Strategic Orientations on Water and Climate Change

GOBIERNO DE ESPAÑA
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
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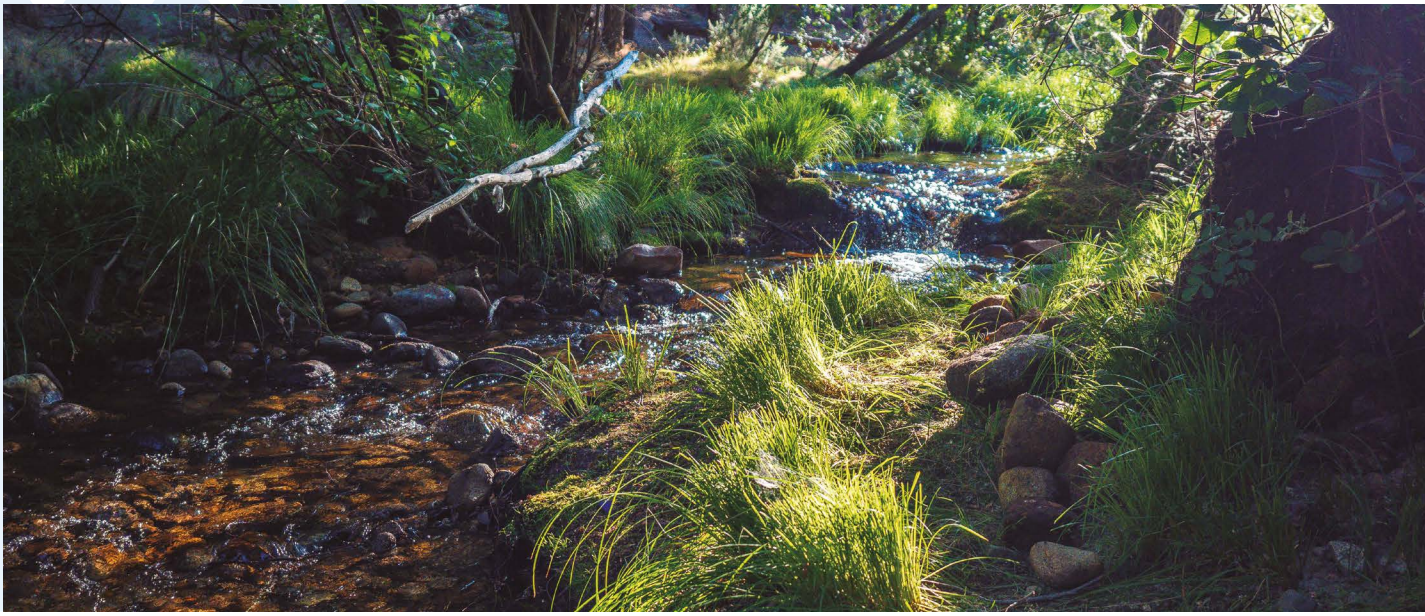
The Strategic Orientations on Water and Climate Change were approved by the Council of Ministers on July 19, 2022 in development of the provisions of article 19.2 of Law 7/2021, of May 20th, on Climate Change and Energy Transition.

EXECUTIVE SUMMARY



Manzanares River in the Sierra de Guadarrama National Park (Madrid).
River Nature Reserve, Tagus basin, selected for monitoring of climate change.

Aim and objectives

Throughout the historical process followed to address the great water irregularity existing in Spain, there has not always been sufficient environmental awareness, nor adequate solidarity towards future generations. The commitment to the Sustainable Development Goals (SDG) and the 2030 Agenda should make us reflect on the actions that we must undertake in order to guarantee water security, achieve the environmental objectives linked to water and promote the social aspects of sustainable development, which largely contribute to providing solutions to face the demographic challenge.

The EU's 2000 Water Framework Directive already warned about the need to make a change in traditional policies. Because doing nothing or doing business as usual will not only lead to higher costs, but will also make a minimum development model unfeasible.

With this objective, article 19.2 of the Climate Change and Energy Transition Act establishes the need to develop a Water Strategy for the Ecological Transition whose mission will be to establish the guidelines and measures that must be considered in the planning and management of water in Spain. In compliance with this mandate, the drafting and approval of this Water Strategy for the Ecological Transition as a *programmatic planning instrument of the Public Administration* is agreed.

According to the Intergovernmental Panel on Climate Change (IPPC), the Mediterranean region is especially sensitive to the impacts of climate change. These risks have been assessed for different climate scenarios, and all of them agree in highlighting the high probability of deterioration of our river ecosystems, the presumed reduction in the water security of water demands and uses, and the intensification of episodes of floods and droughts.

Climate change confronts us with the undeniable fact of having to overcome this reactive concept of water policy, and therefore, of taking into consideration, with all its consequences, the relevance of the integrated water resources management and its governance, in a framework of sustainability in which it is necessary to address jointly other policies connected, related and even dependant on the water policy.

Adaptation to climate change

There is no doubt that in the coming years water management will be determined by the impacts that climate change will have on rainfall and temperatures, and indirectly on the state of water ecosystems. All these factors are going to strain the already existing issues regarding water management, so that adaptation to climate change in terms of water resources will become the backbone of the transition strategies of the water sector towards increasing water security, restoring our water bodies and increasing their resilience.

As climate models predict, large areas of our country are especially vulnerable to climate change, not only regarding the reduction of water resources, but also regarding its variability, which will increase, so the complete scenario would be one with less resource available, more floods and more droughts.

All of this will cause a high probability of a decline in water resources, more striking in the arid and semi-arid zones of our country, precisely where river basins currently are burdened with the main water management issues and the worst quality of their bodies of water. It is pertinent to point out that the extensive endowment of infrastructures already existing in Spain leaves little marginal utility for new infrastructures to provide the water management system with adequate resilience, so that the strategy in these areas must opt for actions which rely more on demand management, on the efficient use of the resource, on the use of non-conventional resources (as reuse and desalination), and on the environmental recovery of water bodies.

The National Plan for Adaptation to Climate Change (PNACC) 2021-2030 constitutes the basic planning instrument to promote coordinated action against the effects of climate change in Spain, whose Work Program 2021-2025 has 24 measures associated with water management and water resources.

Policies and strategies on water

The European Green Deal is a true roadmap of what the European strategy should be in terms of the environment and the economy. With this objective, the European Green Deal aspires to achieve “zero pollution for an environment without toxic substances”, both to prevent pollution from being generated and to eliminate it where it is already present in the water environment. To respond to these interrelated challenges, the European Commission adopted in 2021 a “zero pollution” action plan for air, water and soil.

In this same direction, the EU established in 2021 an important milestone in terms of adaptation, the new “EU Strategy for Adaptation to Climate Change: Forging a climate-resilient Europe”. Regarding water management, the Strategy proposes to “expand the frontiers of knowledge on adaptation, promoting nature-based solutions for adaptation and guaranteeing the availability and sustainability of freshwater”.

Another inspiring document for global water policies is the 2030 Agenda for Sustainable Development of the United Nations, incorporated by the Spanish Government through the publication of the Spanish Agenda for Sustainable Development and its corresponding action plan, in which a series of principles and objectives are stated to be taken into account in the planning and management of water. Specifically, SDG goal 6 is dedicated to “Ensuring the availability and sustainable management of water and sanitation for all”.

Another important point of this 2030 Agenda refers to its commitment to the integrated water resources management (IWRM), which considers the horizontal nature of water and the fact that water is not an extractable mineral resource to be used as a productive input, but rather a renewable natural element that has certain environmental conditions to deliver its social functions. Spain has a highly developed IWRM, given our long and extensive tradition in river basin management. But it is obvious that there are still some challenges in this regard, related to water governance, access to information, the water economy and the integration of environmental aspects.

The Spanish Circular Economy Strategy sets a series of quantitative objectives to be achieved by 2030, among which is a 10% improvement in efficiency in water use. Specifically and regarding irrigation, the aforementioned document states that "modernization projects will be ranked in accordance with hydrological planning criteria in which surface or groundwater is to be replaced by reclaimed water, within the framework of a balanced, sustainable and orderly territorial development of our rural areas".

The National Plan for Adaptation to Climate Change (PNACC) 2021-2030 approved on September 22, 2020 and Order TED/132/2022, of February 21, adopts the First Work Program of the National Adaptation Plan to Climate Change 2021-2030.

The Strategy for a Just Transition soundly contributes to these Strategic Orientations. Such instrument will allow the identification and adoption of measures that guarantee equitable treatment and solidarity to workers and territories affected by the transition to a low-carbon economy. On similar grounds, the Strategy against the Demographic Challenge, assesses the impact and demographic perspective to the preparation of investment, regulations, plans and programs.

Water in the Climate Change and Energy Act

Article 19 of the Climate Change and Energy Transition Act is devoted exclusively to the "Consideration of climate change in water planning and management".

Fuente del Mas Royo spring, Ebro river basin (Teruel, Aragón)

The Act states as objectives of Spain's climate and hydrological policies water security for people, biodiversity and socioeconomic activities together with an increased system's resilience. A water security that must be achieved in accordance with the hierarchy of uses established by the River Basin Management Plans, and reducing its exposure and vulnerability to climate change, taking into account that the regime of ecological flows should not be defined as another competing use of water, but as a prior restriction to the uses of water within the water management system of each river basin.

The Act also defines the goal of the Strategy's contents, as "hydrological planning and management must be adapted to the guidelines and measures developed in the Water Strategy for the Ecological Transition, although remaining observant to any powers entitled to the Regional governments".

The Act indicates a series of specific risks which Spain's strategy, planning and management of water will have to address, specifically those originated from the changes in flow regimes and the alterations of the basins' vegetation, the higher frequencies of extreme events (floods and droughts), the increase in the temperature of water bodies and the rise in sea level and their impact on coastal aquifers, wetlands and coastal systems.

Challenges in water management to face climate change

Spain is a country with a great climatic and geographical diversity, which has as a consequence the existence of differentiated hydrological environments. The Mediterranean climate of most of Spain is prone to significant rainfall irregularity, with regular periods of drought and also with major flood episodes. According to the European Environment Agency, Spain is the Member State of the European Union with the greatest imbalance between extraordinary flood flows and ordinary flows, which happen mainly on its Mediterranean side.

It is evident that in the coming years Spain will have to face important challenges in water management. To the issues inherent to the management of water resources, and those that the different basins have been facing for many years, now we must add the impacts of climate change on our water management systems and on their related ecosystems.

There are currently more than 2,000 urban settlements in Spain over 2,000 inhabitants equivalent which generate a load of more than 63 million inhabitants equivalent. Despite the progress made by Spain as a result of the implementation of the 1995-2005 Sanitation and Wastewater Treatment Plan, in recent years there has been a certain slowdown in investments in sanitation and wastewater treatment. Partly as a result of this, the EU has opened various infringement procedures to Spain in recent years for non-compliance with sanitation and wastewater treatment obligations in settlements over 2,000 inhabitants equivalent. Currently, 477 urban settlements do not meet all the conditions required by the EU in terms of wastewater treatment.

On the other hand, Directive 91/271/EEC on the treatment of urban wastewater is in process of being reviewed by the European Commission, which will mean an enormous challenge for our country. After 30 years in force, this review aims to address important still pending challenges, among others: the presence of remaining pollution, such as that generated in small settlements of less than 2,000 inhabitants equivalent, individual treatment systems, urban runoff or storm waters overflows; the need to treat new micropollutants such as drugs or microplastics; the issue of eutrophication in European waters; the need to improve energy use in order to move towards climate neutrality, or waste management, especially sewage sludge.

Another important challenge that Spain has to face is the environmental recovery of groundwater. Despite its strategic importance, 48% of groundwater bodies are in poorstatus, 23% in poor quantitative condition due to over extraction exceeding their renewable threshold and 35% in poor chemical condition, mainly due to diffuse pollution caused by nitrates and pesticides.

Aquifer over-exploitation is generally more patent in the regions of Spain where water has higher economic value, and where the breach between water demand and the available resources is larger. The intensive use of groundwater in these areas has caused a significant decrease in groundwater levels, with significant environmental effects, such as the cessation of discharge to fountains and springs, causing many of them to dry up, the disconnection of aquifers with surface water or saline water intrusion into coastal aquifers. In some areas, mainly in the southeast of the mainland, groundwater levels have dropped hundreds of metres below their natural former levels.

This intensive use, fundamentally for agricultural use, is directly related to the issue of pollution by nitrates, which is particularly important in groundwater bodies. The increase in nitrate levels has skyrocketed in the last two decades of the last century, coincident with an intensive use of groundwater in some areas. Subsequently, a certain stabilization of the situation has been achieved, but it has not been possible to reverse it, which has led to the opening of an infringement procedure against Spain for non-compliance with Directive 91/676/EEC, regarding nitrate pollution.

On the other hand, it must be borne in mind that there are still many uncontrolled pesticides, which hold special importance regarding its infiltration through water into aquifers, and above all, the fact that this type of contamination is latent, delaying its arrival at the aquifer according to their time of passage through the soil unsaturated zone.

Like diffuse pollution, hydromorphological changes in rivers have caused a significant loss of biodiversity and ecosystem services. Nearly 30% of surface water bodies suffer some type of hydromorphological impact. The profoundly altered situation of many of our rivers, which in many cases have even suffered an inversion with respect to their natural hydrological regime, back up the need to make decisive progress in their renaturalization.

It is essential to promote the linear continuity of river ecosystems, for which transversal barriers are one of the most relevant hydromorphological pressures. In interregional basins alone, more than 19,000 barriers to sediment and fauna have been inventoried. In terms of transversal continuity and connection with riverbanks and floodplains, more than 14,500 bank stabilization works or dikes or flood protection berms have been inventoried in the interregional basins, in a total of 13,600 km in length.

Last, Spain has kept for decades a very fragile balance between the available water and the water that agriculture, livestock, industry and households consume. Although significant progress has been made in increasing our desalination capacity, the reuse of treated wastewater, the modernization of irrigation systems or changes in consumption habits, Spain still has one Europe's highest Water Exploitation Index, which is aggravated by increasingly frequent droughts.

