advanced distribution and irrigation networks. As a result, several Government Water Projects (GWP) were developed to cover the main domestic and irrigation needs all over the island. Eventually, non-conventional water resources were also introduced, both for domestic water supply (desalination) as well as for irrigation (tertiary treated effluent).

On the demand side the installation of improved on farm irrigation systems was encouraged, the construction of modern, efficient conveyance and distribution systems with minor losses was promoted and water charges were imposed both for domestic water supply and for irrigation water.

**Surface Water**

*Water Rationing from GWP*

Despite the costly supply enhancement measures and the demand management measures implemented, the Government of Cyprus has to apply additional short-term measures to cope with water scarcity and drought events. These measures constitute a Drought Mitigation and Response Plan in all GWP, which includes water restrictions to the different uses and it is applied on a yearly basis, depending on the prevailing climatic conditions. That is, water from the GWP is allocated to the different uses, based on a rationing procedure, giving priorities as described below:

*Domestic water*

Water for domestic purposes (treated water from dams + desalinated water) is mainly supplied through GWP, which cover 85% of the country's domestic water needs. It is supplied "in bulk" to the Local Water Authorities (LWA), i.e., Water Boards, Municipalities and Community Councils, which undertake its supply to the individual consumers. Nevertheless, there is a number of communities which have their own water supply sources, mainly groundwater, which they manage themselves.

According to the yearly water rationing plan, priority is given to the vital aspects of health, social life and welfare and therefore the domestic water needs are satisfied by 100 % (households, tourism, industry and livestock).

*Irrigation water*

GWP supply also irrigation water from the dams and from the main tertiary treatment plants (for agricultural production and forage crops, greening areas, industrial use etc) on a "retail basis" through the projects' irrigation schemes.

Within the process of water rationing, every January, the farmers are invited to submit to the Water Development Department (WDD) of the Ministry of Agriculture, Rural Development and Environment, their application for the supply of irrigation water from the GWP, giving information related to the area and the type of the crops they plan to cultivate (permanent, seasonal, greenhouses etc). Based on this information and taking into consideration the annual water demand per crop per area, WDD estimates the water needs per GWP for the coming irrigation period, from January to December.

In spring, when the rainfall period comes to end, the WDD estimates the available total water quantities for the coming period, based on the dam storage at that time and the quantities that can be purchased from desalination plants and from the tertiary treatment of sewage. Considering the above demand and supply conditions, WDD prepares the scenario for the allocation of water to the different uses, for the coming period. The procedure and priorities are as follows:

a. Account for the principle that the estimated domestic water needs have to be satisfied by 100%.
b. A certain amount of water is required to be maintained in the reservoirs, both for environmental as well as for safety reasons (keep storage for the years to come, considering possible droughts).

c. A certain amount is left for recharging the aquifer downstream the dam, during the year.

d. The remaining quantities are allocated to irrigation, according to the farmers' applications above. If the quantities available are not enough to satisfy those needs (this is the usual scenario), water is allocated to the different crops by priority: i.e., first satisfy the greenhouses and permanent crops to a portion of their normal water needs (varying from 40%-100%) and then the seasonal crops (from 0% to 70%). Note that for the period of 1990 to 2011, there was only one year that the full irrigation demand was met, and that was in 2004, when all dams were over-spilling.

It is important to note that the scenario is prepared with the participation of the different interested parties, like the local authorities' representatives and the farmers' organizations.

The scenarios are submitted by the Minister of Agriculture, Rural Development and the Environment to the competent Water Management Advisory Committee (WMAC), in which relevant stakeholders participate (organised water users, interested organisations, professional bodies and relevant Government Services), in accordance with the Integrated Water Management Law.

After this consultancy procedure, the final scenario is approved by the Council of Ministers. With the approval of the scenario, each farmer is informed about the approved quantities, per plot for the coming irrigation period. If the quantities are exceeded, the non-approved quantities are charged at an overconsumption rate (which is higher than the normal rate), and the supply may be disconnected in case that the overconsumption continues.

*Irrigation outside the GWP*

There are also certain areas outside the GWP, which rely on surface water use, mainly small off stream reservoirs. These water projects were funded by the state with the contribution of the locals and are now managed by the local Irrigation Divisions (Irrigation organizations managed by committees under the chair and the supervision of the local District Officer). Water is allocated to the farmers by the committees, depending on availability.

**Groundwater**

Groundwater reserves a key role in irrigation, as it was always considered to be the most obvious and accessible source of water. As a result, private boreholes and wells have been extensively used, not only by the Irrigation Organizations or the farmers outside the GWP, but also by the farmers who typically irrigate their land within the GWP areas, especially when they had to overcome shortages during dry years.

Today, most of the aquifers face severe over abstraction problems, which led to seawater intrusion and deterioration, of both, quantity and quality of groundwater. This was the reason to introduce a system by which the WDD can regulate, to a certain extent, the abstraction from the aquifers. During the last 20 years, a special legislation was applied in certain areas in order to prevent the deterioration of the local coastal aquifers.

Today, the recent legislation regarding Water Management, called "The Integrated Water Management Law of 2010", has been put into effect. With the entry into force of this law, WDD took over the responsibility for drilling permits and abstraction permits, which are legally required all over the country. A more stringent procedure of permitting the sinking of wells is applied, with the ability to regulate abstractions, depending on the aquifer's condition. Generally, when the aquifer is in "poor status," or it is over pumped, the new permits are limited only to the irrigation of existing permanent plantations. Additionally, the new procedure involves the reviews of the old boreholes with the objective to apply an abstraction charge, reflecting the environmental and resource cost, to all.

The procedure is being implemented since the beginning of 2011; however, there is still a long way to reach the goal.

### 10.2.4. Further information

<u>Websites:</u>

http://www.moa.gov.cy/moa/wdd/wdd.nsf/page28_en/page28_en?opendocument

Contact:

Yianna Economidou

Senior Executive Engineer

Water Development Department

100-110 Kennenty Avenue, CY-1047 Pallouriotissa, Nicosia, CYPRUS

Tel. (357) 22609413

E-mail: yeconomidou@wdd.moa.gov.cy

## 10.3. Meuse Bilateral Water Allocation Treaty

### 10.3.1. General information

| | |
|---|---|
| Member State(s) | Netherlands |
| RBD(s) | Meuse |
| Location | River Meuse |
| Time period (start - end) | e.g. 1995 - ongoing |
| Good practice example promoter | Conducted Rijkswaterstaat and de Vlaamse Waterweg on behalf of the national governments NL and BE-Flanders |

### 10.3.2. Challenge(s) faced

Code of the challenge(s):

Description of the challenge:

The Meuse drainage treaty between Flanders and Netherlands provides a key for the distribution of the Meuse water at low discharges (smaller than 130 cubic metres per second at Monsin). The starting point here is equal use of water for the economic purposes of both countries and the joint responsibility for the common Meuse (too low discharge here can be detrimental to this ecologically valuable stretch of river). To manage the convention, the ministers set up the Working Group on Meuse Discharge Regulation, in which besides Flanders and the Netherlands Wallonia is represented.

### 10.3.3. Good practice(s) developed

Code of the good practice(s):

**Table 3 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| | Regulatory | Established by legislation/law |
| | Technical | Water flow/discharge parameters are monitored |
| | Economic | Equal economic benefits Flanders and Netherlands |
| | Research | - |
| | Governance | Conducted by Working Group on Meuse Discharge Regulation |
| | Others | - |

Description of the good practice:

In order to comply with the agreements of the Meuse treaty, both Flanders and the Netherlands must limit their water use by taking measures. In the Netherlands this mainly involves pumping back the discharge water at the sluices of the Julianakanaal canal; also, according to also using economical or siphoning sluices or saving bowls. If that is not sufficient, other user categories are cut, the prioritization of which is done according to the displacement series. Flanders is also currently busy reducing its water use by installing pumps at the lock complexes on the albert canal. When there is sufficient discharge from the Meuse, the pumps will work in reverse as a hydroelectric power plant generating renewable energy. In designing the installations, much attention was paid to fish-friendliness. If at any time one of the parties has difficulty complying with the treaty, it will be jointly examined whether it can temporarily use more water. Any costs involved will be settled. In order to comply with the agreements of the Meuse Convention, the amount of water used by each of the parties must be known. For this purpose, *the joint information system* that is constantly fed with flow measurements of the Dutch and Flemish canals and of the common Meuse and gives at any therefore gives an up-to-date picture of the distribution of the Meuse water over the channels in Flanders and the Netherlands and on the common Meuse. The application also provides insight into the measures taken on both sides of the taken on both sides of the border to avoid. The information system is an important an important stimulus for mutual cooperation.

Effort of the action(s):

To manage the convention, the ministers set up the Working Group on Meuse Discharge Regulation, which takes actions when necessary

Result(s) achieved so far:

Implementation of the treaty has proven extremely effective during the low discharges in the very dry years of 2018, 2019, 2020 and 2022.

Difficulties faced:

Due to hydropeaking and low flows, discharge measurements are sometimes inaccurate.

Remaining constraint(s): -

Planned next step(s):

Actions of the Working Group on Meuse Discharge Regulation are evaluated with some regularity

Transferability:

The methodology would be applicable in other countries e.g. riverbasins for agreements on water allocation.

#### 10.3.4. Further information

- Websites:

  wetten.nl - Regeling - Verdrag tussen het Koninkrijk der Nederlanden en het Vlaams Gewest inzake de afvoer van het water van de Maas - BWBV0001232 (overheid.nl)

- Scientific articles: -
- Other publications/documents:

  339754 (wur.nl)

- Contact:

  Watermanagementcentrum Nederland | Rijkswaterstaat

## 10.4. Prioritization ranking for water use in the Netherlands

### 10.4.1. General information

| | |
|---|---|
| Member State(s) | Netherlands |
| RBD(s) | All area of the Netherlands including river Rhine and Meuse |
| Location | MS |
| Time period (start - end) | e.g. 10/2008 - ongoing |
| Good practice example promoter | Conducted by the national water distribution committee in case of water shortage / severe droughts |

### 10.4.2. Challenge(s) faced

Code of the challenge(s):

Description of the challenge:

*In normal conditions :* Due to the specific situation of the water system in the Netherlands (polders), almost 65% of the surface area can be supplied with water from the rivers. Especially for the Rhine, there is a water distribution issue more than a water allocation issue. Permits (for large abstractions) and water agreements (for intakes to regional waters) have been established for water use from rivers and canals. Permits and levies are also in place for large groundwater abstractions.

*In case of severe water shortages :* Water managers use a hierarchy of water uses laid down by law to distribute the available freshwater. Water shortage occurs when the demand for water from the various social and ecological needs exceeds the supply of water of a quality suitable for the various needs. The  hierarchy indicates the order of social and environmental needs that is taken into account in the distribution of available water.

### 10.4.3. Good practice(s) developed

Code of the good practice(s):

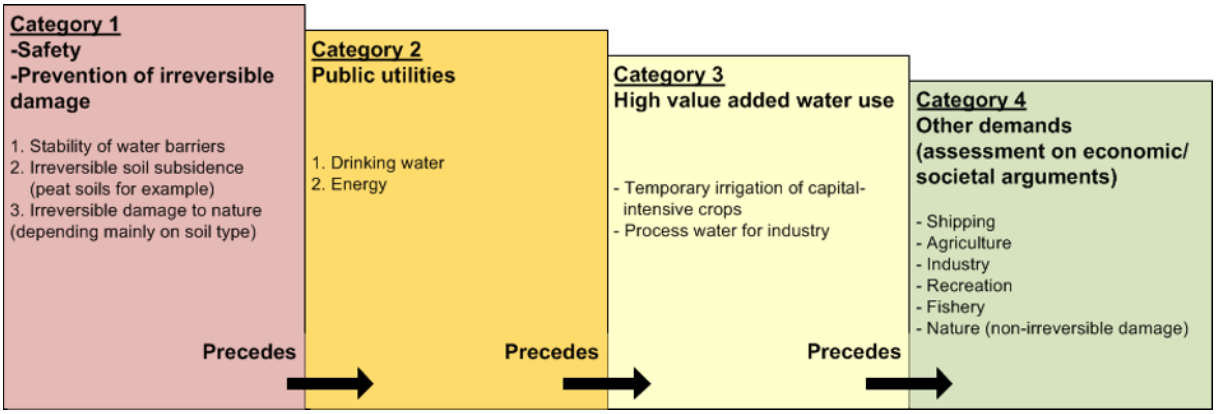
**Table 4 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| | Regulatory | Established by legislation/law |
| | Technical | Water shortage parameters (ground and surface water) are monitored |
| | Economic | Prioritization ranking based on water safety, irreversible damage to infrastructure and nature, public utilities and economic and social factors |
| | Research | - |
| | Governance | Conducted by the national water distribution committee in case of water shortage / severe droughts |
| | Others | - |

Description of the good practice:

*In case of severe water shortages :* Water managers use a hierarchy of water uses laid down by law to distribute the available freshwater. Water shortage occurs when the demand for water from the various social and ecological needs exceeds the supply of water of a quality suitable for the various needs. The hierarchy indicates the order of social and environmental needs that is taken into account in the distribution of available water.

The hierarchy consists of four categories. The ranking of interests within categories 1 and 2 is established at the national level. Within categories 3 and 4, no ranking has been established at the national level. Within those categories, further ranking can be done by provincial regulation.




Reasons for initiating action(s):

In case of severe water shortage, low discharge Rhine and Meuse and low groundwater levels, LCW is the implementing agency for water shortage crisis management.

Selection of the action(s):

Based on practical experience and applied, for example, in the dry summer of 2018. Also calculated performed with the National Water Model

Description of the action(s):

Water allocation is carried out according to the prioritization ranking by water distribution, amounts of water intake withdrawals carried out by the water managers. See figure 1

Also long term strategic actions to avoid more frequent crisis situations in the future as a result of climate change, f.e.:

- During (imminent) water shortages let go of fixed distribution and steer based on real-time data.
- Steering on strategic freshwater buffers and zones.
- Letting go of current method of salinization control RMM thereby releasing water.
- New supply route IJsselmeer.
- Steering from national overview across management boundaries. Smart Water Management 2.0
- Targeted investments to make the water system more robust.

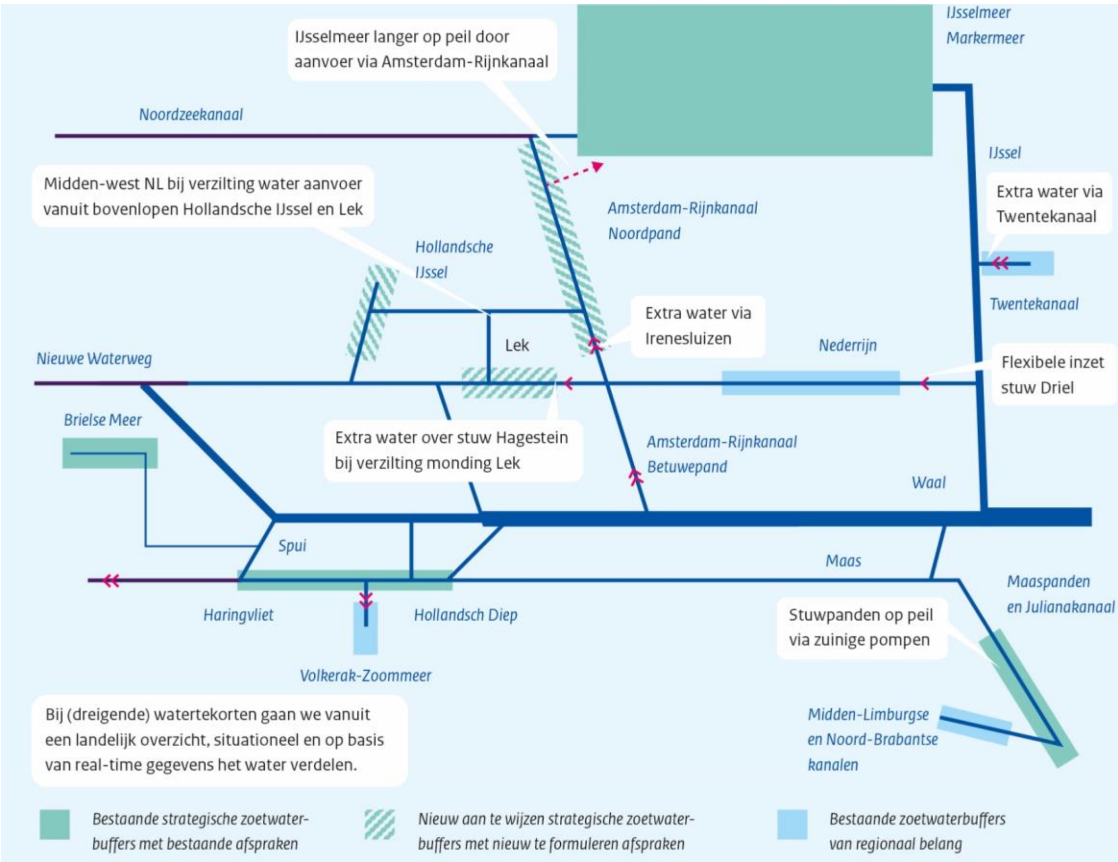



**Figure 3 Example of Water distribution of Rhine.**

Effort of the action(s):

The legislation of prioritization ranking is a result of years of drought experience (particularly 2018), model-based calculations and careful discussions with stakeholders and water managers

Result(s) achieved so far:

Fortunately the prioritization ranking operated only sporadically (applied only for category 4 water use)

Difficulties faced:

Every drought is different, so considerations within f.e. category 4 are also tailored to the then specific situation

Remaining constraint(s): -

Planned next step(s):

Learning / new insights can lead to fine-tuning.

Transferability:

The methodology would be applicable in other countries e.g. riverbasins, if it is adapted to the water use and allocation. It would be interesting to apply it at international RBD level.

### 10.4.4. Further information

- Websites:

Verdringingsreeks: rangorde bij waterschaarste | Informatiepunt Leefomgeving (iplo.nl)

LCW - Landelijke Coördinatiecommissie Waterverdeling (LCW) (rws.nl)

- Scientific articles: -
- Other publications/documents:

Nieuwe afspraken over waterverdeling in IJsselmeergebied bij droogte (h2owaternetwerk.nl)

- Contact:

Watermanagementcentrum Nederland | Rijkswaterstaat

## 10.5. Deltaprogram Fresh Water (Strategies and Actions) 2015-2021-2027

### 10.5.1. General information

| | |
|---|---|
| Member State(s) | Netherlands |
| RBD(s) | All area of the Netherlands including river Rhine and Meuse |
| Location | MS |
| Time period (start - end) | 2015 - ongoing |
| Good practice example promoter | Conducted by the national government, provinces and water boards. |

### 10.5.2. Challenge(s) faced

Code of the challenge(s):

Description of the challenge:

The Netherlands must adapt to the consequences of climate change. We will have to deal with longer periods of drought, more low water in the rivers and an increasing chance of heavy showers with flooding. The supply of fresh water is not always sufficient for the demand. This was evident during the prolonged droughts in 2018, 2019 and spring 2020. Salinization, due in part to rising sea levels, also poses a threat to freshwater availability in the Netherlands. Anticipating these developments is therefore in the interests of the Dutch economy and society.

In doing so, we are running up against the limits of our ability to find solutions to the drought problem within the current water system. Structural actions in the water system and more water awareness in water use are needed to make the Netherlands resilient to water scarcity and droughts. For this we need to retain water much more than we do now. This certainly applies to areas where no fresh water supply is possible, such as the high-lying sand and loess soils in the south-east and north of the Netherlands and parts of Zeeland that are surrounded by salt and brackish water. This requires a shift in thinking by all water managers from rapid water discharge to water retention through more buffering and infiltration, taking into account a good balance between water shortage and flooding. Actions in the water systems alone are not sufficient to prevent future consequences of drought. A future-proof freshwater supply also requires adaptations in environmental planning.

Working on sufficient freshwater in our country is and will remain crucial, among other things for the stability of dikes, nature and for the supply of drinking water and electricity. Various sectors depend on freshwater for their production, such as agriculture, shipping and many industries. Together, these sectors are responsible for about 16% of the national economy. Sufficient freshwater is also important to combat subsidence, for the quality of the living environment and public health.

### 10.5.3. Good practice(s) developed

Code of the good practice(s):

**Table 5 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| | Regulatory | Established by legislation/law/financing |
| | Technical | Several actions, see further on |

| | | |
|---|---|---|
| | Economic | Several actions, see further on |
| | Research | Several actions, see further on |
| | Governance | Conducted by the national, regional and local level |
| | Others | - |

Description of the good practice:

The overarching goal of the Delta Program Freshwater is to ensure that the Netherlands is resilient to water shortages by 2050. The task is to maintain and promote a healthy and balanced (ground)water system, protect crucial utilization functions and use the available freshwater effectively and economically. This has been laid down and elaborated in the Delta Decision Freshwater. This includes a national preferential strategy for the main water system and a preferential strategy for each of the six freshwater regions: Northern Netherlands, High Sandy Grounds East, High Sandy Grounds South, River Region, Western Netherlands and the Southwest Delta.

Based on the national and regional constraint analyses the national government and freshwater regions have set ambition levels for water availability and resilience to water shortages. For the main water system a quantitative ambition has been included in the preferred strategy: the main water system must be resilient to a drought occurring once every 20 years. In the second phase of the Delta Program Freshwater (2022-2027) the national government is exploring the social feasibility of this ambition.

The ambition levels for the six freshwater regions are set out in regional preferred strategies. Some freshwater regions, such as West Netherlands, have formulated a quantitative ambition. Other regions have opted for a qualitative objective. In line with recommendations by the Court of Audit the objectives will be concretized and quantified where necessary during the second phase.