Lines to take to address the challenges

The main lines to take of the water policy to be followed in Spain in the coming years are summarized below.

Mainly Directive 2000/60/EC Water Framework (WFD) and its related directives, Directive 91/271 on the treatment of Urban Wastewater, Directive 91/676 on the Protection of Water against contamination by Nitrates, Directive 2007/60 on Flood Risk Assessment and Management and Directive 2020/2184, on the quality of water intended for human consumption, among others.

Water planning in a context of adaptation to climate change

- Launch the new cycle of hydrological planning (2022-2027), which is expected to be approved during the year 2022 in the 25 river basin districts. The purpose of the River Basin Management Plans is to achieve the environmental objectives for the water bodies and associated ecosystems, as well as meeting the demands for the different uses, compatible with the good state of the waters, in a context of adaptation to climate change aligned with the Climate Change and Energy Transition Act and the implementation of the First Work Program of the National Plan for Adaptation to Climate Change 2021-2030.

Dam on the Ebro river in Logroño, Ebro basin (La Rioja)

Recover, restore and protect rivers, lakes, aquifers and wetlands.

- Promote the National River Restoration Strategy (ENRR), with actions aimed at conserving and recovering their good condition, minimizing the risks of flooding through proper management of the river domain, the recovery of riverbanks and meanders, and the expansion of river spaces through the implementation of various nature-based solution projects.
- Set in motion actions for the recovery of aquifers through the reduction in the extraction of groundwater by its substitution by alternative resources, mainly from reuse and desalination.

Increase water security

- Promote projects that contribute to savings and lower water consumption through the efficient and rational use of resources, demand reduction and the protection of water bodies and associated ecosystems.
- Foster the expansion of the capacity of existing desalination plants and build new facilities. Developing renewable energy projects that contribute to energy optimization and cost reduction.
- Incorporate circularity actions in the water cycle, by considering treated wastewater as a resource and not as waste, especially for its use in agriculture and in territories that have major hydric imbalances.
- Develop Integrated Water Systems, which take into account the set of conventional and non-conventional resources and facilitate the management of basin authorities, especially in territories with greater hydric imbalances.
- Encourage the use of renewable energies for the production and storage of water, provided that they do not produce unacceptable alterations in the flow regimes of the rivers.
- Enhance the safety of the infrastructures, so that they continue to provide service in proper safety conditions. And finally, maintain the hydraulic infrastructures that comprise the paramount water heritage of the State's dams and canals in good condition.

Foster sanitation, wastewater treatment and reuse

- Promote sanitation and water treatment actions in urban settlements affected by the infringement procedures opened by the EC against the Kingdom of Spain or those non-compliant with the Waste Water Directive.
- Incorporate the latest innovations and technological advances into the treatment facilities in order to adapt to the new requirements that the review of European Wastewater Directive will foreseeably entail.
- Promote specific action plans for small and medium-sized urban settlements, which have greater difficulty in complying with regulatory requirements.
- Establish actions to reduce plastic pollution, seeking solutions that prevent these synthetic materials from reaching the sea.

Fight against diffuse pollution

- Ensure compliance with the regulatory instruments aimed at protecting water bodies from pollution caused by nitrates (Royal Decree 47/2022, of January 18, on the protection of waters against diffuse pollution produced by nitrates from agricultural sources, approved in 2022).
- Implement practices for the sustainable use of phytosanitary products, promote integrated pest management and use alternative techniques to phytosanitary products.

Upgrade flood risk management through PGRI

- Manage flood risks in a coordinated manner, integrating the effects of climate change in risk management and proposing adaptation actions in watersheds which minimize risks, such as natural retention actions, nature-based solutions and green infrastructure.
- Upgrade the hydrological information systems, connecting AEMET weather forecasts with numerical models, real-time information and hazard maps, transmitting information to the agents involved and promoting preparation for the risk of flooding, being a key tool of the National Civil Protection System.

Refine drought risk management through PES

- Manage drought risks in a coordinated manner, integrating the effects of climate change in risk management and proposing management actions for these extreme situations in accordance to the drought phase in which the operating systems are in.
- Refine the indicator systems for prolonged drought and scarcity and develop forecast models for these indicators in the short and medium terms.

Recover Natural Heritage Sites

- Implement Mar Menor Recovery Action Plan.
- Enhance sediment flow and management in the final stretch of the Ebro River under the aegis of the Plan for the Protection of river Ebro's Delta
- Police actions of the hydraulic public domain in the Doñana nature reserve.
- Increase actions of water income and quality improvement in Valencia's Albufera lagoon.
- Implement the Special Plan for the Control and Use of Water in the Area of Influence of the Tablas de Daimiel National Park.

Innovate, research and apply new technologies

- Update monitoring systems for the state and quality of water, developing monitoring early warning systems for floods and droughts and improving the information available on the Ministry's web services.
- Refine the digitization of hydraulic infrastructures, incorporating new management tools such as drones or Big Data analysis, which will join remote sensing and the use of Geographic Information Systems.
- Enhance modelling studies of the hydrological cycle in order to anticipate future scenarios, which will allow correct decision making.
- Incorporate into the nationwide early warning system SAIH (the Automatic Hydrological Information System) the control of the flows supplied to the main users of water and connect with systems of other agencies and entities to feed a developing Decision Support System (DSS) for the management of spates and floods.

Foster sustainable economic activities

- Promote economic reactivation and employment through investments in water management and its infrastructures under the aegis of the Recovery, Transformation and Resilience Plan (PRTR).
- Support business projects that promote water circularity, savings and efficiency in its use by paying special attention to nature based solutions and green infrastructures.

Strengthen financing

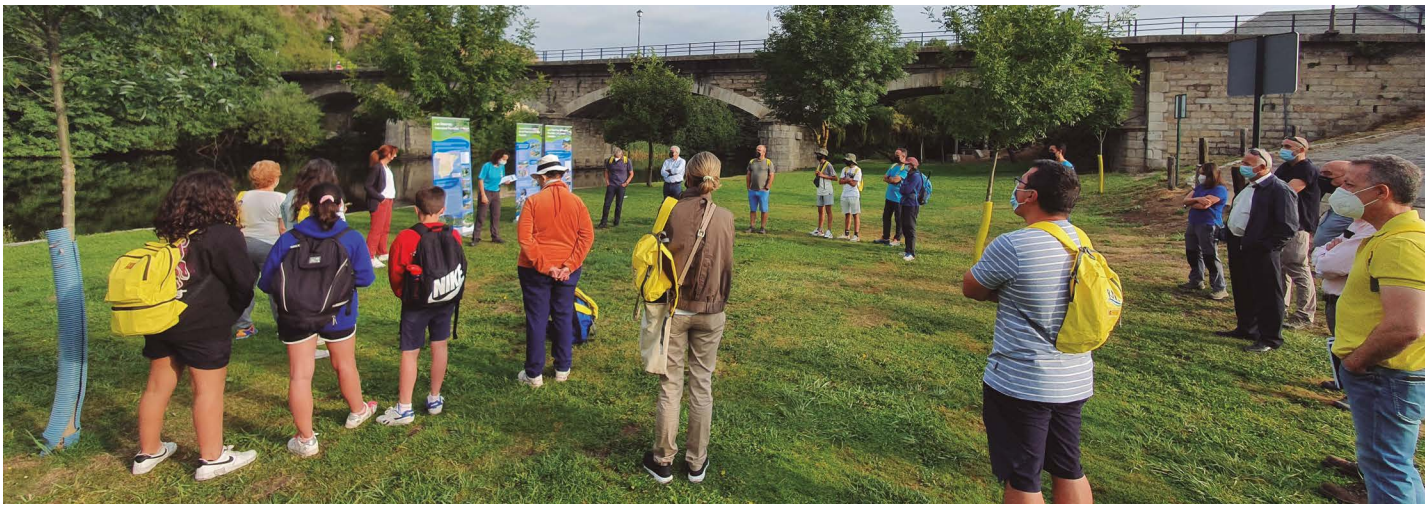
- Allocate from the General State Budget (GBS) 10,000 million euros in 6 years to water management and its infrastructures. At least 1,700 million will originate from the Recovery, Transformation and Resilience Plan (PRTR), promoting projects aimed, among others, at the recovery of rivers aquifers, flood risk mitigation, sanitation, water treatment and reuse, as well as digitization.
- Commit through the FEDER 2021-2027 funding program an estimate of 1,000 million euros investments in water for the next 8 years.

Build a transparent, equitable and participatory water governance model

- Improve coordination between the different government levels and socioeconomic agents for the proper functioning of the urban water cycle.
- Integrate all stakeholders (users, companies and administration), in decision making and promote the public disclosure of the issues and challenges of water management.

Promote the international water agenda

- Promote active participation in the multilateral organizations in which Spain is represented, in particular in UNESCO's Intergovernmental Hydrological Program Council, WMO, OECD and collaborating with UN Water in the SDG6 Accelerator Framework.
- Reinforce the role of water in adaptation to climate change within the actions derived from the United Nations Framework Convention on Climate Change, the Paris Agreement, and the Convention for Biological Diversity.
- Advance bilateral cooperation with partner countries, in particular with Morocco, Algeria, France and Italy.
- Give continuity to the regional work programs developed in Ibero-America, by the Permanent Technical Secretariat of the Conference of Water Directors of Ibero-America (CODIA) and in the Mediterranean, through the Mediterranean Network of Basin Organizations (MENBO) and continuing the work program of the Commission for the Application and Development of the Albufeira Convention (CADC).
- Create a "Spanish Water Partnership" comprising Public Administration institutions, representatives of companies in the water sector, research centres and academia with the aim of facilitating Spain's presence in numerous international water forums.



Environmental volunteering and public participation in the Tera River in Puebla de Sanabria, Duero river basin (Zamora, Castilla y León)

Instruments of the Strategy

The main instruments for dealing with the issues and challenges posed by water management in Spain and the impacts of climate change are described below.

River Basin Management Plans | Planes Hidrológicos de Cuenca - PHC

The 2022-2027 River Basin Management Plans differ from the previous ones in that they contemplate in a more extensive and explicit way the risk of climate change and the need for the management of water resources to adapt to this risk, in order to increase water security and the resilience of systems. And no less important, the need for these plans to contemplate the European and global objectives that Spain has committed to complying with and, in a very special way, the European Green Deal, as the backbone framework that has to make sectoral and environmental policies compatible. For this reason, a fundamental axis to understand these new River Basin Management Plans is the fact that the environmental of bodies masses is prioritized as the main indicator of the robustness and guarantee of water management systems in Spain.

In addition, the River Basin Management Plans are coordinated with different sectoral plans in order to harmonize the needs of the different sectors that affect water, such as land use, energy policy or irrigation.

Regarding the way in which each plan deals with responses to issues, the well-known methodology (Driving Forces-Pressures-State-Impacts-Responses) of the European Environment Agency is applied, which constitutes the reference framework for application of the Water Framework Directive.

National Strategy for River Restoration | Estrategia Nacional de Restauración de Ríos - ENRR

The National Strategy for River Restoration (ENRR) began back in 2005. A little over 15 years after its initial promulgation, a second phase of development of the ENRR is currently being addressed, to update the objectives and development mechanisms of the Strategy.

Its most outstanding lines to take are: the improvement of the hydro-sedimentary regime of the riverbeds, the restoration of longitudinal connectivity through the removal or permeation of transversal obstacles, the restoration of transversal connectivity through the reconnection of riverbeds and floodplains, the restoration of aquatic and riparian habitats, the eradication and control of invasive species in continental aquatic and riparian environments, the carrying out of informative and awareness-raising activities and the development of actions to improve knowledge and innovation.

A key element to understand river restoration and materialize in actions representative, is the catalogue of Hydrological Reserves, which constitute a protection figure that aims to preserve those bodies of water with little or no human intervention and in very good ecological condition.

Due to the review process of the River Basin Management Plans for the third planning cycle (2022-2027), a series of stretches of rivers, lakes and aquifers whose characteristics make them worthy of being classified as hydrological reserves have been identified. With the approval of this proposal, the National Catalogue of Hydrological Reserves will comprise a total of 289 reserves, of which 161 are river nature reserves, 19 lake nature reserves and 22 underground nature reserves. Climate change is to be monitored in 37 interregional river nature reserves.

Strategic Plan for Wetlands | Plan Especial de Humedales - PEH

Wetlands can play an important role in mitigating climate change, reducing floods, offering water security and enriching the biodiversity of ecosystems. The Strategic Plan for Wetlands identifies the main threats over them and establishes numerous lines to take to revitalize these ecosystems due to their undoubted social, environmental and economic values.

Flood Risk Management Plans | Plan de Gestión de Riesgos de Inundación - PGRI

The Mediterranean arc in which Spain is located has rainfall intensity indices that are difficult to compare with other European areas; In some areas of our country, the maximum daily rainfall can be of the order of the average annual rainfall. This causes, in conjunction with the characteristics of the basins, that there is a great disproportion between spate and average flows that the rivers carry up to figures non comparable with other rivers in the region.

Currently in Spain there are 19,900 km of delimited and published flood zones, but it is necessary to generate new cartography of the hydraulic public domain and flood zones of at least 6,000 km of river.

Both flood risk management plans and the measures contained in the River Basin Management Plans must be undertaken in synergy with the environmental recovery of the river domain, as highlighted by the European Green Deal as one of its priorities. For this reason, the EU Biodiversity Strategy 2030 has as one of its goals the restoration by 2030 of the condition of free-flowing rivers in a length of 25,000 km in the European Union, of which Spain plans to recover 3,000 km.

A key element in flood risk management is communication, and for this reason, a National Strategy for Communication against Flood and Adaptation to Climate Change is to be launched together with the improvement of early warning and meteorological and hydrological forecasting systems and their proper coordination with all civil protection protocols.

Special Drought Plans | Planes Especiales de Sequía - PES

The highly irregular rainfall pattern that our country suffers implies that management systems have to be prepared to deal with extreme drought situations. This phenomenon will in all likelihood be aggravated by the effects of climate change, which makes drought planning a fundamental element of water management in Spain.