Preferred order for water management:

- Starting point is that spatial planning and land use should take greater account of water availability and flooding;
- All water users, including agriculture, nature, industry and consumers, will need to use water more sparingly;
- Water managers (including water boards, provinces, municipalities, the Department of Public Works, farmers and nature site managers) will have to retain, store and store water more effectively;
- Water managers will have to distribute water more intelligently;
- With a natural phenomenon, all damage can never be prevented, so if the effort is still insufficient, we as a society must accept the (residual) damage and prepare for it.

Effort of the action(s):

The legislation of prioritization ranking is a result of years of drought experience (particularly 2018), model-based calculations and careful discussions with stakeholders and water managers.

The preferential strategies form the compass for implementing actions in the second phase of the Delta Program Freshwater. This Delta Plan Freshwater contains all programmed actions and investments by Rijkswaterstaat, provinces and water boards.

*Overview actions in the main/large water & rivers*

- Water-saving actions at lock complexes Meuse
- Strengthen international cooperation for water management in the Meuse and Ruhr river basin
- Explore the possibilities for water storage/buffers along the Meuse

- Continuation of Smart Water Management (Slim WM) program including development of national information screens.
- Integral study of strategy for climate-proof freshwater supply in the main water system (rivers and lakes)
- Develop a decision support system for the Rhine water allocation including the area susceptible to salinization
- Management actions to increase flow and flexibilization at weirs
- Actions to limit (external) salinization at the sluices and shipping locks
- Increasing robustness of the local water supply by canals

*Overview actions in the main/large water & rivers*

- Flexible water level management and buffering, f.e. lake IJsselmeer
- Stream restoration and watercourse re-profiling
- Adjustable and underwater drainage
- Local drainage and dewatering
- Disconnection of paved surface to storage or infiltration facility
- Improving soil structure
- Targeted watering systems
- Business-oriented incentive plans
- Environmental adaptation & changing function into room for water
- Converting coniferous forest to heath or deciduous forest
- Pilot reuse effluent
- Underground water storage & abstraction facilities
- Exploration utilization brackish groundwater for drinking water supply

Result(s) achieved so far:

Between 2015 and 2021, a total of 37 of a total of 61 actions have been realized; the others are still being worked on. Research shows that the drought affected the entire water system and resulted in damage to agriculture, horticulture and nature. Structural adjustment of the water system, water management and water use is needed to become more resilient to drought. The implementation of a number of more complex implementation actions in the Delta Plan Freshwater requires more time than anticipated.  The delay is due in part to the consequences of the corona pandemic, the nitrogen problem and delayed land purchases. For some projects, the delay in realization is also related to personnel capacity. There is great pressure to implement projects and in many organizations the available capacity for implementation is fully utilized.

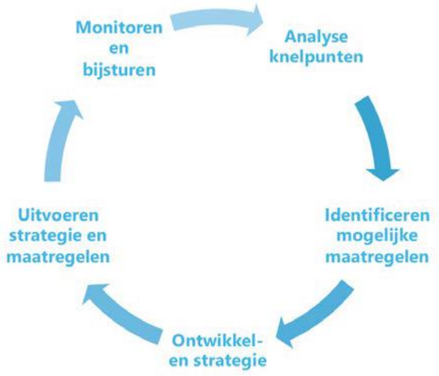
Difficulties faced:

A lot of actions need 'room' and have to be incorporated in environmental planning. The amount of room is limited and spatial adaptation planning take a long time. Also stakeholders need to adapt and this takes also a long term effort.

Remaining constraint(s): -

Planned next step(s):

By the 'monitoring-analyses-actions-strategy-implementation' cycle




Transferability:

The methodology / planning would be applicable in other countries e.g. riverbasins.

### 10.5.4. Further information:

- Websites:

  Zoetwater | Drie thema's | Deltaprogramma

  Deltaplan Zoetwater 2022-2027 | Publicatie | Deltaprogramma

- Scientific articles:
- Other publications/documents:
- Contact:

  Ministry of Infrastructure and Water

## 10.6. Implementation of a unique permitting system for water resources uses in Portugal

### 10.6.1. General information

| | |
|---|---|
| **Member State** | Portugal |
| **RBD(s)** | PTRH1 - MINHO AND LIMA<br>PTRH2 - CAVADO, AVE AND LECA<br>PTRH3 - DOURO<br>PTRH4A - VOUGA, MONDEGO AND LIS<br>PTRH5A - TAGUS AND WEST RIVERS<br>PTRH6 - SADO AND MIRA<br>PTRH7 - GUADIANA<br>PTRH8 - ALGARVE RIVERS |
| **Location** | Mainland Portugal<br>(PTRH1, PTRH2, PTRH3, PTRH4A, PTRH5A, PTRH6, PTRH7 e PTRH8) |
| **Time period (start - end)** | 01/01/2006 – ongoing |
| **Good practice example promoter** | Portuguese Environment Agency (APA) |

### 10.6.2. Challenge(s) faced

**A3:** Ownership of water (public, private, commonly owned) and authority over access and use of water is unclear, leading to delay and blockage over changes in allocations

**Description of the challenge:** Need for standardization, dematerialization and streamlining of permitting processes, implementing the effort to integrate and harmonize them on a single platform.

### 10.6.3. Good practice(s) developed

**Scope:** Development of a unique permitting system for water resources uses for the mainland river basin districts.

The Water Framework Directive[8] (WFD) establishes as minimum requirements to be met within the scope of programs of measures to achieve and maintain the good status of water bodies, a suitable pressure management that allows impacts to be reduced or eliminated, ensuring efficient and effective permitting, as well as the systematization and updating of the water pressure information.

In this sense, the Water Law[9], which transposed the WFD into the Portuguese legal order, also has as its primary objective the sustainable management of waters and their protection, which is why it

---

[8] Directive 2000/60/EC of the European Parliament and the Council, October 23th, 2000.
[9] Law n.º 58/2005, of December 29th in current writing.

is required, that activities that have a significant impact on the state of the waters can only be carried out through a permit.

APA's Integrated Environmental Permitting System (SILiAmb) emerged in 2012 as a response to the need for standardization, dematerialization and streamlining of permitting processes, implementing the effort to integrate and harmonize them on a single platform, and constituting since then, a decisive support tool in terms of water resources management, as it supports the permitting of the majority of uses covered in the Portuguese legal regime for the water resources uses[10], such as:

- Water abstraction (includes groundwater and surface water intended for human consumption, irrigation, industrial activity, livestock activity, recreational or leisure activities and animal watering);
- Constructions, beach support, equipment and infrastructure, parking lots and access to the water domain;
- Extraction of aggregates;
- Hydraulic infrastructures;
- Rejection of wastewater (includes domestic and urban wastewater, wastewater from industrial activities, livestock farms and the use wastewaters from olive oil production to irrigate agricultural land).

Having since its entry into production, SILiAmb become a decisive support tool in terms of water resources management, as it already supports the permitting of the majority of uses covered by the Water Law and the legal regime for the uses of water resources as it receives around 90% of requests made by users.

It includes the following advantages in terms of water resources management:

- Standardization of electronic forms for the mainland country;
- Harmonization of licensing processes, but considering the regional specificity;
- Streamlining the workflow process, allowing response times to be reduced;
- Expert analysis supported by a report on environmental conditions, obtained automatically by geoprocessing;
- Centralization and management of the collection of self-control data.
- Centralization of processes for consultation and reporting purposes.
- More easy to include licensing restrictions due to extreme events or the rules from each RBMP cycles.

For analysis of requests, the GIS tool integrated into the platform is used in the technical analysis of requests, allowing a report to be drawn up with all existing environmental restrictions, namely the status of the affected water bodies, water balances, water scarcity index, other licensing water uses, protected areas, constrains established in existing plans. This reports results from the crossing of several shapes with updated information on the different environmental conditions, allowing in a short time to identify when there are incompatibilities with the request under analysis, namely to ensure verification of compliance with the different WFD obligations (Figure 2 and 4).

[10] Decree-Law n.º 226-A/2007, of May 31st in current writing.

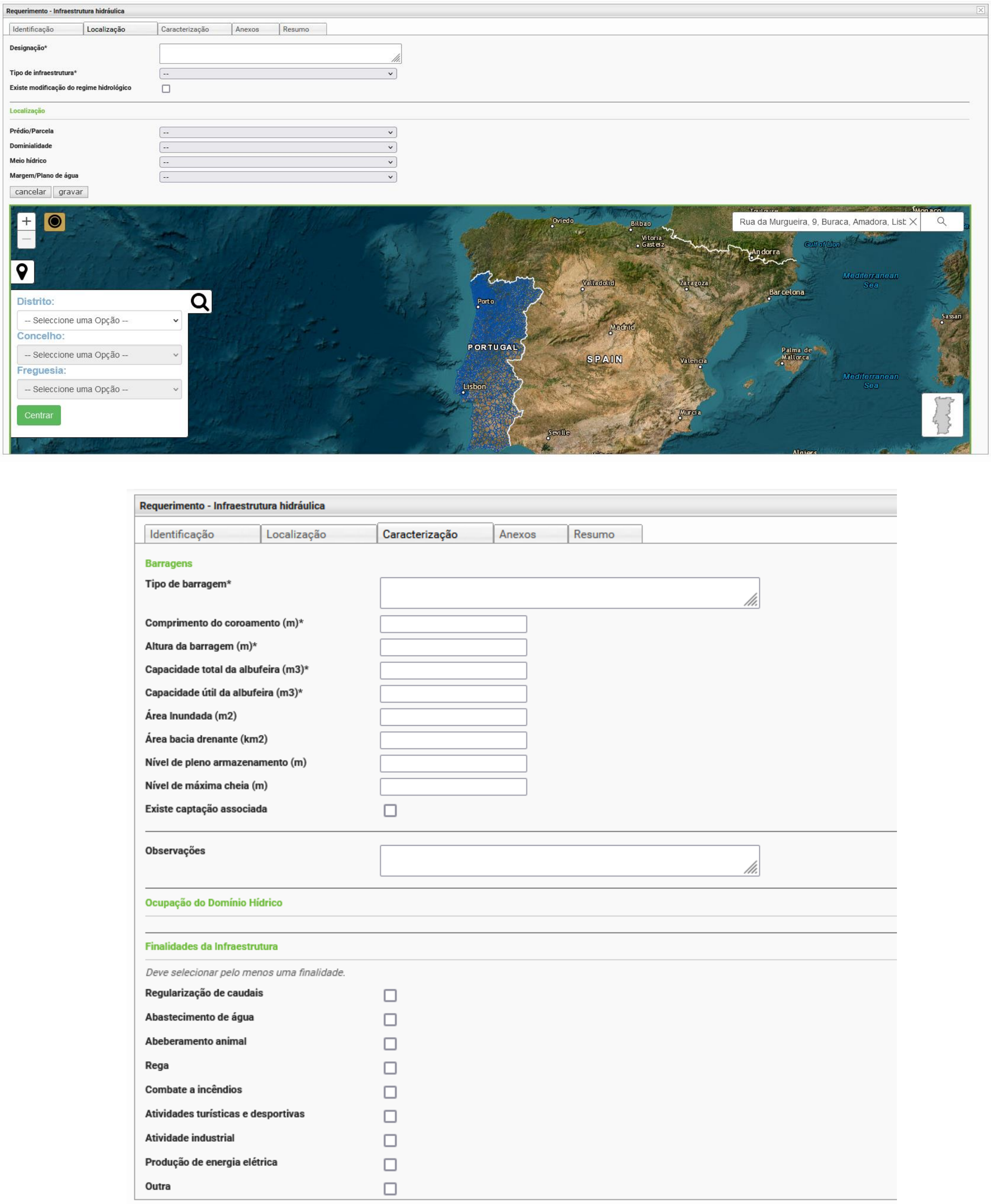



**Figure 5 - Standardized electronic form**

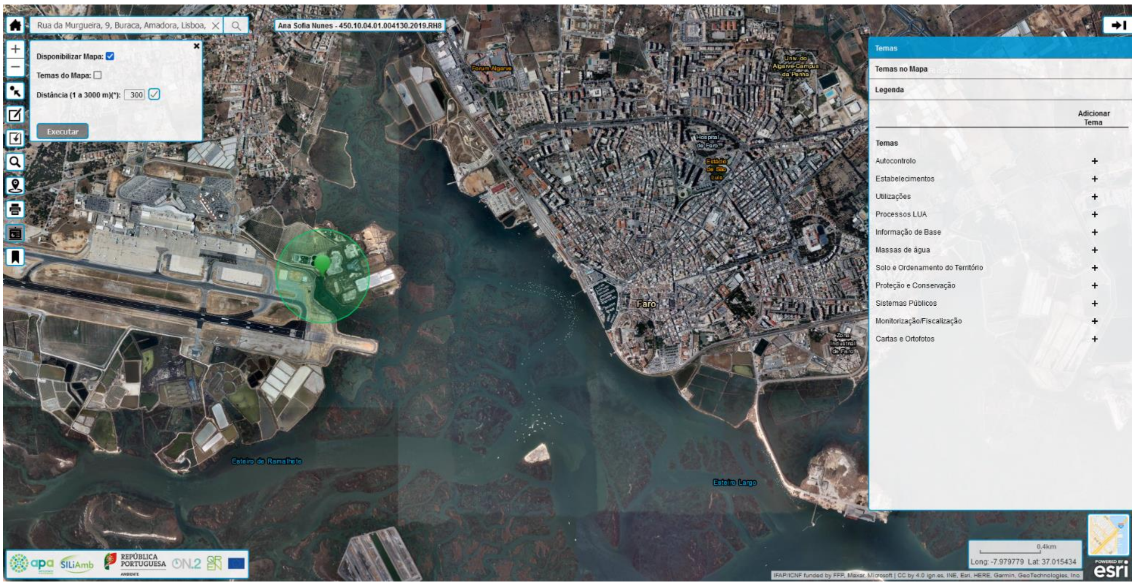


**Figure 6- GIS tool integrated into the platform**

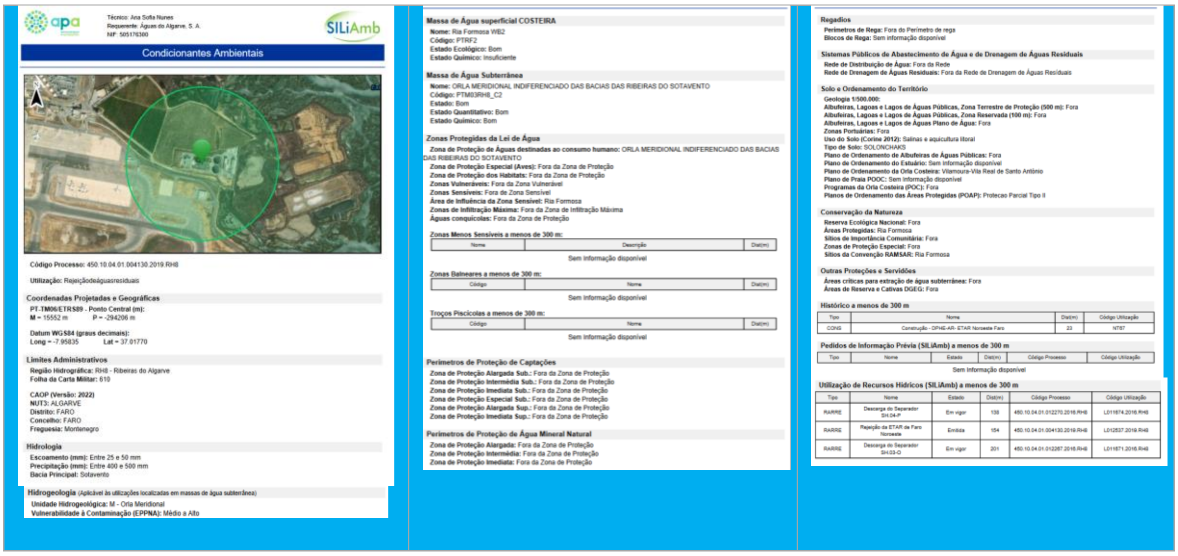
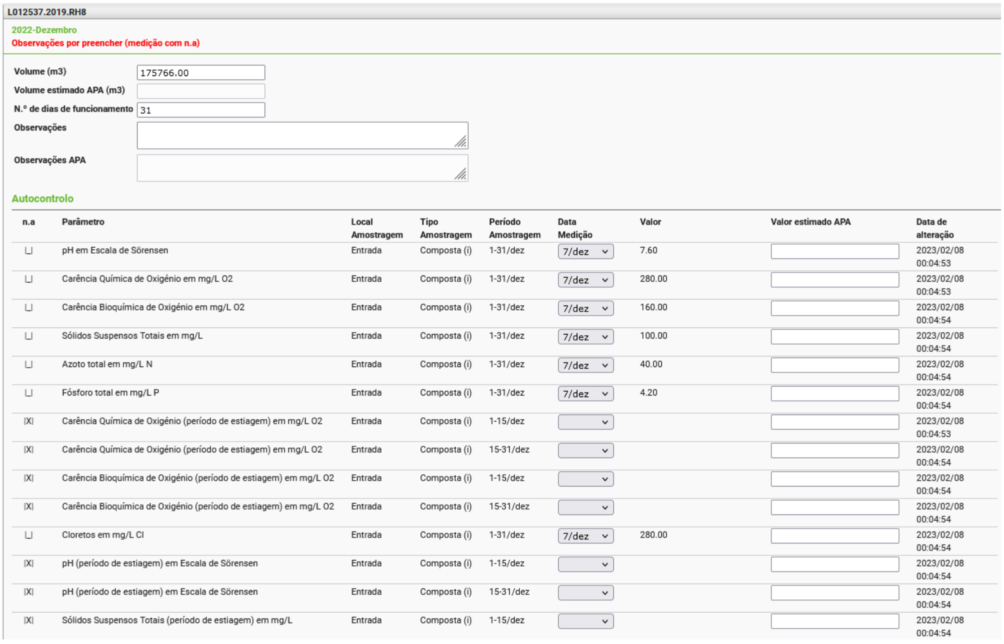


**Figure 7 - environmental conditions report automatically produced in the GIS tool**

SILiAmb also allows users of water resources to report data from self-control programs, some automatically through the use of webservices, and monitoring of the receiving environment, including the attachment of laboratory reports.



L012537.2019.RH8

2022-Dezembro

Observações por preencher (medição com n.a)

Volume (m3) 175766.00

Volume estimado APA (m3)

N.º de dias de funcionamento 31

Observações

Observações APA

Autocontrolo

| n.a | Parâmetro | Local Amostragem | Tipo Amostragem | Período Amostragem | Data Medição | Valor | Valor estimado APA | Data de alteração |
|---|---|---|---|---|---|---|---|---|
| [ ] | pH em Escala de Sörensen | Entrada | Composta (i) | 1-31/dez | 7/dez | 7.60 | | 2023/02/08 00:04:53 |
| [ ] | Carência Química de Oxigénio em mg/L O2 | Entrada | Composta (i) | 1-31/dez | 7/dez | 280.00 | | 2023/02/08 00:04:53 |
| [ ] | Carência Bioquímica de Oxigénio em mg/L O2 | Entrada | Composta (i) | 1-31/dez | 7/dez | 160.00 | | 2023/02/08 00:04:54 |
| [ ] | Sólidos Suspensos Totais em mg/L | Entrada | Composta (i) | 1-31/dez | 7/dez | 100.00 | | 2023/02/08 00:04:54 |
| [ ] | Azoto total em mg/L N | Entrada | Composta (i) | 1-31/dez | 7/dez | 40.00 | | 2023/02/08 00:04:54 |
| [ ] | Fósforo total em mg/L P | Entrada | Composta (i) | 1-31/dez | 7/dez | 4.20 | | 2023/02/08 00:04:54 |
| [X] | Carência Química de Oxigénio (período de estiagem) em mg/L O2 | Entrada | Composta (i) | 1-15/dez | | | | 2023/02/08 00:04:53 |
| [X] | Carência Química de Oxigénio (período de estiagem) em mg/L O2 | Entrada | Composta (i) | 15-31/dez | | | | 2023/02/08 00:04:54 |
| [X] | Carência Bioquímica de Oxigénio (período de estiagem) em mg/L O2 | Entrada | Composta (i) | 1-15/dez | | | | 2023/02/08 00:04:54 |
| [X] | Carência Bioquímica de Oxigénio (período de estiagem) em mg/L O2 | Entrada | Composta (i) | 15-31/dez | | | | 2023/02/08 00:04:54 |
| [ ] | Cloretos em mg/L Cl | Entrada | Composta (i) | 1-31/dez | 7/dez | 280.00 | | 2023/02/08 00:04:54 |
| [X] | pH (período de estiagem) em Escala de Sörensen | Entrada | Composta (i) | 1-15/dez | | | | 2023/02/08 00:04:54 |
| [X] | pH (período de estiagem) em Escala de Sörensen | Entrada | Composta (i) | 15-31/dez | | | | 2023/02/08 00:04:54 |
| [X] | Sólidos Suspensos Totais (período de estiagem) em mg/L | Entrada | Composta (i) | 1-15/dez | | | | 2023/02/08 00:04:54 |

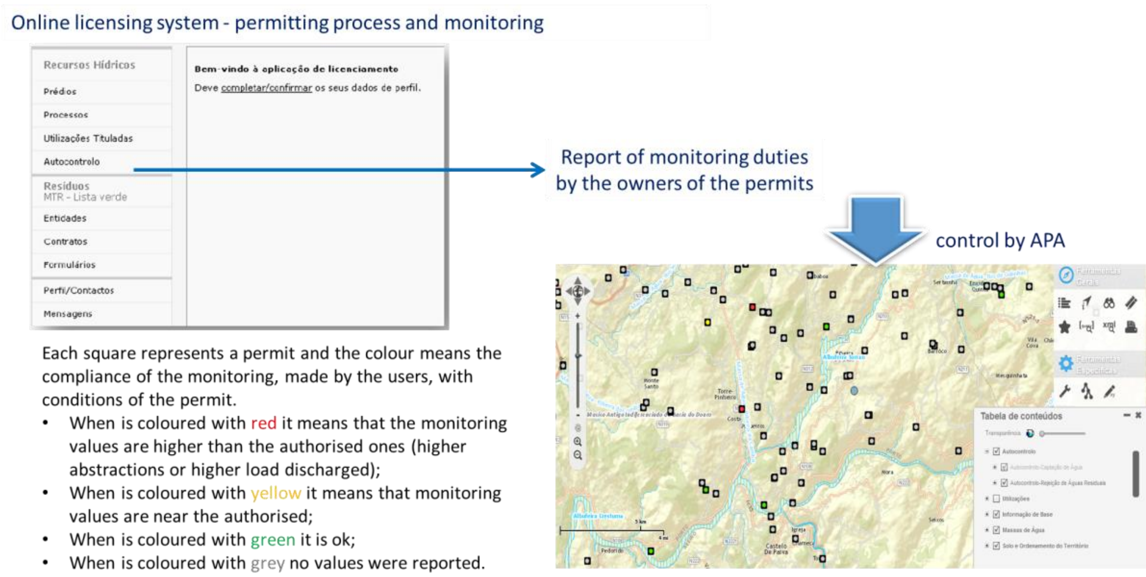



**Figure 8 - Report data from self-control programs**

In conclusion, SILiAmb is a dynamic system that is automatically updated whenever there is a new request or a need of change, with the issuance of new permits and the transmission, ending, amendment and renewal of existing ones. The entire administrative process of requesting, issuing and managing permits is carried out in SILiAmb for the mentioned water uses.