It should be noted that the special drought plans do not deal with the issue of structural scarcity, associated with permanent issues of meeting demands and not the result of a temporary situation caused by anomaly in rainfall. This structural scarcity must be analysed, valued and resolved through ordinary hydrological planning. However, water management systems cannot be designed to operate normally in temporary situations of extreme scarcity, because this would mean assuming extraordinary costs and installing an excess of idle infrastructure for most of the time. For this reason, the Special Drought Plans (PES) are not, in any case, a framework for the approval of new construction projects, but rather are management plans for resources in extreme situations, for existing infrastructures.

Navacerrada Dam, Tagus basin (Madrid)

The Special Drought Plans (PES) include indicator systems as an objective and useful tool for decision making. Thus, the objective application of measures in the initial phases of scarcity, delays and sometimes prevents, the arrival of the most severe phases (alert and emergency), which are the ones that produce most relevant impacts.

Groundwater Action Plan | Plan de Acción de Aguas Subterráneas - PAAS

Groundwater is an essential resource for covering water demands together with other types of resources, within the framework of an Integrated Water Resource Management. They also constitute an strategic asset in drought situations. Reasons why a priority objective of the strategy must be to achieve and maintain good quantitative and chemical status of groundwater bodies.

Groundwater bodies have a decisive influence on ecological flows and on the good condition of surface waters, since they are responsible for maintaining the base flows of rivers, having the overexploitation to which they are subjected in some places, as well as their pollution, a very negative impact on biodiversity and the environmental recovery of our rivers.

But given that there are still 40% of groundwater bodies in poor condition in Spain, and due to the fact that significant improvements have not been seen in recent years, it is for this reason that there is a need to enhance their knowledge and correct management through the Groundwater Action Plan.

The main lines to take considered in the Action Plan are the following: the improvement of knowledge of groundwater, the expansion and improvement of control networks, the analysis of the representativeness of the data, the measurement, surveillance and control of the uses of groundwater, protection against the deterioration of groundwater, particularly against nitrates and pesticides, pollutants and marine intrusion, the improvement of regulations and the necessary legal and regulatory modifications.

Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse Plan | DSEAR

The DSEAR Plan was approved by Ministerial Order in 2021 with the aim of reviewing the intervention strategies for the execution of the measures that set the water policy in topics such as wastewater treatment, sanitation and reuse.

Half-empty Sichar Reservoir in the Mijares river, Júcar river basin (Castellón, Valencian Community)

The DSEAR Plan is not a planning tool per se, in the sense of including the determination of what, when, how and who carries out certain actions, nor is it associated with a list of investments. It is a governance instrument that establishes a critical analysis of the water supply, wastewater treatment, sanitation and reuse sectors in Spain, identifies the issues detected in seven areas or governance objectives and develops a set of proposals for action for its improvement.

Digitization of the water cycle | PERTE

Digitization of the water sector, either by collecting data and information on water resources, or making it available so that administrations, water users and citizens can use it and establishing a computerized system that facilitates relations of citizens with the Water Administration, is an essential task regarding the efficient and fair management of water.

In this sense, by Agreement of the Council of Ministers of March 22, 2022, the Strategic Project for Economic Recovery and Transformation (PERTE) for the digitization for the water cycle was approved, which is expected to mobilize 3,060 million in the coming years. Euros in public and private investments, and will activate the creation of nearly 3,500 quality jobs, highlighting professionals in engineering, data processing, science and telecommunications.

The PERTE will finance aid programs to promote the digitization of the different water users, with an investment from the General State Budget of some 1,700 Million Euros. Additionally, PERTE proposes an investment of 225 Million Euros to modernize and promote digitization in Basin Authorities and Automatic Hydrological Information Systems.

Refine water governance | Libro Verde de la Gobernanza de Agua - LVGA

Improving water governance entails the review and strengthening of legal and regulatory, coordination and institutional mainstreaming of water policy, participation of the relevant social actors, access to information, transparency and accountability as prior stages for participation, and very importantly, the review of the financial mechanisms that are known, have worked and can work.

In 2020, MITERD carried out an ambitious study to detect these governance gaps and propose institutional, legal, participatory and financial solutions, in the "Green Paper on Water Governance in Spain", a document that provides adequate guidance on how to address water governance in the coming years in Spain.

These principles are consistent with the features presented by the Green Paper and which inspire this Strategy: coordination and coherence of sectoral policies, participation and co-responsibility, and information, monitoring and continuous assessment to apply decision criteria in the prioritization of public actions.

Update and adapt current regulatory framework (TRLA)

The Consolidated Text of the Water Act (TRLA) is the main regulation that establishes the basis for water management in Spain. Originally approved in 1985, since then has included multiple amends, especially regarding European legislation on water, but also trying to improve different aspects related to the more efficient management of water resources and with the protection of its environment.

Nerja WWTP, Andalusian Mediterranean Basins (Málaga, Andalusia)

For this reason, the strategy will focus on the need to approve a new amend to TRLA with the aim of establishing a clearer and more structured text that attempts to resolve the numerous issues in water management that have been noted in recent years, focusing on environmental protection and water security and seeking a more agile and modern water administration.

Reform of the economic and financial regimes

The objectives related to the economic-financial regime must render effective the application of the polluter pays and cost recovery principles and of course, the human right to water, that of achieving a distribution of costs and benefits that is as fair as possible in response to social inequalities and the demographic challenge.

It seems worthwhile to remember that according to Spanish legislation what is collected for the use of water is only used to recover the costs that the administrations assume to provide the service. Even so, the current economic system only serves to recover 70% of the water costs, which is passed on to the end users of the water. The existing collection breach is a significant barrier to materialize the necessary measures to achieve environmental objectives in the water environment. In the coming years, steps should be taken to achieve total cost recovery, with the exceptions already included in current regulations.

Implementation calendar

To develop this Strategy, articulated in the previously described sectoral plans and all of them coordinated with the National Plan for Adaptation to Climate Change, the time horizon is set at 2030, with four significant milestones:

- **Year 2022:** Approvals of the main planning instruments in the field of water: River Basin Management Plans, Flood Risk Management Plans, National River Restoration Strategy and Groundwater Action Plan.
- **Year 2025:** Completion of the first work program of the Work Plan of the National Plan for Adaptation to Climate Change.
- **Year 2027:** Completion of the third cycle of hydrological planning and the second cycle of flood risk planning.
- **Year 2030:** Completion of the horizon of the Strategy and the National Plan for Adaptation to Climate Change.

These strategic guidelines on water and climate change will be reviewed and updated during the year 2030 in coordination with the review of the National Plan for Adaptation to Climate Change 2021-2030.

Participatory workshop for the definition of the "Green Paper on Water Governance"

Strategy monitoring indicators

This Strategy aims to guide Spain's water planning and its management in the coming years. Thus, it is essential to provide the Strategy with some metrics that allow checking its performance over time, on how the water management system in Spain aligns to the objectives of the Strategy. To this end, this Strategy includes some monitoring indicators identified regarding the water management objectives.

1

AIM AND OBJECTIVES

Alberche river in the Tagus basin (Toledo, Castilla-La Mancha)

Water is essential for life and for socioeconomic development in Spain, a country in which we have had to face the irregularity, in the space and time, of water resources, a situation currently aggravated by climate change. In this historical process, it is evident that there has not been enough environmental sensitivity, nor adequate solidarity towards future generations. Today, at a time when we are already using a significant share of natural water resources, the commitment to the Sustainable Development Goals (SDGs) and the 2030 Agenda should make us reflect on the actions we must undertake to guarantee water security, while achieving the environmental objectives linked to water and promoting the social aspects of sustainable development, which will largely contribute to offering solutions to address the demographic challenge.

Water is a right granted to us by nature, which is also connected with other rights, fundamentally the right to healthy food, the right to health, the right to energy or the environment, in short, with the right to living welfare. Water policy should become the main guarantor for the defence of that right to water access and its equitable distribution among all citizens.

The water policy for the coming years must be based on a strategy consistent with the present time, with the social, economic, legal, administrative, technological, environmental situation, and let us also add, cultural and educational, which are the pillars on which we must support the water management system.

And such happens by assuming that the true value of water lies in its renewability, in the ability of the hydric environment to offer quality water, to be able to ensure the water resource as long as we are capable of protecting it and ensuring its biodiversity. And therefore, whenever the capacity of water has been compromised and in some cases seriously diminished, carry out strategies whose fundamental axis of action is to ensure the sustainability of the socio-environmental system.

The EU's 2000 Water Framework Directive already warned about the need to make a change in traditional policies. Because doing nothing or doing business as usual will not only lead to higher costs, but will also make a minimum development model unfeasible.

The water cycle is part of the climate system, so any alteration caused by climate change will affect the water system, and therefore, the regime of flows and recharge of rivers and aquifers, and their quality, in addition to the capacity that water has to provide well-being and guarantee biodiversity.

Water planning and management are vulnerable to the effects of climate change, to the extent that aquatic ecosystems and systems for capturing, distributing, using, treating and discharging water will be affected by climate change, mainly due to changes in rainfall and temperature.

For this reason, the planning and management of water resources must adapt to this circumstance and integrate the impacts of climate change in all its strategies, policies and measures related to the objective *"of achieving water security for people, for the protection of biodiversity and for activities, according to the hierarchy of uses, reducing exposure and vulnerability to climate change and increasing resilience"*.

With this objective, article 19.2 of the Climate Change and Energy Transition Act establishes the need to develop a Water Strategy for the Ecological Transition whose mission will be to establish the guidelines and measures that must contemplate the planning and management of water in Spain.

In compliance with this mandate, the drafting and approval of this Water Strategy for the Ecological Transition is agreed upon, with the character of a *"programmatic planning instrument for Public Administrations"*.

It should be noted that the Strategy does not only aim to adapt the existing water management system to the impacts of climate change, but also to transform the current water management system towards the achievement of a series of environmental objectives related to water quality and biodiversity, without which it would be impossible to guarantee in the future both the well-being of the population and the sustainability of the production and energy system. Therefore, as indicated by the Climate Change and Energy Transition Act, to increase the resilience of the water management systems.

Accordingly, it is not about adapting just to minimize the impacts, but to increase the resilience of the management system by addressing its main environmental, social and economic challenges in the new scenario marked both by climate change and by those inherent to a just ecological transition and the demographic challenge. As highlighted in the preamble to the Climate Change and Energy Transition Act, *"delaying decisions would mean assuming more risks, more costs and more unfairly distributed and giving up opportunities to modernize our economy and our society, putting at risk fundamental objectives for national security"*.

Water has a great value for mitigating climate change, and today it is the only viable way to effectively integrate other renewable energies and guarantee the energy security of our country, in the context of the necessary energy transition, as established by both the Climate Change and Energy Transition Act itself and the European Green Deal in its ambition to turn Europe into a climate-neutral continent. It is necessary to point out that the generation of electricity through hydropower in rivers and reservoirs is climate neutral, and that the integration of the hydropower with the renewable energy generation network, especially through reversible pumping systems of water, could help transform our energy system and reduce our dependence on fossil fuels. Water also has a fundamental value for our food security, through its use in irrigation, an activity that must be compatible with the environmental objectives set for water bodies.

But water and its dependent ecosystems can also help mitigate climate change in other ways. Keeping in mind that wetlands can provide multiple collateral benefits to being carbon sinks, such as the attenuation of floods and droughts, natural purification and the increase of biodiversity, their restoration and conservation are of the utmost importance.

On the other hand, according to the Intergovernmental Panel on Climate Change (IPPC), the Mediterranean is especially sensitive to the impacts of climate change. These risks have been analyzed in some detail according to different climate scenarios, and all of them coincide in highlighting the high probability of deterioration of our river ecosystems and the presumed decrease in water security of water demands and uses, and the intensification of flood episodes and of droughts.

A part of the actions that are carried out on the hydraulic public domain are subject to processes of environmental impact assessment, with the aim of achieving a balance between pros and cons at a social, environmental, economic level, etc. Because the impacts caused by infrastructures or actions on adaptation to climate change, decarbonisation, social justice, the demographic challenge, the environment, the ecological transition or the economy are not always aligned, the Strategy should provide guidance on how to resolve these conflicts between such laudable objectives in such a way that hydrological planning contains sound orientations on how to make all these management objectives compatible.