**Table 6 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| ✓ | Regulatory | Law No. 58/2005 of December 29th<br>Approves the Water Law, transposing Directive 2000/60/EC into the national legal order and establishes the bases and institutional framework for sustainable water management.<br>Decree-Law n.º 226-A/2007, of May 31th<br>Establishes the regime for the use of water resources. |
| ✓ | Technical | Acquisition of specialized services for the development of the SILIAmb |
| ✓ | Economic | Simplify, harmonize and speed-up licensing procedures |

| | | |
|---|---|---|
| | Research | - |
| ✓ | Governance | More consistency and transparency in the application of the law related with environmental licensing.<br>Reduction in time for analysis and licensing.<br>Systematization of relevant information to support decision-making and planning.<br>Information about pressures (localization, characterization and monitoring data) and water bodies status.<br>Web-services linked with external systems (economic activities licensing, supervision and inspection, etc.). |
| | Others | - |

Result(s) achieved so far:

Annually, Portugal measures the evolution of the pressure exerted on water resources, in terms of the demand that is requested through the number of applications submitted, and the Water Resources Permits (TURH) issued by APA.

In terms of requirements for the use of water resources submitted to administration, the following figure shows their evolution by mainland river basin districts in the time period between 2017 -2021.

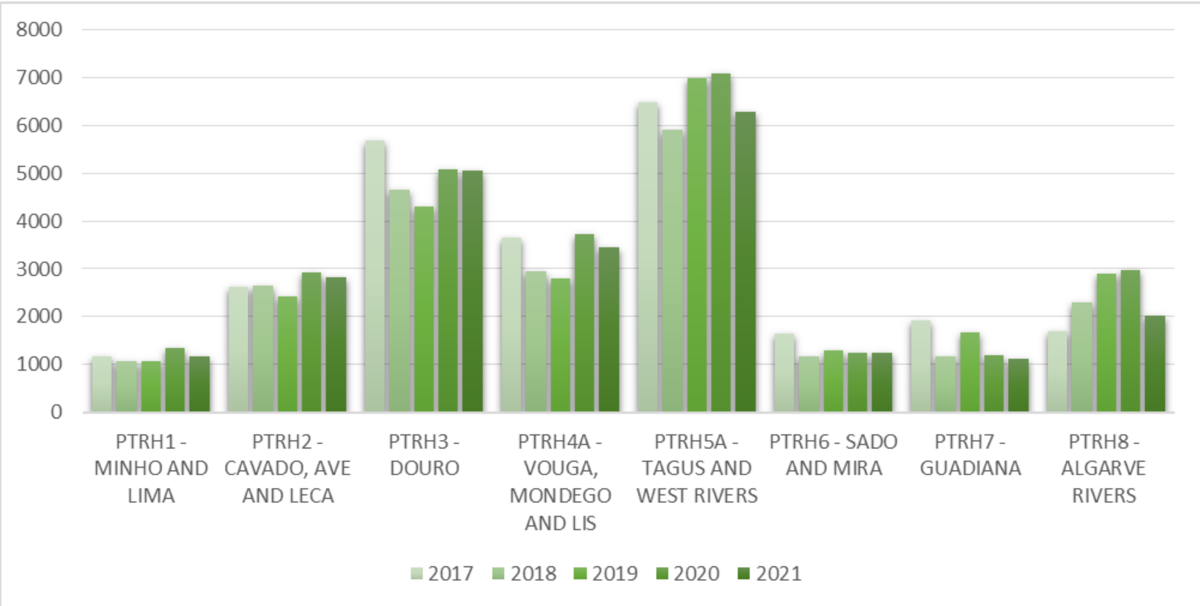



**Figure 8 - Evolution of the number of applications submitted by river basin district between 2017 and 2021 (Source: APA, 2022).**

Analysis of the data presented allows us to conclude that the majority of applications submitted aim to use water resources in larger river basin districts, such as Douro (22%) and Tagus and Ribeiras do Oeste (27%), comprising in 2021 around of half of the total applications submitted in mainland Portugal.

At a temporal level, it appears that, compared to the previous year, in 2021 all river basin districts of mainland Portugal showed a decrease in the number of applications submitted, more pronounced in RH5 and RH8.

Also noteworthy is the increased pressure on water resources with the increase in the number of applications submitted in recent years, particularly in the centre-south of the country, possibly associated with an increase in water demand caused by the dry period that occurred mainly in 2017.

Regarding the type of intended use of water resources, it turns out that the majority of applications submitted are intended for water abstraction, totalizing approximately 82% of the total submitted in 2021 (19007 from a total of 23131). This behaviour also seems to highlight a reduced demand for alternative sources of water for various purposes, such as the use of water for reuse of non-potable uses whose legal regime has been in force in Portugal since 2019[11].

In terms of titles issued for the use of water resources, the following figure shows their evolution by river basin districts in the period under analysis, between 2017 and 2021.

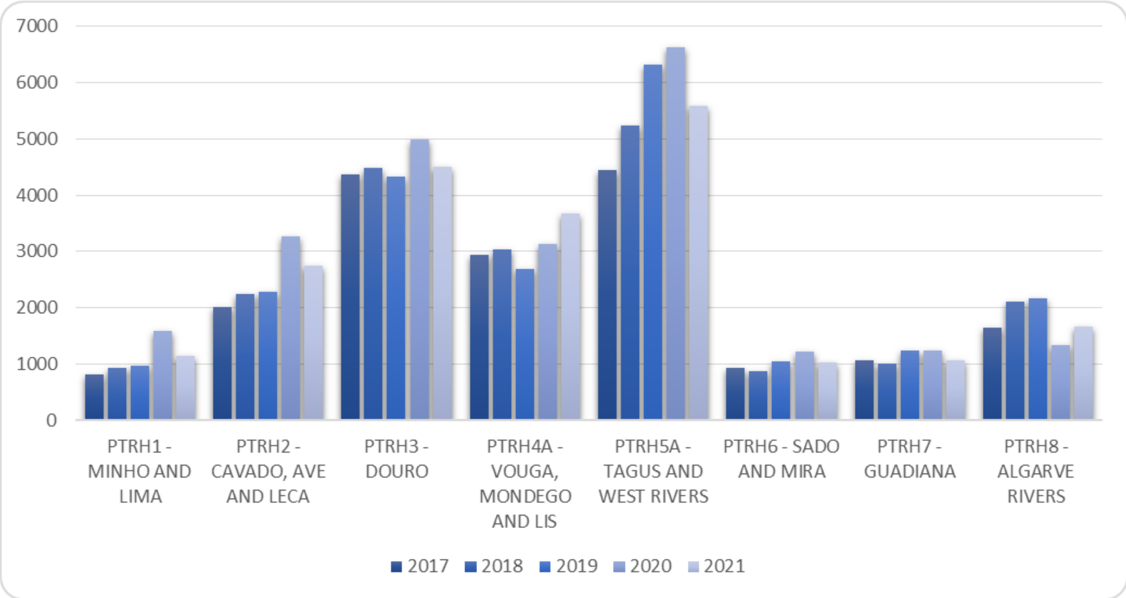



**Figure 9 - Evolution of the number of permits issued by river basin district between 2017 and 2021 (Source: APA, 2022).**

Similar to the pattern observed in the evolution of the number of applications submitted, it appears that the issuance of titles responds, in general, to the requests made.

In 2021, all river basin districts in mainland Portugal recorded a decrease in the total number of titles issued, with the exception of RH4A and RH8, which reflects the pattern already recorded in the applications submitted for the same year.

At a temporal level, there is also a generalized oscillation, with a tendency towards growth, in the number of titles issued in all river basin districts, throughout the period under analysis.

Regarding the type of intended use, it appears that the majority of titles issued aim to respond to requests made by applicants, that is, they are mainly intended for water capture, comprising approximately 86% of the total in 2021 (18342 from a total of 21389).

In terms of spatial distribution, it can be seen that, by observing the figure presented below, it is generally possible to establish a correspondence between the total number of applications submitted and permits issued, in each river basin district, between 2017 and 2021. This pattern is also highlighted in temporal distribution represented in the graph, also presented below, by type of use of water resources.

[11] Decree-Law n.º 119/2019, of August 21th in current writing.

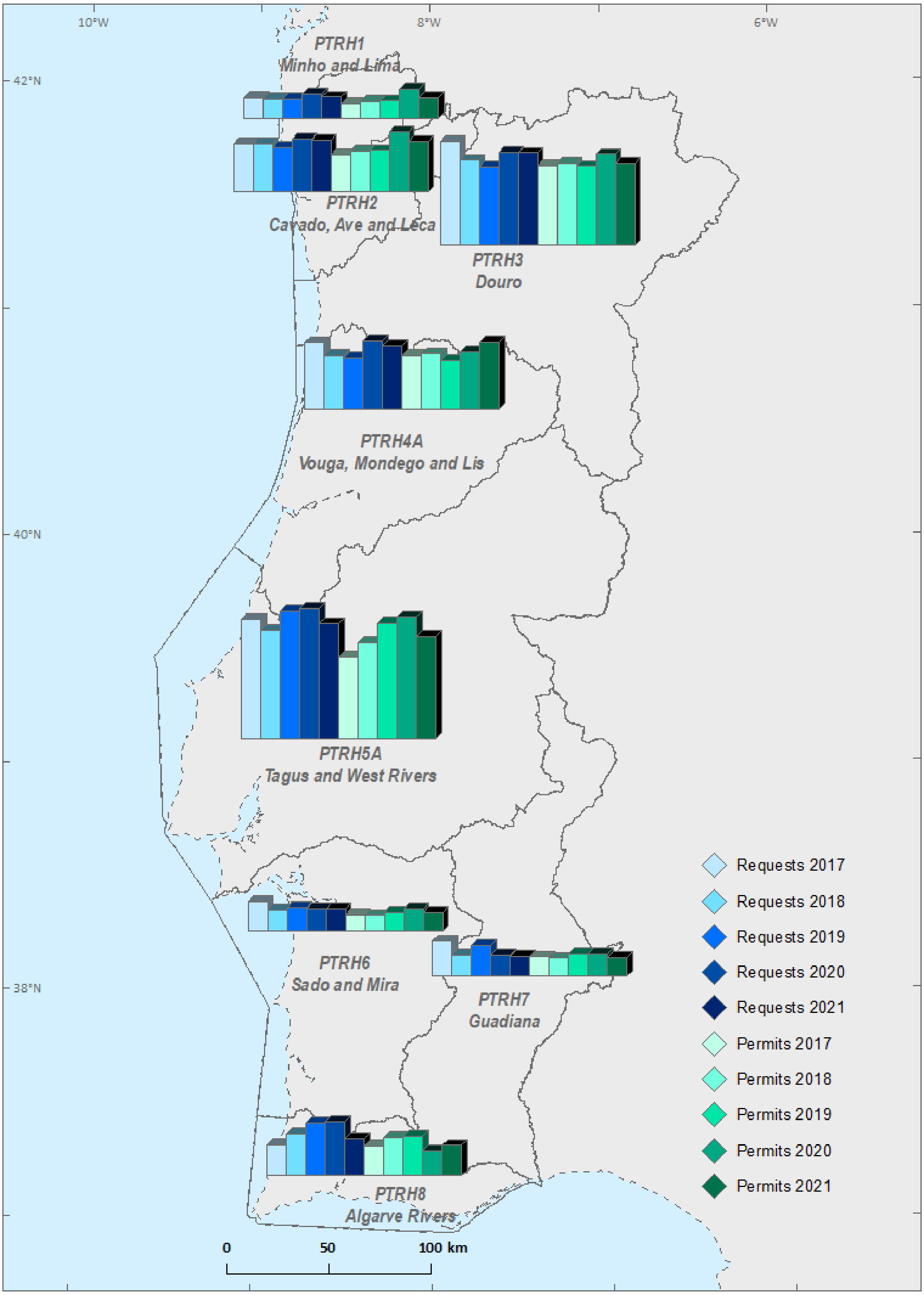



**Figure 10 - Geographic distribution of applications submitted and titles issued by river basin district between 2017 and 2021 (Source: APA, 2022).**

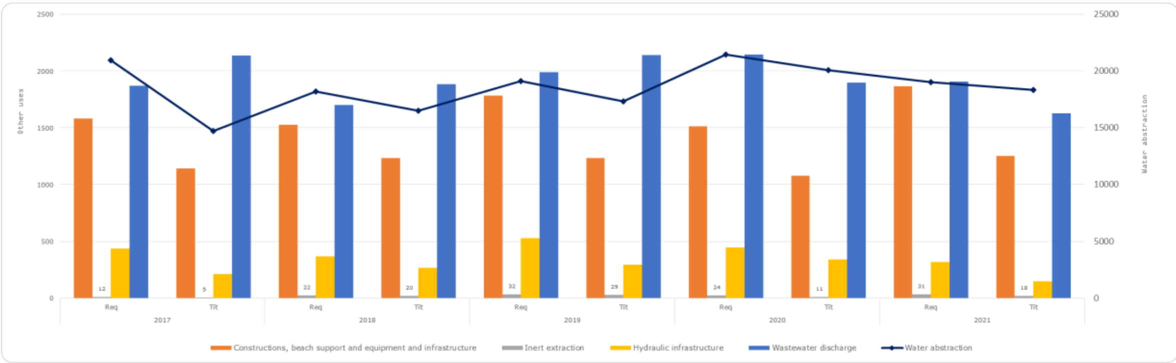



**Figure 11 - Temporal evolution of applications submitted and titles issued by type of use between 2017 and 2021 (Source: APA, 2022).**

<u>Difficulties faced</u>

The use of this tool by who need to apply for a water resources permit, in a friendly and expeditious manner, is often not easy and requires follow-up by technicians.

<u>Remaining constraint(s)</u>

The evolution to a tool that allow the environmental permitting in all its aspects has meant that the focus on the specifics of water resources has been somewhat lost, requiring constant updates and the implementation of new functionalities.

<u>Planned next step(s)</u>

Improvements in terms of new functionalities and new permitting requirements, as well as improve the accessibility to all citizens.

<u>Transferability</u>

Taking into account the national or regional specificities of each country, it is possible to develop similar tools to support the permitting process, which is crucial to the efficient and effective management of water resources.

### 10.6.4. Further information

**Portuguese State of the Environment Report**
https://rea.apambiente.pt/content/utiliza%C3%A7%C3%A3o-de-recursos-h%C3%ADdricos

**Integrated Environmental Permitting System (SILiAmb)**

https://siliamb.apambiente.pt

**Contact:**

Portuguese Environment Agency; https://apambiente.pt/

drh.geral@apambiente.pt

## 10.7. Implementation of the water resources fee (TRH) in Portugal

### 10.7.1 General information

| | |
|---|---|
| **Member State** | Portugal |
| **RBD(s)** | PTRH1 - MINHO AND LIMA<br>PTRH2 - CAVADO, AVE AND LECA<br>PTRH3 - DOURO<br>PTRH4A - VOUGA, MONDEGO AND LIS<br>PTRH5A - TAGUS AND WEST RIVERS<br>PTRH6 - SADO AND MIRA<br>PTRH7 - GUADIANA<br>PTRH8 - ALGARVE RIVERS |
| **Location** | Mainland Portugal<br>(PTRH1, PTRH2, PTRH3, PTRH4A, PTRH5A, PTRH6, PTRH7 e PTRH8) |
| **Time period (start - end)** | 01/07/2008 – ongoing |
| **Good practice example promoter** | Portuguese Environment Agency (APA) |

### 10.7.2 Challenge faced

**A19:** Allocations do not encourage efficient water use

### 10.7.3 Good practice developed

**Scope:** The fee aims to implement the user pays principle in order to promote better use of water contributing to water management costs and also allow the financing of measures defined in the RBMP. The Water Resources Fee (TRH), collected by Portuguese Environment Agency (APA), "*aims to compensate the benefit that results from the private use of water resources (a public good), the environmental cost inherent to the activities that can cause a significant impact on them, as well as the administrative costs inherent to the planning, management, inspection and guarantee of water quantity and quality*".

The Water Law[12], which transposed the Water Framework Directive[13] (WFD) into the Portuguese law, defines that among the principles that should regulate the management of water resources are:

- the **principle of social value of water**, by which it is recognized that it constitutes a good to which everyone must have access to satisfy their elementary needs;
- the **principle of the environmental dimension of water**, by which it is recognized that it constitutes an environmental element essential to life on the planet and that requires protection that guarantees sustainable use;

[12] Law n.º 58/2005, of December 29th in current writing.
[13] Directive 2000/60/EC of the European Parliament and the Council, October 23th.

- the **principle of the economic value of water**, by which it is recognized that water, being a scarce resource, must be used efficiently, with the water user confronting the costs and benefits that are inherent to it.

Thus, the use of water resources is subject to the application of a Water Resources Fee (TRH), under the user-pays and polluter-pays principles, meaning that the user of water resources contributes to the extent of the cost that they impute to the community or to the extent of the benefit that the community provides to it, aiming to promote the sustainable use of water resources, namely through the internalization of costs due to activities likely to have a negative impact on these resources.

The collection of this fee is established in the Economic and Financial Regime of Water Resources[14], reference legal document for water pricing policy in Portugal. This instrument is of the utmost importance in implementing the principles that are at the genesis of the Water Law.

The TRH thus constitutes an economic and financial instrument that aims to offset the benefit that results from the private use of the public water domain, the environmental cost inherent to activities likely to cause a significant impact on water resources, as well as the administrative costs inherent to planning, management, supervision and guarantee of water quantity and quality. It applies to all uses of water, regardless of their origin (surface or underground) and ownership (public water domain of the State or private water domain), and covers the various sectors of activity and different types of users (public or private, collective or singular).

TRH focuses on the following uses of water resources:

- Private use of water from the State's public water domain;

- The direct or indirect rejection of effluents into water resources, which could cause a significant impact;

- The extraction of inert materials from the State's public water domain;

- The occupation of land or water planes in the State's public water domain;

- The use of water, whatever its nature or legal regime, subject to public planning and management, likely to cause a significant impact.

According to Decree-Law n.º 97/2008, the TRH base is made up of six components, expressed by the following formula:

$$TRH = A + E + I + O + U + S$$

on what,

**A** = use of water from the State’s public water domain;

**E** = wastewaters rejection;

**I** = extraction of aggregates from the State's public water domain;

**O** = occupation of the State’s public water domain;

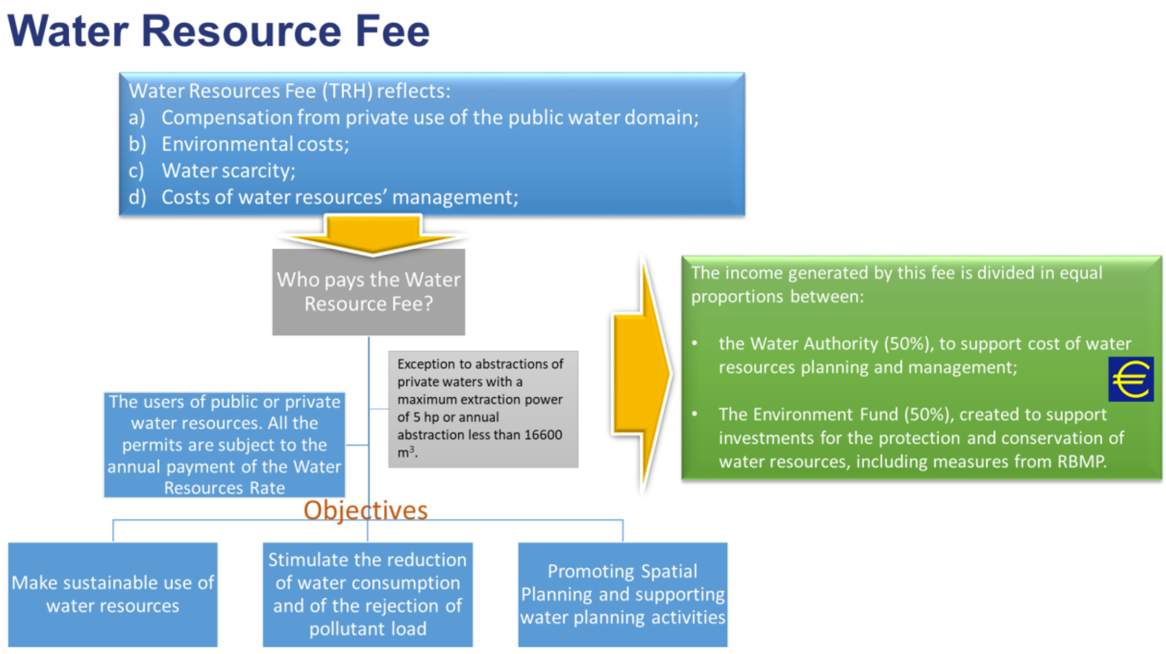
**U** = use of water subject to public planning and management;

**S** = promote the sustainability of urban water systems.

The application of the components is cumulative, that is, for the same use, such as water abstraction, it may be necessary to pay for more than one component, such as the occupation of public domain in addition to the volumes collected. Each of the components may be subject to the application of reductions or exemptions, in accordance with what is established in the legal documents in force. Also, the calculation of component A includes, in addition to applying a base value to the volume

[14] Decree-Law n.º 97/2008, June 11th.

captured or used, the multiplication by a scarcity coefficient applicable in each river basin, when it is not marine waters (they include coastal and territorial waters, but not transitional waters).