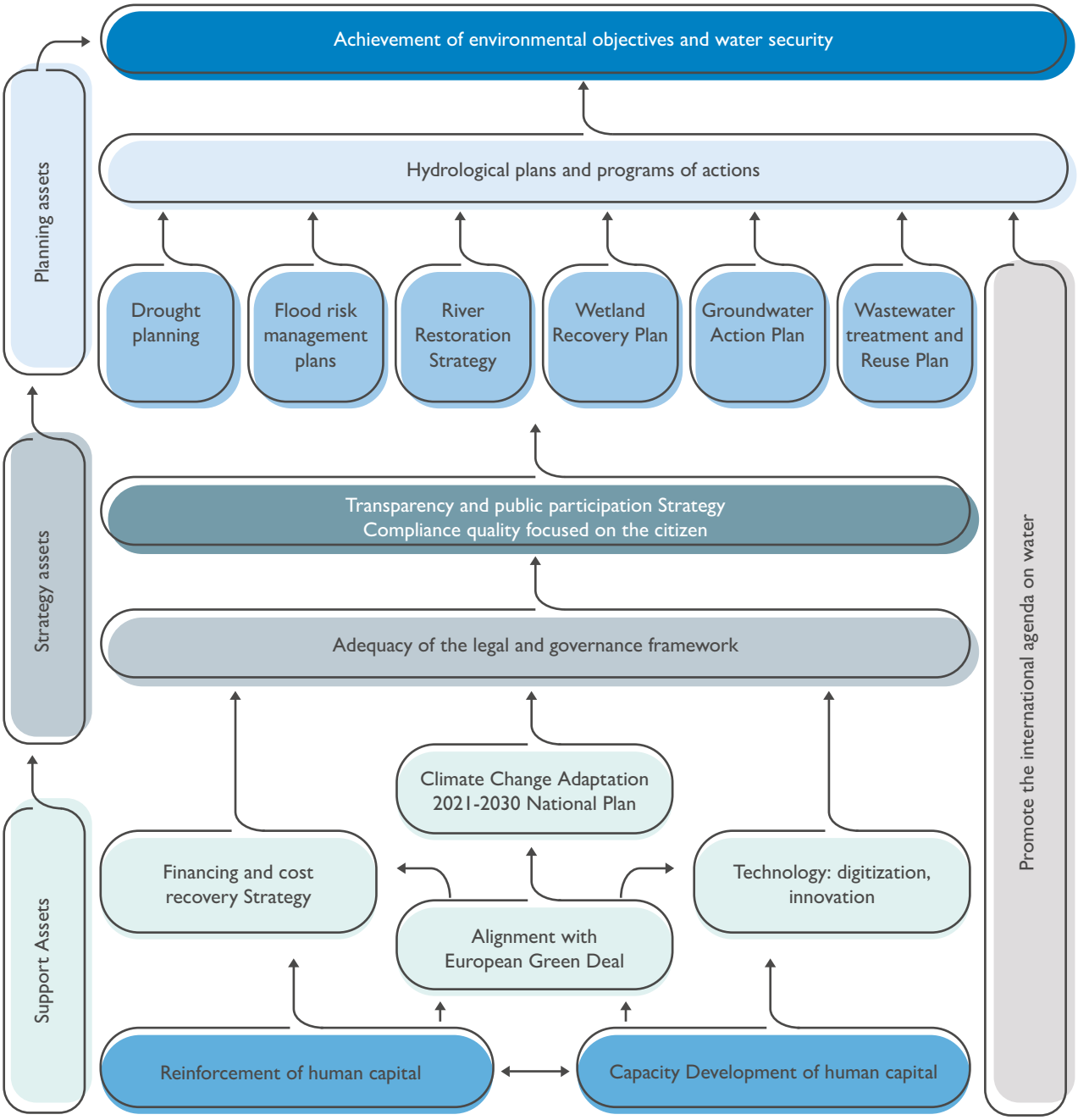
In addition, it is essential that the Strategy defines, regarding water, *"a system of indicators of impacts and adaptation to climate change, which facilitates monitoring and assessment of public policies, as well as the need to prepare risk reports"* associated with the different actions and regarding social vulnerability, population distribution, biodiversity, water security, etc. It cannot be claimed that each action optimizes all these conflicting objectives, but it is possible to ensure that the set of actions over a large territory reaches an adequate balance. For this, it is essential to have these risk indicators and reports.

It should also be noted that each of these water management objectives, depending on the territory in which action is desired, will also involve different administrations and competent administrative bodies and, therefore, with decision-making capacities, as well as the users of water and other agents. Hence the importance of water governance, and in essence, the establishment of roadmaps, schemes, cooperation procedures between administrations that guarantee an effective decision-making process in terms of water planning and management.

The decisions that have historically been made in planning and water management have often depended on other "superior" decisions on land use and territorial planning, demography, industrial production, energy, etc. And the main water issues (water imbalances, deterioration of the state of water bodies,...) have been caused by those other policies that have prevailed when making decisions on the management of water resources. Climate change confronts us with the undeniable fact of having to overcome this reactive concept of water policy, and therefore, of taking into consideration, with all its consequences, the relevance of the Integrated Water Resource Management and its governance, in a framework of sustainability in which it is necessary to treat these other policies in connection, interrelation and even dependency on the water policy.

In this sense, hydrological planning as it is addressed by Spanish and EU legislation stands as an indispensable instrument to adapt our water management system in such direction. This Water Strategy for the Ecological Transition becomes, therefore, a fundamental instrument for coordination and establishment of management principles and objectives that will have to be incorporated into hydrological planning. As stated in the Climate Change and Energy Transition Act: *"consider the principles of the Water Strategy for Ecological Transition for the adaptation and improvement of the resilience of the resource and its uses in the face of climate change in the identification, assessment and selection of actions in River Basin Management Plans and in water management"*.

INSTRUMENTS OF THE STRATEGY



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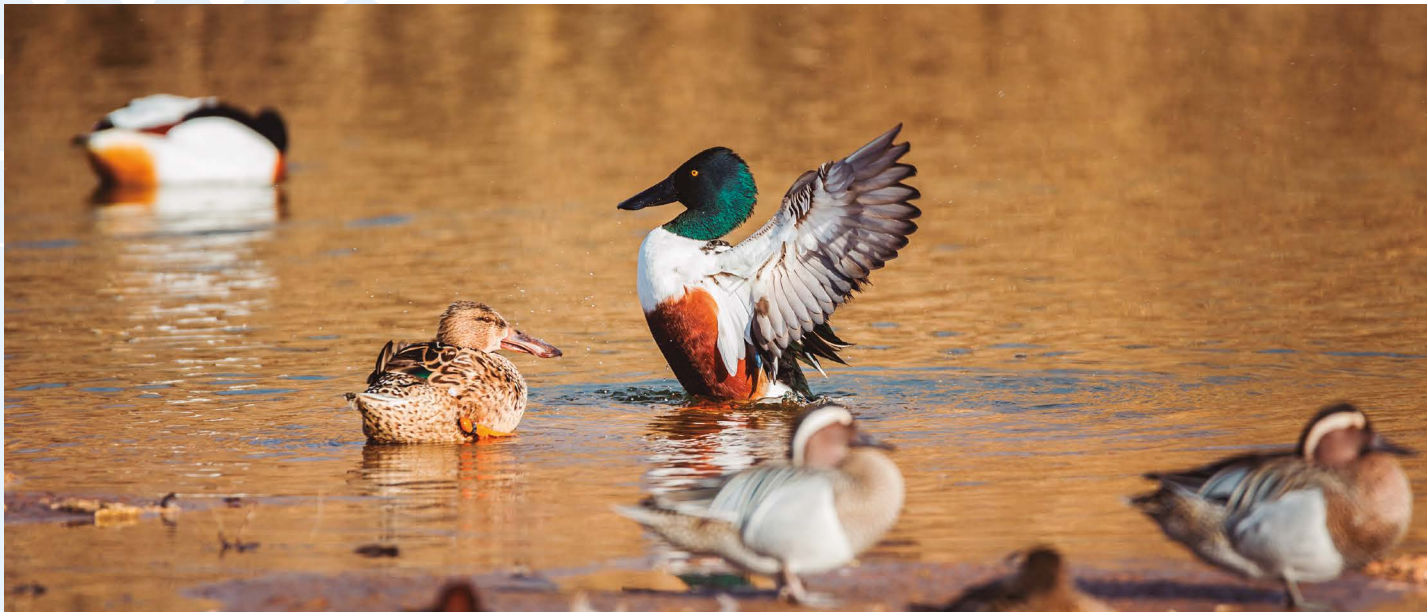
ADAPTATION TO CLIMATE CHANGE



The importance of water is vital for the maintenance of protected species.
Tablas de Daimiel National Park, Guadiana basin (Ciudad Real, Castilla-La Mancha)

There is no doubt that in the coming years water management will be determined by the impacts that climate change will have on the rainfall and temperatures, and indirectly on the state of the water ecosystems and on the vegetation of the watersheds. All these factors are going to strain the already existing issues regarding water management, so the strategy of adaptation to climate change in terms of water resources has to become the backbone of the transition strategies of the water sector towards a scenario of increased water security, restoration of our water bodies and increased resilience.

As highlighted in the 2020 UN Report on Water and Climate Change: *"Climate change will affect the availability, quality and quantity of water for basic human needs, endangering the effective enjoyment of the human right to water and sanitation of potentially billions of people. Climate change-induced hydrological changes will make it even more difficult to sustainably manage water resources, which are already under pressure in many parts of the world."*

The flow regime of the rivers, as well as the recharge of the aquifers, will be affected by climate change in very different ways throughout the planet, but certain areas are already especially vulnerable, either due to the water stress that they currently suffer from the expected decrease in the rainfall regime, will suffer its consequences to a greater extent. To the extent that a large part of the Spanish river basins are in this situation, the effort that our country must make in adapting to climate change must be intense and continuous, with the aim affecting our communities as little as possible on its main socioeconomic and environmental variables.

As the climate models predict, large areas of our country are especially vulnerable to climate change, not only regarding the reduction of water resources, but also regarding its variability, which is going to be increased, so the complete scenario would be one with less available resource, more floods and more droughts.

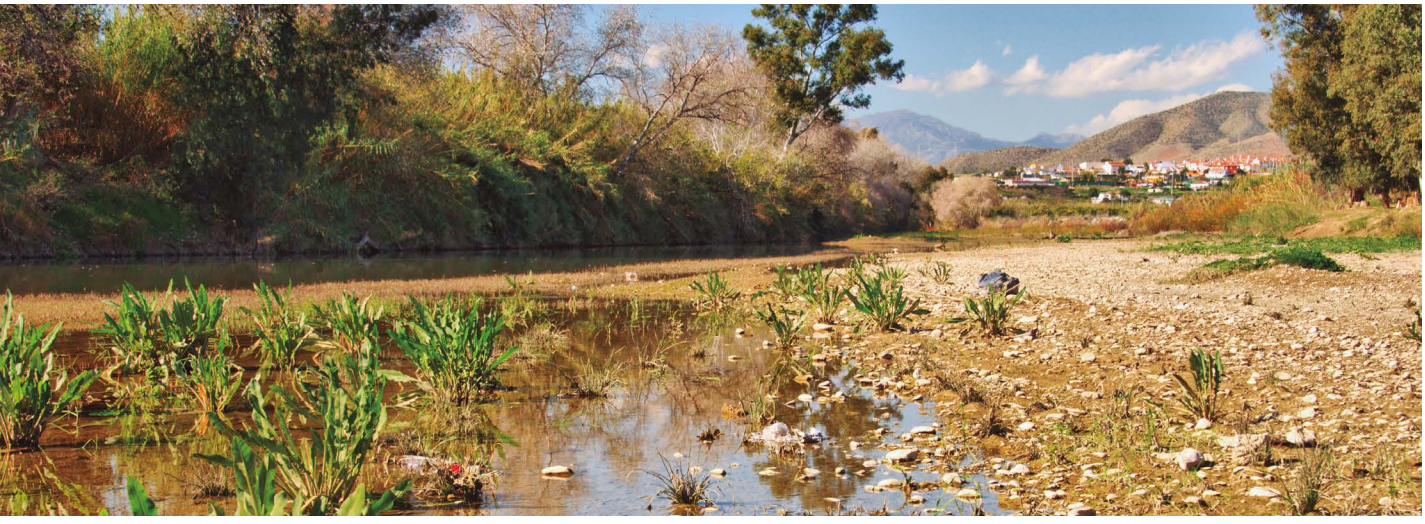
As highlighted in the Climate Change Impact Report and Risk Assesment in Spain (MITERD, 2021), all climate prediction models show a progressive increase in maximum and minimum temperatures and heat waves throughout the 21st entire century. For mainland Spain as a whole, considering all the projections generated for the period 2021-2100, the variations on the annual scale could range between 4.2°C and 6.4°C under the most emissive scenario, and between 2 0.0°C and 3.4°C under the most optimistic scenario. The expected changes in summer are higher than the rest of the seasons, with averages 5°C higher.

Regarding rainfall, the aforementioned report forecasts a *reduction in average rainfall in Spain for the last twenty years of the 21st century, with values relative to those of the reference period (1961-1990), of between 16% and 4%. In Spring, this reduction would be between 24% and 0% while in Autumn it would be between a reduction of 4% and an increase of 4%. The most important relative reductions are expected in Winter, in the river basins in the south and the Mediterranean Levant and in the two archipelagos. For example, in the Andalusian Mediterranean Basins, the projected reductions would be between 18% and 38% at the end of the century and under the most emissive scenario. In Summer, it can be seen that the greatest decreases are located in the southern part of the peninsula and in the extreme northwest of the Iberian Peninsula (with more certainty between models in Galicia) with relative decreases that would be between 6% and 42% by the end of century on the most emissive stage"*.

All of this will translate into a high probability of a decline in water resources, more noticeable in the arid and semi-arid zones of our country, precisely in the river basins that currently suffer from the main water management issues and the worst quality of their water bodies. As mentioned in the aforementioned report: *"Spain has a very heterogeneous spatial and temporal distribution of precipitation, much more pronounced than in other countries, which is combined with an extraordinary variability in the time of contributions. In general, the sensitivity of water resources to increases in temperature and decreases in rainfall is very high, particularly in areas with high average temperatures and low precipitation; that is to say, the most critical areas in Spain are the semi-arid ones. However, these areas generally already have regulation and storage infrastructures, as well as a scarcity management culture"*. Although it is also pertinent to highlight that precisely this extensive provision of infrastructures leaves little marginal utility for new infrastructures to provide the water management system with adequate resilience, so the strategy in these areas must opt for actions that result more in the demand management, in the efficient use of the resource, the use of unconventional resources (reuse and desalination), and in the environmental recovery of water bodies.

Currently, the impacts of climate change on water resources in Spain are already becoming evident. For example, during the second half of the 20th century, a reduction of between 10% and 20% of the available water resources in many basins of the Iberian Peninsula has been detected.

However, uncertainty is still high regarding the statistical significance of these decreases in natural runoff in the Spanish river basins, as evidenced by the latest Report on *Climate Change in water resources and droughts in Spain* carried out by CEDEX (2017). Although the average changes for Spain always give runoff reductions of between 3% and 7% for 2010-2040, between 11% and 14% for 2040-2070 and between 13% and 24% for 2070-2100.



Dry riverbed of the Guadalhorce river in the Andalusian Mediterranean Basins

Regarding droughts, studied based on their return period, most climate projections show a future in which droughts would be more frequent, with this effect becoming more pronounced the further we go in the 21st century.

For such reasons, hydrological planning includes the need to adapt our water management systems, in a prudent manner, to the following scenario of reduction of natural contributions, until the year 2039, percentages that have been considered in the 2022-2027 hydrological planning period, but which must be re-evaluated in the next cycle until 2045, in coherence with what should be a hydrological policy that adapts to climate change.

To the extent that uncertainty continues to exist, as stated in the aforementioned CEDEX report, *"Hydrological planning should not focus so much on determining the share of reduction in water resources given the impossibility of eliminating uncertainty, but rather on analyzing the robustness and resilience of the system in the face of stress situations, to identify where it is most vulnerable and propose adaptation measures"*.

3

WATER POLICIES AND STRATEGIES

Proserpina Reservoir, Guadiana basin. Dam of Roman origin (Mérida, Extremadura)

The Water Strategy must also contain the principles, objectives and criteria that define other documents which also inspire European and Spanish water policy.

3.1. UNITED NATIONS

It should be noted that the right to drinking water and sanitation is an essential human right for the full enjoyment of life, recognized by the United Nations in its Resolution 64/292, of July 28, 2010 and included in the 2030 Agenda on Sustainable Development, where it ranks the availability of water and its sustainable management and sanitation for all, as a priority issue that requires immediate, since it plays a key and horizontal role in the global achievement of many other development goals.

Consistent with this line, in 2014 the European Union (EU) recognized the right to water and sanitation as a human right when it declared that "Water is not a commercial good, but a public good!" through the first European citizens' initiative Right2Water, and which is already part of the new EU water and sanitation legislation.

It should be noted that in order to make this human right to water effective, States must establish which specific water needs of the population must be universally covered, regardless of group, purchasing power, race, territory or any other consideration. Therefore, decisions on infrastructure, management and economic regime must have the priority of guaranteeing this right without exclusions, and therefore, of establishing both the priorities for use in the territory, as well as the quality of the rivers and aquifers, attending to this essential goal.

It should also be taken into account that the water crisis is not only due to its scarcity, but as defined by the Special Rapporteur on the Human Rights to Drinking Water and Sanitation (UN, 2021), due to the priorities that States impose on its uses in opposition to the Human Rights to Drinking Water and Sanitation.

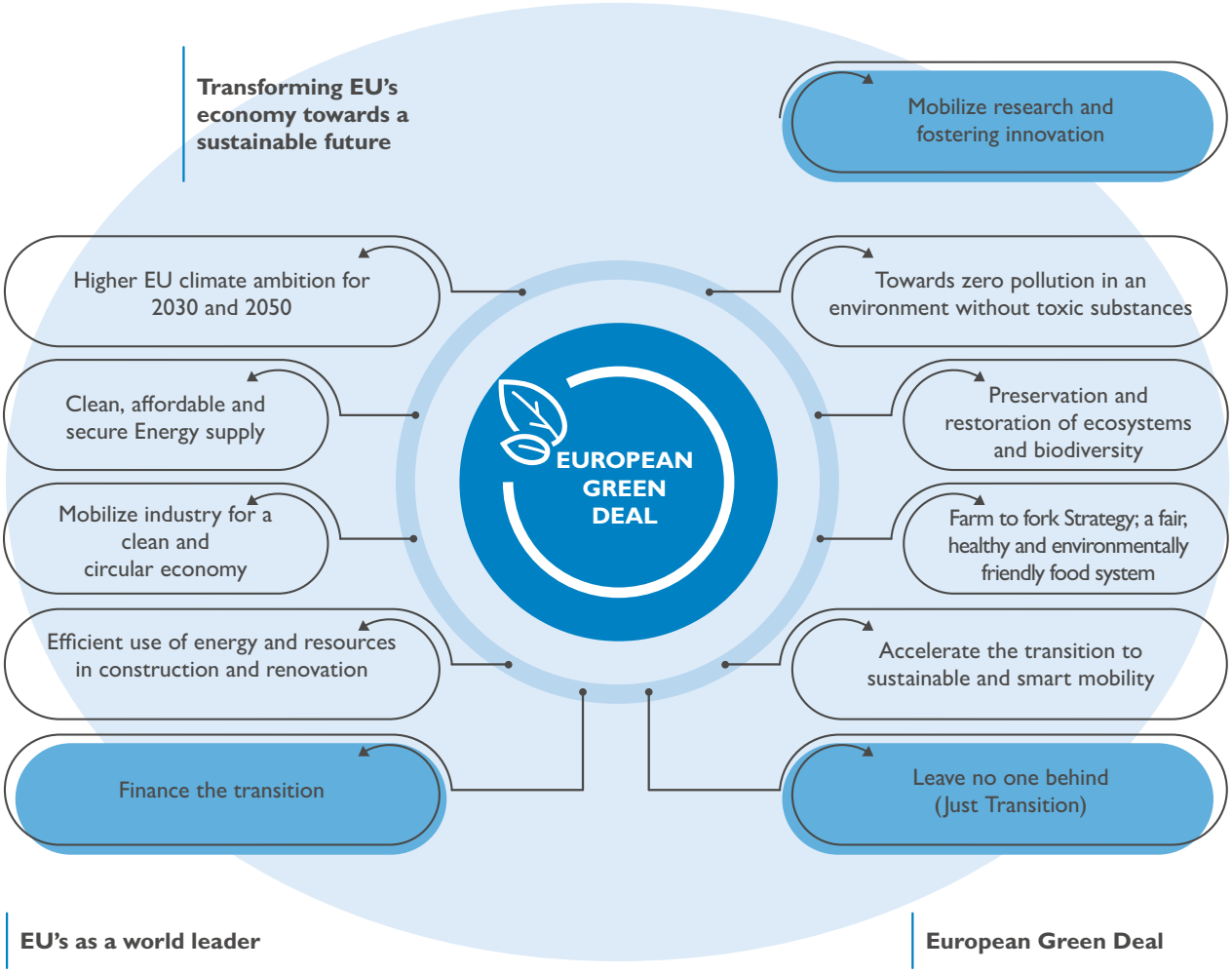
3.2. THE EUROPEAN GREEN DEAL

The European Green Deal, a true roadmap of what should be the European strategy in terms of the environment and the economy, specifically proposes the following regarding water:

"The natural functions of the groundwater and surface water. This is essential to preserve and restore biodiversity in lakes, rivers, wetlands and estuaries, and to prevent and limit damage caused by flooding. Implementation of the Farm to Fork Strategy will reduce pollution caused by excess nutrients. In addition, the Commission will propose measures to confront pollution caused by urban runoff and by new or particularly harmful pollution sources, for example microplastics and chemicals, including medicines. The combined effects of different pollutants also need to be addressed."

With this objective, the European Green Deal aspires to achieve "zero pollution for an environment without toxic substances", both to prevent pollution from being generated and to eliminate it in cases where it is already present in the water environment. To respond to these interrelated challenges, the Commission adopted in 2021 a "zero pollution" action plan for air, water and soil.

EUROPEAN GREEN DEAL



3.3. EU STRATEGY FOR ADAPTATION TO CLIMATE CHANGE

In this same direction, the EU established in 2021 an important milestone in terms of adaptation, the new "EU Strategy for Adaptation to Climate Change: Forging a climate-resilient Europe". Regarding water management, it proposes the following actions: *"expand the understanding on adaptation; promote nature-based solutions for adaptation; ensure the availability and sustainability of freshwater."*

It is worth clarifying what the European Commission understands by nature-based solutions, to the extent that the Spanish water policy already includes this fundamental element of water management:

"Solutions inspired and supported by nature, which are profitable, simultaneously provide benefits and help build resilience. These solutions bring more, and more diverse, natural features and processes to cities, landscapes, and seascapes, through interventions tailored to local circumstances, resource efficient, and systemic."

And regarding the objective of guaranteeing the supply, in short, of offering water security, the Commission highlights the following:

"It will help guarantee the use of water and its sustainable and climate-resilient management in all sectors, improving coordination between sectoral plans and promoting other mechanisms, such as the allocation of water resources and water permits; will help reduce water use by increasing water-saving requirements for products, encouraging water efficiency and savings, and promoting the wider use of drought management plans, as well as sustainable soil management and land use; will help ensure a stable and secure supply of drinking water, encouraging the incorporation of climate change risks in water management risk analyses".

Río Dulce River Nature Reserve, Tagus river basin (Guadalajara, Castilla-La Mancha)

3.4. THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

Another inspiring document for water policies in the world is the United Nations 2030 Agenda for Sustainable Development, incorporated by the Spanish Government through the publication of the Spanish Agenda for Sustainable Development and its corresponding action plan, which includes a series of principles and objectives to be taken into account in water planning and management.

Specifically, objective 6 of the strategy is dedicated to *"Ensuring the availability and sustainable management of water and sanitation for all"*. The aim would be to guarantee universal access, and therefore, that the price of supply and sanitation be affordable to the entire population. We are in a situation in which strong investments will have to be made in the water resources sector, both to ensure the ecological quality of the waters and to increase water security, both in normal situations and in the face of extreme events, and especially all regarding the impacts of climate change. And in concatenation with these investments, the need also to enforce the principles of "polluter pays" and "cost recovery". Therefore, it would be a matter of making the guarantee of universal supply and sanitation compatible with the internalization of costs, and therefore, of advancing in another of the objectives of environmental management, which is to carry out a just ecological transition.

Another important point of this 2030 Agenda, which is part of the 2030 Sustainable Development Strategy, approved by the Council of Ministers in June 2021, refers to its commitment to the Integrated Water Resource Management. Integrated management considers the crossing nature of water and also the fact that water is not a mineral resource that is extracted and used as a productive input, but rather a renewable natural element that has certain environmental conditions to provide its social services. Integrated water management therefore aspires to consider these conditioning factors in all policies and activities that require water for their development.

"Integrated Water Resources Management (IWRM) is a process that promotes the coordination of water, land and other related resources, in order to maximize the resulting economic and social welfare in an equitable manner, without compromising sustainability of vital ecosystems".

Our country is in a very prominent place in IWRM, given our long and extensive tradition in river basin management, and the fact that we have progressively integrated other administrations, sectors and citizens in decision-making, especially those related to water planning. But it is obvious that there are still some challenges in this regard, related to water governance, access to information, the economy of water and the integration of environmental aspects.

The 2030 Agenda revolves around the concept of water security, a concept that also includes our legislation on water, and specifically, the Climate Change and Energy Transition Act (LCCTE). The definition offered by the 2030 Agenda seems very appropriate for the purposes of water resources management:

"The capacity of a population to safeguard sustainable access to adequate quantities of water of acceptable quality for the maintenance of livelihoods, the human well-being and socioeconomic development; to ensure protection against waterborne pollution and water-related disasters, and for the conservation of ecosystems in a climate of peace and political stability as key to achieving these goals."

In relation to the impact of climate change on water and the implications that this would have on the adaptation of the water resources sector, in 2021 the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) collected the main quantifiable metrics in each of the priority areas, fresh water being one of them. The examples that it shows in its synthesis report on measures adopted in the field of water are the following:

"Development of national information systems, including hydrological maps and resource models; definition of river basin indicators; development of tools to assess socio-economic impacts and costs; supply diversification, including through stormwater collection and treatment, recycling and desalination; improve water storage options; introduction of legal and institutional frameworks".

Therefore, this means establishing a water information system that offers managers, administrations and citizens reliable and adequate information for efficient and transparent decision-making on the matter, knowing the socioeconomic impact of the measures that can be adopted to face the challenges of the water crisis, increase the resilience of water management systems through diversification of supply and comprehensive management of the water cycle and, finally, improve water governance by adapting the regulatory and administrative framework to the current situation .

3.5. EU ACTION PLAN FOR THE CIRCULAR ECONOMY

An important milestone regarding the transformation of the European industrial fabric with the aim of achieving a decarbonized Europe that is also environmentally respectful of the use of raw materials and waste management, is the new *"New Circular Economy Action Plan for a cleaner and more competitive Europe"*, of 2020, which our country has incorporated through the *"Spanish Circular Economy Strategy"* and its corresponding *"2021-2023 Action Plan"*. Given that water is used as an essential raw material in so many industrial processes, and also as a final receptacle for discharges, both associated with industries and the consumption of their products, the aforementioned documents contemplate water as an important factor in their attempt to incorporate water into industrial and consumption processes in a fully renewable way.

3.6. THE SPANISH CIRCULAR ECONOMY STRATEGY

The Spanish Circular Economy Strategy emphasizes that "more than ever, it is necessary to work towards improving the efficiency of water use in production cycles to reduce its demand through water policy instruments, such as hydrological planning and sustainable management of water resources, [….]. And, in this way, address the loss of biodiversity in aquatic ecosystems, avoid contamination and reduce the impacts associated with climate change".

In this context, the Strategy establishes a guidelines' decalogue and sets a series of metrics to be achieved by 2030, among which is a 10% improvement in water use efficiency.

It is also necessary not to forget what the aforementioned European Action Plan for the Circular Economy states:

"The new regulation on water reuse will promote circular approaches regarding water reuse in agriculture. The Commission will facilitate water reuse and water efficiency, industrial processes included. Additionally, it will develop an integrated nutrient management plan to ensure a more sustainable application of nutrients and to stimulate markets for recovered nutrients. In this context, it will also consider reviewing the directives on the treatment of wastewater and sewage sludge, and will examine natural means of nutrient removal, such as algae".

Specifically, Axis 5 of the Spanish Circular Economy Strategy dedicated to water reuse and wastewater treatment, highlights the importance of promoting the use of reclaimed water within the framework of the current hydrological planning process, and in line with the Wastewater Treatment, Sanitation, Efficiency and Reuse Plan (DSEAR Plan).

Guadalest Reservoir, Júcar river basin (Alicante, Valencian Community)

But it also fosters *the establishment of a water accounting methodology, in line with the European Action Plan for the Circular Economy, to contribute to the development of indicators that allow quantifying the degree of circularity of the economy in non-financial terms. The actions included in this axis are proposed with a view to moving towards the establishment of a common framework for water accounting for water use and its efficiency*". For this reason, the action plan also highlights that "*measures to improve the circularity of water should promote the adjustment of water demands, a greater digitization of water services and an improvement in the accounting of its uses*".