- Figure 1 – Water resource fee implementation scheme

The TRH application came into force in July 2008 in a harmonized manner at national level, thus ensuring that information relating to the calculation was gathered and centralized in a single system and the assumptions made were universal. This application guarantees the carrying out of the following operations: registration of users of water resources and their respective usage titles, registration of the results of self-control of uses, calculation of TRH amount, sending of information to be included in the annex to the single billing document, management of receipts, calculation of late payment interest and management of defaults. It also includes a portal where the water resources users can upload data from the self-control program, which serves as a basis for calculating the TRH, as well as consult the annexes to the single billing documents issued to them.

**Table 7 Synthetic overview of the actions taken**

| | Type of actions | Characteristics |
|---|---|---|
| ✓ | Regulatory | • Law n.º 58/2005 of December 29th, in current writing<br>Approves the Water Law, transposing Directive 2000/60/EC into the national legal order and establishes the bases and institutional framework for sustainable water management.<br>• Decree-Law n.º 226-A/2007, of May 31st, in current writing<br>Establishes the regime for the use of water resources.<br>• Decree-Law n.º 97/2008, of June 11th, in current writing<br>Establishes the economic and financial regime of water resources. |
| ✓ | Technical | Acquisition of specialized services for the development of the TRH application. |
| ✓ | Economic | The fee paid returns to the environment and users can once again enjoy the benefits of the recovery of water bodies, as well as benefit from support for projects that promote water and energy efficiency. The Environmental Fund includes all the environmental fee collected and had supported important projects |
| | Research | -. |

| | | |
|---|---|---|
| ✓ | Governance | Define a Water Pricing Policy based on the integration of both social and economic value of water and environmental aspects of water resources' management. Implement the Polluter-Pay and User-Pay principles. Promote the costs' internalization, associated with damage to the water status, including environmental and water services costs. Apply to all the water resources uses in order to promote a more sustainable water use. |
| | Others | - |

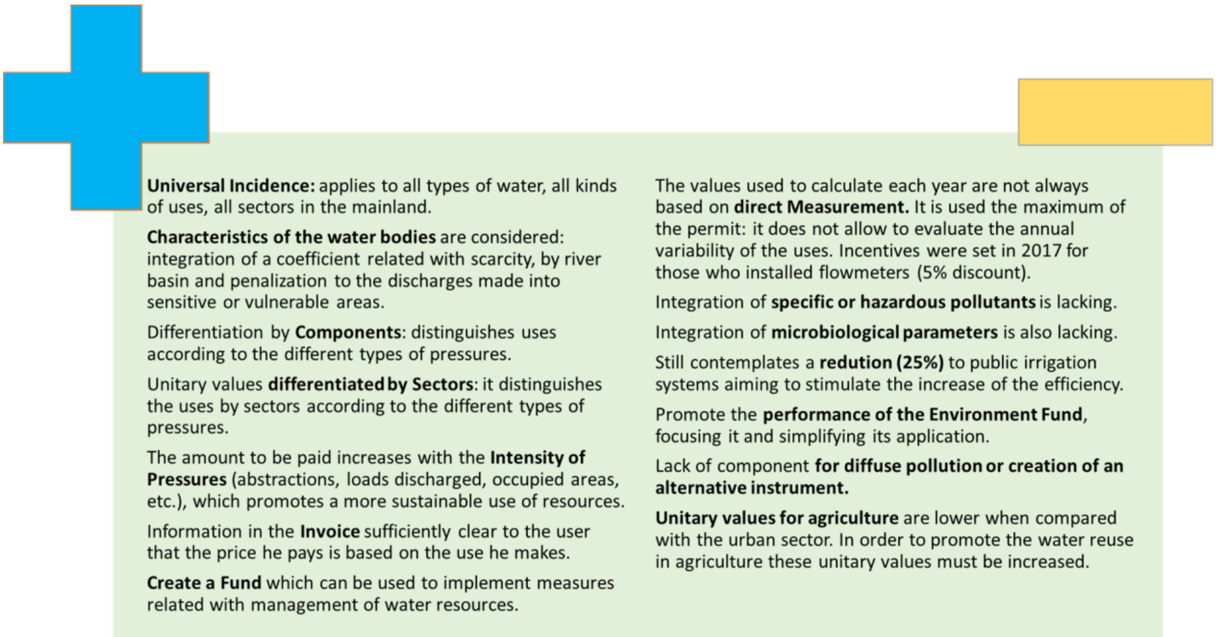



Figure 2 – Positive and less positive points of the implementation of the TRH

<u>Results achieved so far:</u>

Annually, Portugal measures the revenues from TRH on the hydrographic regions of the mainland, in terms of their components and activity sector.

**Table 2 – Distribution of TRH total revenue by component, on the mainland**

| Settlement period | Component A (M €) | Component E (M €) | Component I (M €) | Component O (M €) | Component U (M €) | Component S (M €) | TOTAL (M €) |
|---|---|---|---|---|---|---|---|
| **2014** | 12,3 | 9,0 | 0,2 | 2,3 | 3,1 | 0,0 | **26,9** |
| **2015** | 12,9 | 9,2 | 0,2 | 2,5 | 3,3 | 0,0 | **28,0** |
| **2016** | 12,8 | 10,9 | 0,1 | 2,5 | 3,3 | 0,0 | **29,7** |
| **2017** | 13,9 | 11,4 | 0,1 | 2,6 | 3,6 | 2,4 | **33,9** |
| **2018** | 14,1 | 11,8 | 0,1 | 2,7 | 3,8 | 5,6 | **38,1** |
| **2019** | 15,3 | 11,9 | 0,1 | 1,8 | 3,9 | 5,8 | **38,8** |
| **TOTAL (M €)** | **81,3** | **64,1** | **0,8** | **14,4** | **21,0** | **13,8** | **195,4** |

M € - Millions of euros.
n.a. – not applicable

Carrying out an analysis of the distribution of total revenue from TRH on the mainland, by component integrated in its calculation, it can be seen that component A (water collection) represents approximately 42% of the total revenue collected over the period under analysis, following component E (wastewaters rejection) is 33% and component U is 11%. It should also be noted that the component O (occupation of public domain), which represents approximately 7,4% of total TRH revenue throughout the entire period under analysis, contributes almost the same as the component S (around 7 % of total TRH revenue collected between 2014 and 2019), the latter only collected since 2017.

**Table 3 – Distribution of TRH total revenue by component and by sector, on the mainland, in 2018**

| | Component A (€) | Component E (€) | Component I (€) | Component O (€) | Component U (€) | Component S (€) | TOTAL (M €) | |
|---|---|---|---|---|---|---|---|---|
| Agriculture | 1 466 896 | | | 22 809 | 371 794 | | 1,9 | 4,9% |
| Urban | 9 215 410 | 8 701 820 | | 26 023 | 2 482 546 | 5 643 215 | 26,1 | 68,4% |
| Industry | 716 713 | 2 875 097 | | 31 956 | 164 039 | | 3,8 | 9,9% |
| Energy (Hydroelectric) | 410 657 | | | 11 487 | 78 076 | | 0,5 | 1,3% |
| Energy (Thermoelectric) | 1 385 044 | | | | 259 972 | | 1,6 | 4,3% |
| Others | 904 171 | 219 705 | 113 071 | 2 588 603 | 402 223 | | 4,2 | 11,1% |
| TOTAL (M €) | 14,1 | 11,8 | 0,1 | 2,7 | 3,8 | 5,6 | 38,1 | 100,0% |
| | 37,0% | 31,0% | 0,3% | 7,0% | 9,9% | 14,8% | 100,0% | |

M € - Millions of euros.

By analyzing the previous table, it is clear that the urban sector is representative (68%) of the total revenue generated from TRH on the mainland, followed by industry and other sectors by a large margin. The reductions applied for calculating the TRH contribute greatly to this situation, especially with regard to component A for the agricultural sector. Analyzing the components involved in TRH, we can see the predominance of components A and E compared to the others, together making up 68% of the total revenue recorded on the mainland in 2018. The contribution of component S stands out once again, which is approximately equivalent to the joint contribution of the O and U components.

**Table 4 – Distribution of TRH effective revenue by component, on the mainland**

| Settlement Period | Component A (M €) | Component E (M €) | Component I (M €) | Component O (M €) | Component U (M €) | Component S (M €) | TOTAL (M €) |
|---|---|---|---|---|---|---|---|
| 2014 | 12,2 | 8,6 | 0,1 | 2,0 | 3,1 | 0,0 | 26,0 |
| 2015 | 12,4 | 8,7 | 0,1 | 2,2 | 3,2 | 0,0 | 26,5 |
| 2016 | 12,5 | 9,7 | 0,1 | 2,2 | 3,2 | 0,0 | 27,7 |
| 2017 | 13,5 | 10,8 | 0,1 | 2,2 | 3,5 | 2,3 | 32,5 |
| 2018 | 13,4 | 10,4 | 0,1 | 2,2 | 3,6 | 5,6 | 35,3 |
| 2019 | 13,8 | 11,1 | 0,1 | 1,4 | 3,6 | 5,6 | 35,6 |
| TOTAL (M €) | 77,8 | 59,4 | 0,5 | 12,3 | 20,0 | 13,5 | 183,6 |

M €

- Millions of euros.
n.a. – not applicable

The analysis of the values shown in the table above allows us to conclude that, in general, the TRH settled on the mainland has gradually increased in the period between 2014 and 2019, with only a slight decrease in revenue from settlement being recorded in 2018 of components A, E, O and U. As already seen for the TRH total revenue, the effective revenue is also based mainly on the contribution of components A and E.

M € - Millions of euros.