Specifically regarding irrigation, the aforementioned document states that "modernization projects will be prioritized in accordance with hydrological planning criteria in which reclaimed water replaces *surface or groundwater sources, within a framework of balanced territorial development, as well as sustainable and orderly development of our rural areas*".

For this reason, and extending the importance that reclaimed water acquires in the sustainable management of the resource in other demands, hydrological planning must advance in the integration in the exploitation systems of the river basins of the volumes of reuse together with the rest of the water sources, considering for this its technical-economic and environmental feasibility. In this way, it must be integrated into the allocations and reserves of the exploitation systems of the River Basin districts, identifying, assigning and, where appropriate, reserving, the potential volumes of reuse and desalination.

To this end, the MITERD plans to modify the current regulatory framework in order to promote the reuse of water throughout the territory and for all uses in line with the objectives set by the DSEAR Plan and hydrological planning. Among these objectives of promoting reuse are: the adaptation of the current regulatory framework to Regulation (EU) 2020/741, the identification of the potential for reuse throughout the territory, as well as the modification of the legal framework in order to promote and encourage the reuse of regenerated wastewater throughout the territory, but especially in those basins with more fragile balances between resource availability, water demands and environmental needs.

3.7. SPAIN 2050

In 2021, the Government of Spain published *"The foundations and proposals for a Long-term National Strategy: Spain 2050"*, a document that aims to anticipate the main objectives of socioeconomic and environmental management with the aspiration of responding to the main development and environmental challenges that affect both our country and the rest of the world. This publication includes important resolutions on water management, due to its importance as a development vector and as a connector between various areas of socioeconomic management.

The Spain 2050 Strategy unambiguously raises the need to adapt to climate change and adopts a position in this regard. Far from proposing policies that maintain the status quo in the face of pessimistic climate scenarios, it proposes taking advantage of this enormous challenge to improve and convert our productive system to become associated with its environment, a more resilient system, and therefore, that is capable of providing well-being to the population in a safer way. For this reason, Objective 22 of the Spain 2050 Strategy is titled *"Promoting the water transition as an essential way of adapting to climate change"*.

In the first place, it includes the objective of incorporating, as it could not be otherwise, integrated water resource management among the principles of a circular economy. And in coherence with the climate change scenarios, it establishes the goal of reducing the total water demand by 5% in 2030 and 15% in 2050.

In 2050, Spain should have overcome the threat of water stress. To achieve this, it must adapt the management of its water resources, preparing the system for less water availability and adopting comprehensive management that allows to:

- Promote the reuse and desalination of water until its price becomes competitive.
- Improve the efficiency of urban supply systems, agricultural irrigation and drinking water and wastewater treatment through the modernization of infrastructures and the introduction of new technologies such as sensors and "big data".
- Modify the economic regime of the Water Act, based on the cost recovery and "polluters pays" principles.
- Launch an ambitious strategy for the restoration of rivers, aquifers and other inland aquatic ecosystems and strengthen the network of river reserves and other protected areas.
- Promote actions that encourage the return of water to the river beds with the same or higher quality than when it was caught.
- Reorder agricultural uses and crops, prioritizing sustainable and socially just agriculture.
- Increase the resilience of farms so that they can adapt to climate change and water deficits, and recover from adverse situations such as droughts, by transforming crops and production systems, improving training in farm management and the establishment of adequate financial and governance mechanisms.
- The "agrifood sector" indicates that it will be essential to improve the use of water resources to ensure greater efficiency and real savings of water for rivers and aquifers, through the modernization of irrigation systems, the treatment of wastewater and the development of alternative sources of supply.
- In cities, it indicates that the use of sustainable urban drainage systems that contribute to reducing flood risk should be promoted, through the use of permeable, vegetated gutters, vegetable covers or cistern covers in buildings.

3.8. JUST TRANSITION AND DEMOGRAPHIC CHALLENGE STRATEGIES

Finally, we will mention two strategies that MITERD internalizes as its own in its field of competence and that are therefore related to this Water Strategy for ecological transition. One refers to the Strategy for a Just Transition, which will be the instrument that will allow the identification and adoption of measures that guarantee workers and territories affected by the transition to a low-carbon economy, an equitable and supportive treatment. The objective is that there be no negative impacts on employment or depopulation due to this transition.

The other strategy deals with the demographic challenge, and tries to incorporate the demographic in the elaboration of regulations, plans and investment programs, and therefore, incorporate demography as a variable in water policies as well. This strategy focuses on three demographic challenges: the progressive ageing of the population, territorial depopulation, and the effects of the floating population. As an example, the concept of hydric imbalance is not only related to the unequal distribution of water in Spanish territory, but also to the way in which the population and its activities settle in places that may cause water stress.

Water planning must contemplate the paradox that climate change is affecting areas that demographically are gaining population, to the detriment of others whose environmental components would be more available to host population and activities, and to which the strategy for the demographic challenge tries to make more attractive to economic and social development.

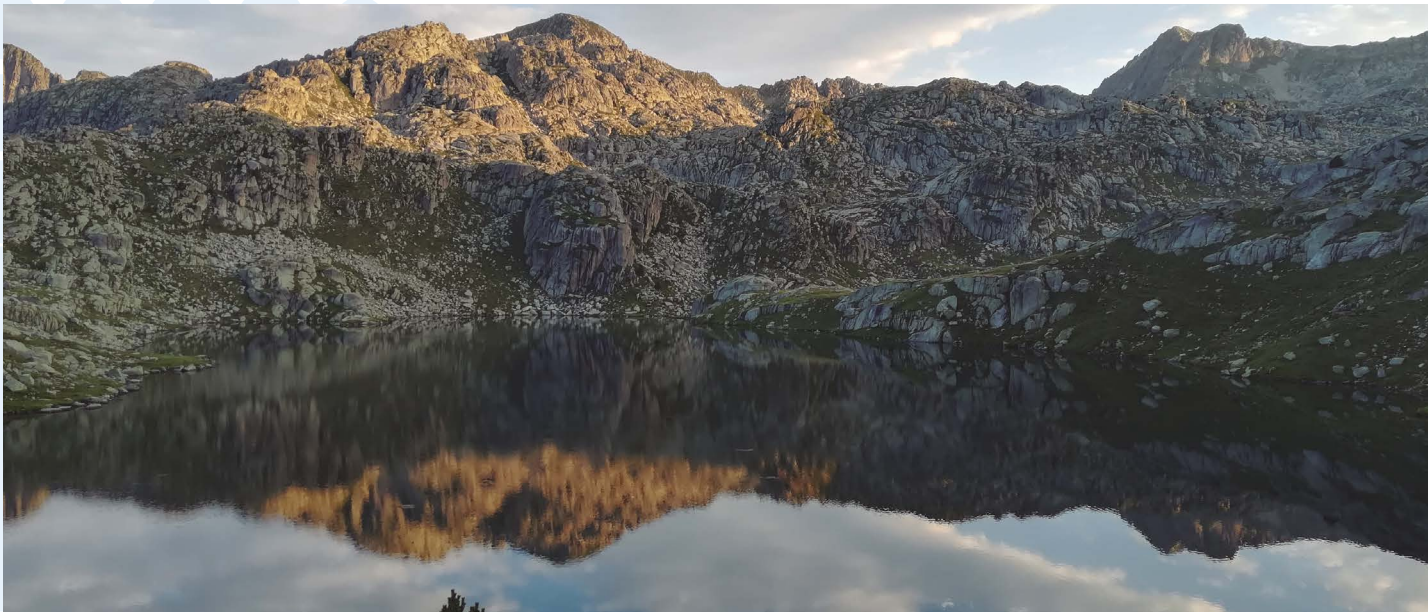
Tourism, as it is mainly developed in Spain, has a clear and manifest impact on the use of water, concentrating a huge seasonal population during the summer months, precisely in the areas that have fewer water resources and that suffer greater vulnerability to climate change.

That is why it is so necessary that water planning, in coordination with other policies that also influence the demographic challenge, internalize this component at the level of allocation of water demands, investments and taxation. It should be noted that Spain is currently the fourth country in the EU that collects the least from environmental taxes, and that the so-called green taxation is called to play an essential role in the challenges posed by the ecological just transition and that it faces the demographic challenge.

Fish ladder built by the Ebro River Basin Authority in the Hijar River (Cantabria)

4

WATER IN THE CLIMATE CHANGE AND ENERGY TRANSITION ACT



Travessani Lake, Ebro basin, in the Bohí Valley, within the Aigüestortes i Sant Maurici National Park (Lleida, Catalonia)

As it has has been indicated previously, the cyclical review of the River Basin Management Plans is an essential tool to carry out an optimal management of water resources. The 3rd generation River Basin Management Plans for the period 2022-2027, are the key tools to reorient water management, integrating it with the commitment to ecological transition assumed in Spain and throughout the European Union under the framework of the European Green Deal and the necessary adaptation to the effects of climate change.

Specifically, the Climate Change and Energy Transition Act provides a series of recommendations and criteria to execute this integration of environmental and climate change policy in water policy. In its Title II dedicated to renewable energies and energy efficiency, article 7 addresses to electricity generation in the hydraulic public domain, wherein three mandates are established:

1. New hydropower concessions will fall primarily on those that support the integration of renewable energies into the electrical system. "To this end, reversible hydropower plants will be promoted, provided that they comply with the environmental objectives of the water bodies and the ecological flow regimes established in the River Basin Management Plans and are compatible with the rights granted to third parties, the efficient management of the resource and its environmental protection".

2. Approve a Regulation where "the technical specifications will be established to carry out pumping, storage and generation to maximize the integration of renewable energies will be established."

3. Attempt to "exploit for power generation the flows of the urban supply and sanitation systems, when technically and economically feasible and always limited to the coverage of the primary purpose of such systems".

In this situation, the progressive reversion of hydropower concessions becomes relevant, once they finalize their corresponding concession periods. In these cases, the Water Administration must execute the reversion to the State as an effective tool to increase its energy efficiency, and above all, so that the use of water in power generation is carried out under water security and environmental protection criteria.

The Climate Change and Energy Transition Act exclusively devotes its article 19 to the "Consideration of climate change in the planning and management of water" to define the two objectives of such integration of climate and water policies are declared: water security for people, biodiversity and socio-economic activities, and increased resilience.

A water security that must be achieved in accordance with the hierarchy of uses established by each River Basin Management Plans, by reducing exposure and vulnerability to climate change, taking into account that the ecological flows' regime is not defined as another competing use of water, but as a prior limitation to the uses of water within the water management system of each river basin. Secondly, the article clearly establishes the Strategy's goal, because "hydrological planning and management must adapt to the guidelines and goals stated in the Water Strategy for the Ecological Transition, without decline to any powers entitled to Regional Administrations.

As for the aforementioned objectives of water security and resilience, the Act indicates a series of specific risks to which the strategy, planning and management of water will have to respond. Specifically, the following risk categories of climate change on water bodies are defined:

- Originated from the change in the flow regime and the alterations in the vegetation of the river basin.
- Originated from changes in the frequency of extreme events: floods and droughts.
- Originated from the increase in the temperature of water bodies.
- Originated from the rise in sea level and its impact on coastal aquifers, wetlands and coastal systems.

Specifically, article 19.4 establishes an extensive list of these activities and ecosystems that hydrological planning must consider in order to "anticipate the foreseeable impacts of climate change, identifying and analyzing the level of exposure and vulnerability of socioeconomic activities and ecosystems, and developing measures to reduce such exposure and vulnerability. The analysis provided for in this section will take special account of extreme weather events, from the probability of their occurrence, their intensity and impact".

And finally, article 19.5 of the LCCTE establishes that the Flood Risk Management Plans must consider the need to execute hydrological-forest correction and erosion prevention actions.

This concludes the specific considerations that the LCCTE states regarding the Strategy and how it must establish the principles to which the river basin management plans must comply with.

But we should not forget the nexus that water planning maintains with other sectors' planning, within the framework of what has been so-called the principles of good water governance. Specifically, article 21 of the LCCTE establishes the consideration of climate change in territorial and urban planning and management.

The PNACC also states that urbanization and its infrastructures tend to waterproof the land, and alter the natural hydrology of the land in which they are located, so that "floods are also favoured by large impermeable urban surfaces, which prevent infiltration and favour runoff.

2010 floods in Almodóvar del Río (Córdoba, Andalusia)

It is evident the need for urban plans to consider the use of water in homes or in associated gardens. Or that territorial planning requires taking the flood risk into account, and therefore, carry out a management of land uses consistent with this risk. Both so as not to expose activities, and so that these do not harm the evacuation of the flooded areas and avoid increasing the risk to third parties. Locating homes or activities on a high risk flooding land is a "misadaptation" as highlighted in the National Plan for Adaptation to Climate Change (PNACC).

Therefore, it is necessary to take into account all these impacts when dealing with the management of the territory regarding the risks associated with climate change and its impact on the state of water bodies.