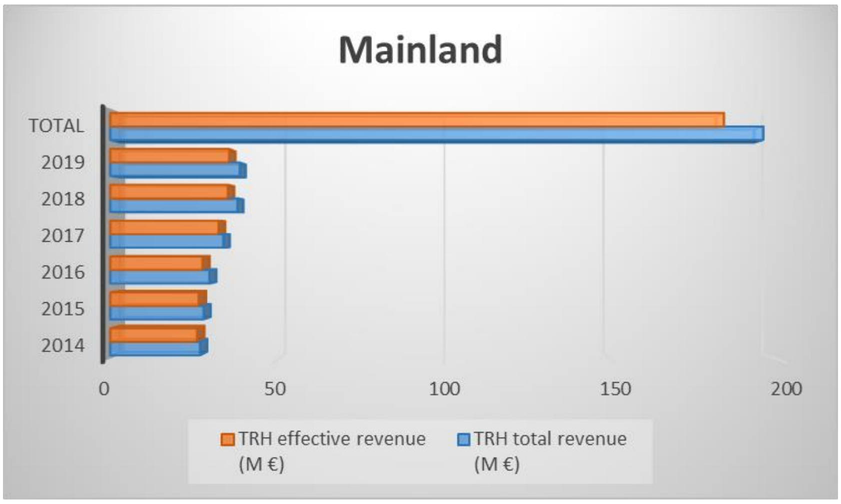



**Figure 3– Comparison between TRH total and effective revenue, on the mainland, in 2018.**

Comparing the total and the effective revenue it can be seen that, in general, less revenue is collected compared to the total calculated, mainly due to non-compliance with payment deadlines arising from the presentation of complaints, the cessation of activities, the transfer of uses, the declaration of insolvency by the holder, death of the holder, among others. In global terms, on the mainland, total effective revenue represented 94% of total revenue in the period under analysis.

**Table 5 – Distribution of TRH effective revenue by component and by sector, on the mainland, in 2018**

| | Component A (€) | Component E (€) | Component I (€) | Component O (€) | Component U (€) | Component S (€) | TOTAL (M €) | |
|---|---|---|---|---|---|---|---|---|
| **Agrículture** | 1 258 529 | | | 22 211 | 320 793 | | 1,6 | 5% |
| **Urban** | 9 201 076 | 8 666 639 | | 26 023 | 2 454 811 | 5 582 547 | 25,9 | 74% |
| **Industry** | 320 225 | 1 560 025 | | 31 328 | 62 628 | | 2,0 | 6% |
| **Energy (Hydroelectric)** | 376 327 | | | 11 487 | 71 783 | | 0,5 | 1% |
| **Energy (Thermoelectric)** | 1 385 044 | | | | 259 972 | | 1,6 | 5% |
| **Others** | 872 776 | 203 623 | 89 635 | 2 092 920 | 386 859 | | 3,6 | 10% |
| TOTAL (M €) | 13,4 | 10,4 | 0,1 | 2,2 | 3,6 | 5,6 | 35,3 | 100% |
| % Componentes | 38,0% | 29,6% | 0,3% | 6,2% | 10,1% | 15,8% | 100,0% | |

M € - Millions of euros.

M € - Millions of euros.

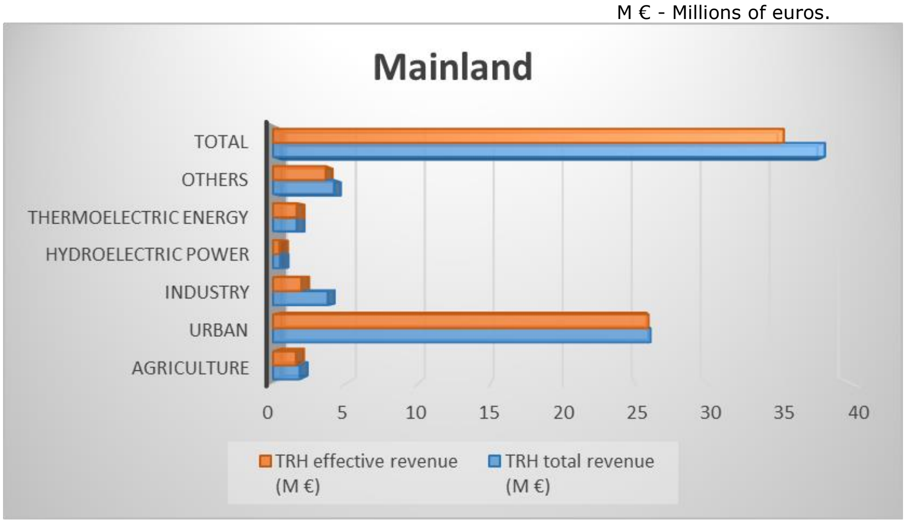



**Figure 4– Comparison between TRH total and effective revenue by component and by sector, on the mainland, in 2018.**

Analyzing the distribution of effective revenue by sector, it is possible to confirm that the urban sector is the largest contributor to TRH revenue on the mainland. This hegemony is even slightly higher than the one that was seen in the revenue calculated (Table 2). On other hand, it appears that the industry presents a higher percentage of total revenue than the actual one. The distribution by component of TRH total and effective revenues presents the same pattern, showing a slight inferiority for the effective revenue, especially in components A and E compared to the others.

<u>Environmental Fund</u>

The fee paid returns to the environment and users can once again enjoy the benefits of the recovery of water bodies, as well as benefit from support for projects that promote water and energy efficiency. The Environmental Fund includes all the environmental fee collected and had supported important projects.

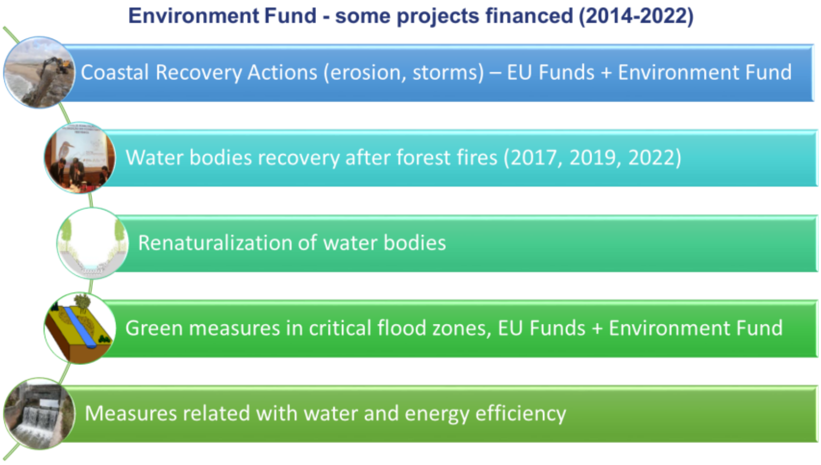



Figure 5 - Typology of water-related projects supported by the environmental fund

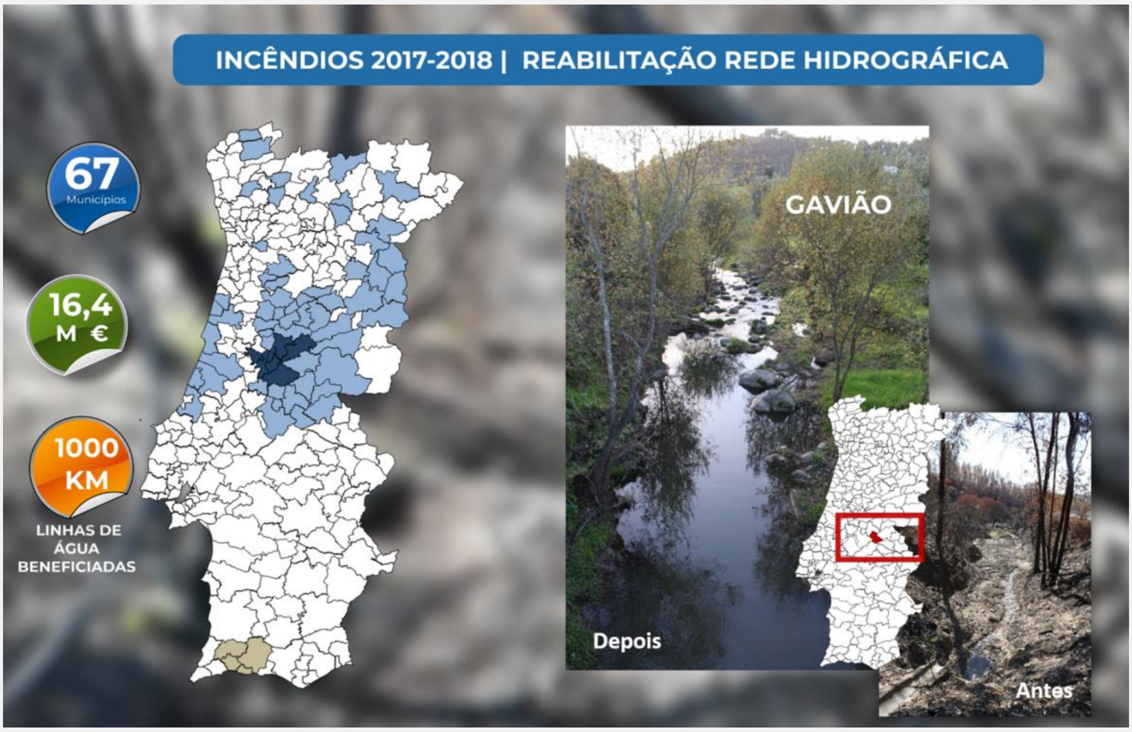
**Recovery of part of the Este River (Cávado PTRH2)**

## Recovery of part of Levira River (Vouga PTRH4A)


## Recovery of Leça River (Douro PTRH3)


## Water bodies recovery after forest fires


Intervenção – Incêndios Rurais de 2017
containment of exotic and invasive vegetation
eucalyptus felling
detention basin (combating soil erosion)


INCÊNDIOS 2017-2018 | REABILITAÇÃO REDE HIDROGRÁFICA
67
Municípios
16,4
M €
1000
KM
LINHAS DE
ÁGUA
BENEFICIADAS
GAVIÃO
Depois
Antes

## Coastal recovery (Sesimbra)


Difficulties faced:

The several legislative changes and the need for integration with the permit system requires constant follow-up supported by specialized technicians.

Remaining constraints:

Considering the effects of climate change on water availability and the need to further increase water efficiency and alternative sources (namely water for reuse), as well as the need to reduce the loads of other pollutants in addition to organic matter and nutrients , there is therefore room to increase the effectiveness of the application of HRT, in particular through:

- Inclusion of microbiological parameters, specific pollutants and priority substances in the calculation of component E;

- Increase in base values associated with the purposes applied to the most consumptive uses, focusing on incentives for those who demonstrably demonstrate more efficiency;

- Promotion of the adoption of measurement practices with telemetry in order to have more effective control of water use, aiming for an equitable application of the rate;

- Application of a scarcity coefficient to private waters for greater equity and better protection of the resource;

- Decrease in reduction and correction percentages associated mainly with components A, E and U in order to ensure better compatibility between the use and protection of water resources;

- Introduction of an environmental compensation component when there is a change in the hydrological regime or river continuity;

- Improvement of the computer system that serves as the basis for calculating and issuing settlement notes, providing it with information management and statistical features that allow for a more in-depth analysis of the application of the TRH.

Planned next step

Integration with the permitting and the self-control program report components of SILiAmb - APA's Integrated Environmental Permitting System.

Transferability

Taking into account the national or regional specificities of each country, it is possible to develop similar tools to support the permitting process, which is crucial to the efficient and effective management of water resources.

### 10.7.4 Further information

https://apambiente.pt/agua/taxa-de-recursos-hidricos

Contact:

Portuguese Environment Agency; https://apambiente.pt/

drh.geral@apambiente.pt