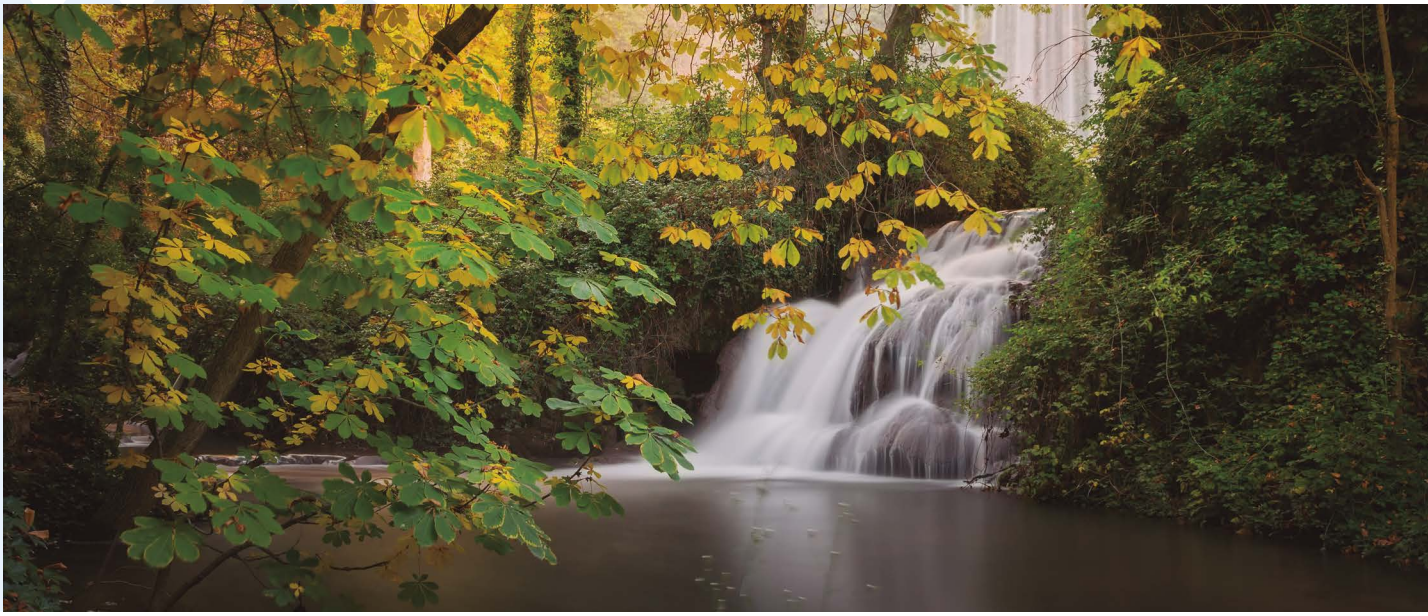
The same can be said about the existing relationships between water policy and biodiversity management, both at the level of the aquatic ecosystems themselves, and of the terrestrial ones that depend on water management at the river basin level. The planning and management of water will have to take into consideration the environmental objectives dictated by the competent administrations, in order to guarantee biodiversity and strengthen the resilience of the water management system. Article 24 of the LCCTE is dedicated to this matter:

"(…) within three years from the approval of the Act, a specific strategy for the conservation and restoration of ecosystems and species that are especially sensitive to the effects of climate change will be presented to the Sectorial Conference on the Environment, among which will be natural ecosystems and high mountain species, Spanish terrestrial wetlands, posidonia meadows and riverbank areas, as well as those that stand out for their role in adapting to climate change".

Since such a specific strategy will be approved in the execution period of the 3rd generation River Basin Management Plans 2022-2027, this planning must be flexible enough to be able to include the content of the specific strategy for the conservation and restoration of ecosystems and species especially sensitive to effects of climate change.

5

CHALLENGES IN WATER MANAGEMENT TO ADDRESS CLIMATE CHANGE



"Baño de Diana" waterfall, Ebro basin, in the Monasterio de Piedra (Zaragoza, Aragón)

Spain is a country with great climatic and geographical diversity, which entails the existence of differentiated hydrological environments. The Mediterranean climate of most of Spain is defined by significant rainfall irregularity, with frequent periods of drought and major flood episodes. Spain is the Member State of the European Union with the greatest disparity between extraordinary flood flows and ordinary flows, according to reports from the European Environment Agency. All of the above has conditioned the availability and distribution of water resources and has given rise to a rich record in the use and management of water.

Water management in Spain considers surface and groundwater bodies as management units. Surface water bodies can be natural such as rivers, lakes or aquifers, artificial such as canals or highly modified such as reservoirs or ports. Of the more than 600,000 km that comprise the complete hydrographic network of Spain, some 80,000 km correspond to water bodies of the river category. But Spain also has over 1,200 reservoirs, with a storage capacity of close to 56,000 Hm^3. Currently, Spain is the ninth country in the world with the largest number of large dams. In addition, natural lakes and lagoons occupy 1% of Spanish territory. Its enormous natural capital lies in its water regulation services, in addition to being one of the most productive ecosystems on the planet.

Special mention should be made of the aquifers, essential both for the supply of water, as well as for their role in supporting aquatic ecosystems and for maintaining the base flows of rivers at low water levels. Its role is especially strategic in drought situations. There are about 800 defined groundwater bodies, which extend over an area of about 360,000 km^2 and from which between 6,500 and 7,000 Hm^3 are extracted annually.

It is evident that in the coming years our country is going to have to face important challenges in management. To the issues inherent to water resource management and those that the different river basins have been facing for many years, at the present time we must add the impacts of climate change on our water management systems and on their related ecosystems. As seen in previous chapters, these climate impacts are subject to uncertainty, which should not allow us to forget the need to strengthen our management systems in the face of possible changes that may lie ahead, trying to transform our integrated water resources management system into a more resilient system, which not only should address the solution of current issues, but also prepares itself to respond to future ones.

The main challenges that will have to be addressed in the coming years follow.

5.1. POINT SOURCE POLLUTION OF SURFACE WATER

There is no doubt that significant progress was made in Spain in sanitation and wastewater treatment since the implementation of the National Sanitation and Wastewater Treatment Plan 1995-2005. In recent years, the completion of numerous urban wastewater treatment infrastructures and the remodelling of many other existing facilities has been conducted.

There are currently more than 2,000 urban settlements in Spain with over 2,000 inhabitants equivalent that generate a load of more than 63 million inhabitants equivalent, of which more than 98% is caught through collection systems and transferred to the existing treatment plants for primary (87%), secondary (85%) treatment and in many cases also to nutrient removal, depending on the area where the discharge occurs.

Despite these advances, in recent years there has been a certain slowdown in the objectives of achieving full compliance due to the difficulties of the administrations when it comes to implementing the necessary actions. Thus, the biennial reports required by the Waste Water Directive 91/271/CEE show that non-compliance still occurs in some cases.

As a result, in recent years the EU has opened various infringement procedures against Spain for non-compliance with sanitation and wastewater treatment obligations in towns with over 2,000 equivalent-inhabitants. Currently, 477 urban settlements do not meet the conditions required by the EU in terms of wastewater treatment.

On the other hand, the extensive use of drugs (for humans and animals) is also an important source of contamination, with Spain being one of the countries in the world with the highest presence of drugs detected in drinking water. Emerging pollutants, also called pollutants of emerging concern, are chemicals or materials recently detected in waters whose presence may pose a risk to the environment and human health. The number of substances included is undetermined and includes drugs for human or veterinary use; pesticides, anti parasites and other biocides; material additives used as antioxidants, flame retardants, plasticizers, corrosion protectors; household products such as detergents, cosmetics, fragrances, creams, drugs, microplastics, etc.

The origin of emerging pollutants in the aquatic environment is diverse, the main source being urban activity. Therefore, the analysis of urban wastewater discharged by urban treatment plants is an important source of information on emerging compounds that can reach the water.

Directive 91/271/EEC on the treatment of urban wastewater is currently under review by the European Commission. After 30 years in force, it intends to address important challenges still pending, among others: the presence of remaining pollution, such as that generated in small settlements of less than 2,000 inhabitants equivalent, individual treatment systems, urban runoff or overflows of sewage storm; the need to treat new micropollutants, such as drugs or microplastics; the issue of eutrophication in European waters; the need to improve the use of energy in order to move towards climate neutrality, or also waste management, especially sewage sludge.

5.2. WATER EXTRACTION AND DIFFUSE POLLUTION IN GROUNDWATER

Despite its strategic importance, 48% of groundwater bodies are in poor status, 23% in poor quantitative status due to extractions above renewable resources and 35% in poor chemical condition, mainly due to diffuse pollution caused by nitrates and pesticides. It is estimated that 36% of groundwater bodies are at quantitative risk due to excessive extraction and that close to 25% are impacted by nutrient contamination, mainly due to excessive use of fertilizers in agriculture.

The overexploitation of aquifers is generally more noticeable in the regions of Spain where water has greater economic value, and where the gap between the use of water and the available resources is larger. The intensive use of groundwater in these areas has caused a significant decrease in groundwater levels, with significant environmental effects, such as the cessation of discharge to fountains and springs, causing many of them to dry up; the disconnection of aquifers from surface water (rivers and wetlands), in some cases affecting very significant ecosystems dependent on groundwater; the intrusion of saline waters into coastal aquifers; or the mobilization of deep waters with inadequate chemical conditions for their use. In some areas, mainly in the southeast of the mainland, the groundwater levels have dropped hundreds of metres with respect to their natural levels as a result of exploitation indices (ratio between the resource extracted and that available) over 1 and in some cases reaching values greater than 5.

This intensive use, fundamentally for agricultural use, is directly related to the issue of diffuse pollution by nitrates, which is particularly important in groundwater bodies. The increase in nitrate content skyrocketed in the last two decades of the last century, coinciding with an intensive use of groundwater in some areas. Subsequently, a certain stabilization of the situation has been achieved, but it has not been reversed, which has led to the opening of an infringement procedure against Spain for non-compliance with Directive 91/676/EEC, regarding nitrate pollution.

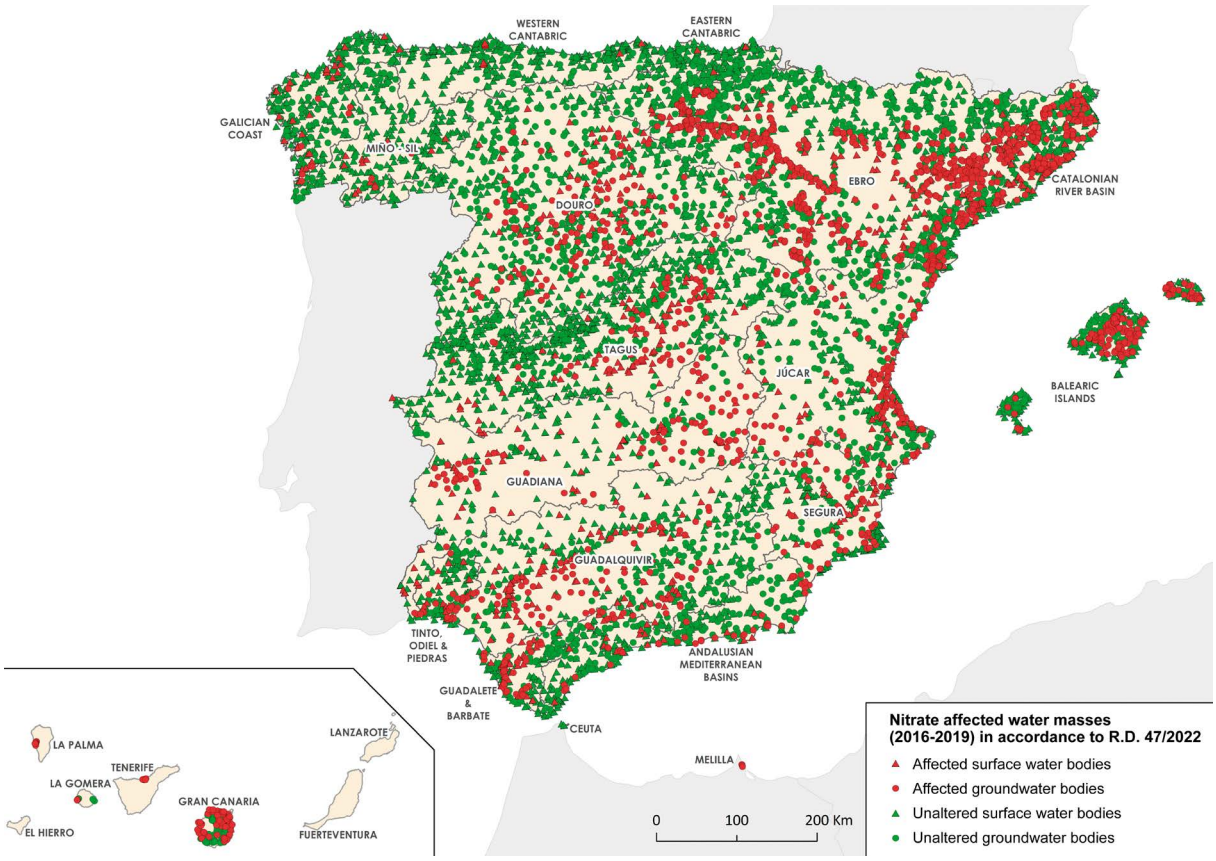
Pesticides and plan protection products are substances used to protect crops from pests. Being essential in agriculture, its use is a risk to human health and the environment since it can cause undesired adverse effects such as the loss of biodiversity or making the drinking water unsuitable.

At the moment, an important effort is being developed for the better characterization of pesticides, since the consumption of phytosanitary products is undergoing a strong increase in Spain. In 2020, more than 70,000 samples were carried out in groundwater, where over 30% of the sample points detected the presence of pesticides.

It must be borne in mind that there are still many pesticides remain uncontrolled, which acquires special importance regarding the infiltration of water into aquifers, and above all with the fact that this type of contamination is latent, by delaying its arrival in the aquifer according to its passage time through the unsaturated zone of the soil.

Slurry ponds can be an important source of contamination of surface and groundwater

WATER BODIES POLLUTED BY NITRATES



5.3. RIPARIAN HYDROMORPHOLOGICAL ALTERATIONS

Like diffuse pollution, hydromorphological alterations in rivers have produced a significant loss of biodiversity and ecosystem services. The hydromorphological deterioration of the fluvial and riparian space, as well as of the lakes and wetlands, is vital in Spain. Nearly 30% of surface water bodies suffer some type of hydromorphological impact. The profoundly altered situation of many of our rivers, which in many cases have even suffered an inversion with respect to their natural hydrological regime, demonstrates the need to make decisive progress in their renaturalization.

The European Green Deal addresses this issue as one of its priorities. Strategies such as Biodiversity 2030 pose as one of its goals for that year, the restoration of the condition of free-flowing rivers in a length of 25,000 km in the European Union.

The actions oriented towards nature based solutions, which tend to return the waters to their natural domain, actions for the mobilization of sediments, or the removal of infrastructures such as berms or weirs in disuse that interrupt the continuity of our rivers, also have a clear synergistic effect with the mitigation of the flood risk, the contribution to the achievement of environmental objectives, the adaptation to climate change, or the protection and improvement of biodiversity and ecosystem values.

It is essential to promote the longitudinal continuity of river ecosystems and especially as a strategy for adaptation to climate change, for which longitudinal barriers are one of the most relevant hydromorphological pressures on our rivers. In the interregional basins alone, more than 19,000 barriers to sediment and fauna in our rivers have been inventoried.

In terms of cross-sectional continuity and connection with the banks and floodplains, more than 14,500 riverbank stabilization works or dikes or berms for protection against flooding have been inventoried in the interregional basins, a total of 13,600 km in length, of which that more than 10,000 km are berms or dikes whose functionality must be studied and analyzed in the coming years.

CROSSING BARRIERS

MARGIN BARRIERS

The General Directorate of Water, together with the different River Basin Authorities, has developed the Inventory of Crossing Obstacles and the Inventory of Longitudinal Works, available for consultation in the MITERD Geoportal. (https://sig.mapama.gob.es/geoportal/)

5.4. HIGH WATER EXPLOITATION INDEXES

For decades, there has been a very fragile balance in Spain between the water available and the water that agriculture, livestock, industry and households consume. Although significant progress has been made in increasing our desalination capacity, the reuse of treated wastewater, the modernization of irrigation systems or changes in consumption habits, Spain still has one of the highest rates of water exploitation of Europe.

The main consumptive uses in Spain extract circa 30,000 Hm^3/year (although an important part cannot be considered as consumption since it is returned to the system), compared to renewable resources estimated at around 100,000 Hm^3/year.

In several European policies related to water, the Water Exploitation Index WEI+ indicator assesses the existing pressure on water resources, considering the water consumed in all sectors compared to the water available. This indicator shows the considerable pressure to which water resources are subjected in some Spanish basins (Baleares or Segura exceed 80%, and Júcar or Guadalquivir are around 50%). On the contrary, in the northern basins (Galicia Costa, Miño-Sil, Cantábrico), the value barely reaches 2%.

It must be considered, however, that the WEI+ is not a management indicator, and its values must be analyzed cautiously in systems in which storage capacity is relevant, as is the case in Spain. Its value is also highly conditioned by the geographical and temporal scales used.

6

LINES TO TAKE TO OVERCOME THE CHALLENGES

Guadalquivir River as it passes through Seville (Andalusia)

So far, the Water Strategy has defined its goals, its main contents, and also the great challenges that lie ahead for water policy in Spain. Following, the strategy defines the potential lines to take for water policy in Spain over the next few years, in order to offer, later on, the instruments with which must be provided to overcome the issues and address the challenges.

6.1. TRANSPOSITION AND COMPLIANCE WITH EU LEGISLATION AND POLICIES

Mainly 2000/60/EC Water Framework Directive (WFD) and its cascading regulations, Directive 91/271 on the treatment of Urban Wastewater, Directive 91/676 concerning the protection of waters against pollution caused by nitrates from agricultural sources, Directive 2007/60 on the assessment and management of flood risks and Directive (EU) 2020/2184 on the quality of water intended for human consumption, framed in the European RIGHT2-WATER citizen initiative, among others.

6.2. FOSTER WATER PLANNING IN A CONTEXT OF ADAPTATION TO CLIMATE CHANGE

Such action will be addressed through the implementation of the new cycle of hydrological planning (2022-2027), which is expected to be approved during the year 2022 in the 25 river basin districts.

The purpose of the plans is to achieve the environmental objectives for the bodies of water and associated ecosystems, as well as meeting the demands for the different uses compatible with the good state of the waters in a context of adaptation to climate change.

6.3. RECOVER, RESTORE AND PROTECT RIVERS, LAKES, AQUIFERS AND WET AREAS

- Promote the National Strategy for the Restoration of Rivers (ENRR), including actions aimed at conserving and recovering their good status, minimize the risks of flooding through proper management of the riparian area, makeland use compatible with flood-prone areas, to the reorganization of flood-prone areas, to the recovery of riverbanks and meanders, and to the expansion of riparian areas and infrastructures through the implementation of various nature-based solution projects.
- Recover 20,000 hectares of wetlands in 2030, which will complement the 18,000 already restored in recent decades.
- Implement measures for the recovery of aquifers through the reduction in the extraction of groundwater by covering the demand with non-conventional resources, such as reuse and desalination.
- Improve the knowledge and management of groundwater through the Groundwater Action Plan, which will include basic studies, the development of mathematical models of flow and groundwater quality or the improvement of piezometry and water quality monitoring networks.

6.4. ENHANCE WATER SECURITY

- Promote projects that contribute to savings and lower consumption of water through the efficient and rational use of resources, demand reduction and the protection of water bodies and associated ecosystems.
- Foster the expansion of the capacity of existing desalination plants and building new facilities if essentially needed, as well as developing renewable energy projects that contribute to energy efficiency and cost reduction.
- Incorporate circularity measures in the water cycle, considering treated wastewater as a resource and not as waste, and making the necessary regulatory changes to adapt Spanish regulations to European regulations.
- Develop Integrated Water Systems, which take into account the set of conventional resources (surface and groundwater) and non-conventional resources (reuse and desalination) and facilitate the management of basin authorities, especially in the territories with the greatest water imbalances in southeast Spain.
- Encourage the use of renewable energies for water production and storage, provided that they do not produce unacceptable alterations in the flow regimes of the rivers.
- Ensure the safety of infrastructures, so that they continue to provide service in proper safety conditions stated by the *Technical Safety Standards for Dams and Reservoirs* approved in April 2021 by royal decree, which will require heavy investments which will be assessed, in addition to expert criteria, through a prioritization strategy based on potential risk.

And finally, maintaining the hydraulic infrastructures that make up the paramount water heritage system of the State's dams and canals in proper condition.

Riaño reservoir, Douro river basin, northeast León (Castilla y León)

6.5. FOSTER SANITATION, WASTEWATER TREATMENT AND REUSE

The development of the National Plan for Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse (DSEAR Plan), approved by Ministerial Order in 2021 will:

- Promote sanitation and Wastewater Treatment actions in urban settlements under infringement procedures opened by the European Commission against the Kingdom of Spain or those which may be non-compliant with the Waste Water Directive.
- Incorporate the latest innovations and technological advances into the treatment facilities that will allow them to adapt to the new requirements that the review of the European Wastewater Directive will foreseeably entail.
- Promote specific action plans for small and medium-sized urban settlements, which have greater difficulty in complying with regulatory requirements.
- Establish measures to reduce plastic pollution, seeking solutions that prevent through wastewater treatment these synthetic materials from entering the sea. In this sense, microplastics (< 5 mm) become relevant, as it small size allows them to be easily ingested by marine fauna and which can also enter the food chain. In fact, Directive (EU) 2020/2184 on the quality of water intended for human consumption provides for the monitoring of microplastics in drinking water. In addition to acting on the emission source, the relevance of implementing capture and elimination systems in wastewater treatment must be assessed to reduce the discharge of microplastics.
- Promote and develop measures for the reuse of treated wastewater, especially in agriculture and in those territories that present the greatest water imbalances.

6.6. FIGHT AGAINST DIFFUSE POLLUTION

- Ensure compliance with the regulatory instruments aimed at protecting water bodies from pollution caused by nitrates, such as *Royal Decree 47/2022, of January 18, on the protection of waters against diffuse pollution produced by nitrates from agricultural sources*, approved in 2022.
- Implement practices for the sustainable use of phytosanitary products, promoting integrated pest management and using alternative techniques to phytosanitary products.

6.7. UPGRADE FLOOD RISK MANAGEMENT

- Manage flood risks in a coordinated manner, integrating the effects of climate change in risk management and proposing adaptation measures in river basins that reduce risks, such as natural retention, nature-based solutions and green infrastructure.
- Update hydrological information systems, connecting AEMET weather forecasts with numerical models, real-time information and hazard maps, transmitting information to the stakeholders involved and promoting preparation for the flood risk, being a tool of the National System of Civil Protection.
- Assess the prevented economic impact due to flood management after each episode.

6.8. REFINE DROUGHT RISK MANAGEMENT

- Manage drought risks in a coordinated manner, integrating the effects of climate change in risk management and proposing management measures for these extreme situations based on the phase of drought in which the operating systems are found.
- Improve the indicator systems for prolonged drought and scarcity and developing forecast models for these indicators in the short and medium term. Assessing, once the drought episode is over, the social, economic and environmental impacts caused.

6.9. RECOVER NATURAL WATER HERITAGE

- Recover natural heritage sites in collaboration with other competent administrations and with the socio-economic agents of the territory. An example of this are the wetlands of the Mar Menor, Delta del Ebro, Daimiel, Doñana and Albufera de Valencia.
- Develop the Framework of Priority Actions to Recover the Mar Menor, the actions to improve knowledge and sediment management in the final stretch of the Ebro River within the framework of the Plan for the protection of the Ebro Delta, with the support of CEDEX, the measures of police of the hydraulic public domain in the Doñana Natural Park, the sanitation and wastewater treatment actions and the retention of storm relief to improve the quality of the water, as well as the actions to increase the contributions of water and improve its quality, within the framework of the Special Plan for the Albufera de Valencia and continuing with the Special Plan for the Control and Use of Water in the Area of Influence of the Tablas de Daimiel National Park.

Doñana National Park, Guadalquivir basin, in the province of Huelva (Andalusia)

6.10. RESEARCH, INNOVATE, AND ADOPT NEW TECHNOLOGIES

- Improve knowledge about the effects of climate change on water bodies, their ecosystems and water uses.
- Update monitoring systems for the status and quality of water, developing monitoring, forecasting and early warning systems for floods and droughts, improving the information available on the Ministry's web services so as to increase transparency in the management of information.
- Refine the digitization of hydraulic infrastructures, incorporating new management tools such as drones or Big Data analysis, which will add up to remote sensing and geographic information systems.
- Enhance modelling studies of the hydrological cycle in order to enhance the monitoring of available water resources and be able to anticipate future scenarios, which will allow responsible public decision makers to define more educated strategies.
- Incorporate into the nationwide early warning system SAIH the control of the flows supplied to the main water users and connecting them with electronic water registries and other organisms and entities' water data.
- Develop Decision Support Systems (DSS) for the management of spates and floods by Basin Authorities.

6.11. ENSURE A TRANSPARENT, EQUITABLE AND PARTICIPATORY WATER GOVERNANCE MODEL

- Update water governance mechanisms to provide dialogue and a coordinated response to the challenges between the stakeholders responsible for water management and sectoral policies.
- Improve coordination between the different levels of administration and socioeconomic agents for the proper functioning of the urban water cycle, promoting the Urban Water Cycle Forum to advance towards the sustainability of urban water services, deepening knowledge and increasing transparency.
- Integrate all social agents (users, companies and administration) in decision-making and promoting the disclosure to the public of the issues and challenges of water management.

6.12. PROMOTE THE INTERNATIONAL WATER AGENDA

- Promote active participation in the multilateral organizations in which Spain is represented, both in stakeholder meetings and in the groups and work programs that outcome from them, particularly in the Intergovernmental Hydrological Program, the WMO and the OECD and collaborating with UN Water in the development of actions related to the SDG6 Accelerator Framework, specially regarding its capacity development component.
- Promote and reinforce Spanish participation in the milestones of the International Decade for Action "Water for Sustainable Development" (2018-2028).

- Consolidate the role of water in adaptation to climate change within the actions agreed within the United Nations Framework Convention on Climate Change, the Paris Agreement, and in the Convention for Biological Diversity.
- Promote bilateral cooperation with the countries with which partnership agreements have been signed (particularly with Morocco, Algeria, France and Italy).
- Continue the regional work programs developed in Ibero-America by the Permanent Technical Secretariat of the Conference of Water Directors of Ibero-America (CODIA), and in the Mediterranean, through the development of the Action Plan of the Water Strategy in the Mediterranean Occidental through the Mediterranean Network of Basin Organizations (MENBO) and continuing the work program of the Commission for the Application and Development of the Albufeira Convention (CADC).
- Establish a "Spanish Water Partnership" that should comprise, at least, public administration institutions, representatives of companies in the water sector, research centres and universities, and that would facilitate the presence of Spain in the multitude of international water forums, resembling similar partnerships in the neighbouring countries of France or Portugal.

6.13. FOSTER SUSTAINABLE ECONOMIC ACTIVITY

- Promote economic reactivation and employment through investments in water management and its infrastructures funded by the Recovery, Transformation and Resilience Plan (PRTR) 2021-2027.
- Support business projects that promote water efficiency, savings and circularity and addressing nature based solutions and green infrastructures as tools for the sustainable water management and the hydraulic public domain.

6.14. STRENGTHEN FINANCING

- Mobilize 10,000 Million Euros in 6 years from Spain's General State Budget in water management and its infrastructures. At least 1,700 million will be funded from the Recovery, Transformation and Resilience Plan (PRTR), promoting projects aimed at, among others, the restoration of rivers and aquifers, the riparian area, the minimization of flood risks, sanitation, wastewater treatment, water reuse as well as water infrastructure digitization.
- Develop investments, estimated at around 1,000 Million Euros, for the next 8 years in water estimated at around 1,000 Million Euros under the aegis of the FEDER 2021-2027 program

Ibiza storm tank (Balearic Islands)

7

INSTRUMENTS OF THE STRATEGY

Fluvial restoration of the river Arga in Funes, Ebro basin (Navarra). Connection of abandoned meander of the river Arga

As has already been shown, the strategy has defined a series of lines to take in accordance with its main objectives, which we recall following: water security, enhanced environmental resillience and restoration of rivers, aquifers and wetlands.

The water planning and management instruments that the Administration is currently promoting in order to advance in the achievement of such objectives regarding the issues and challenges posed by the current state of our water management systems and the foreseeable impacts of climate change are defined below.

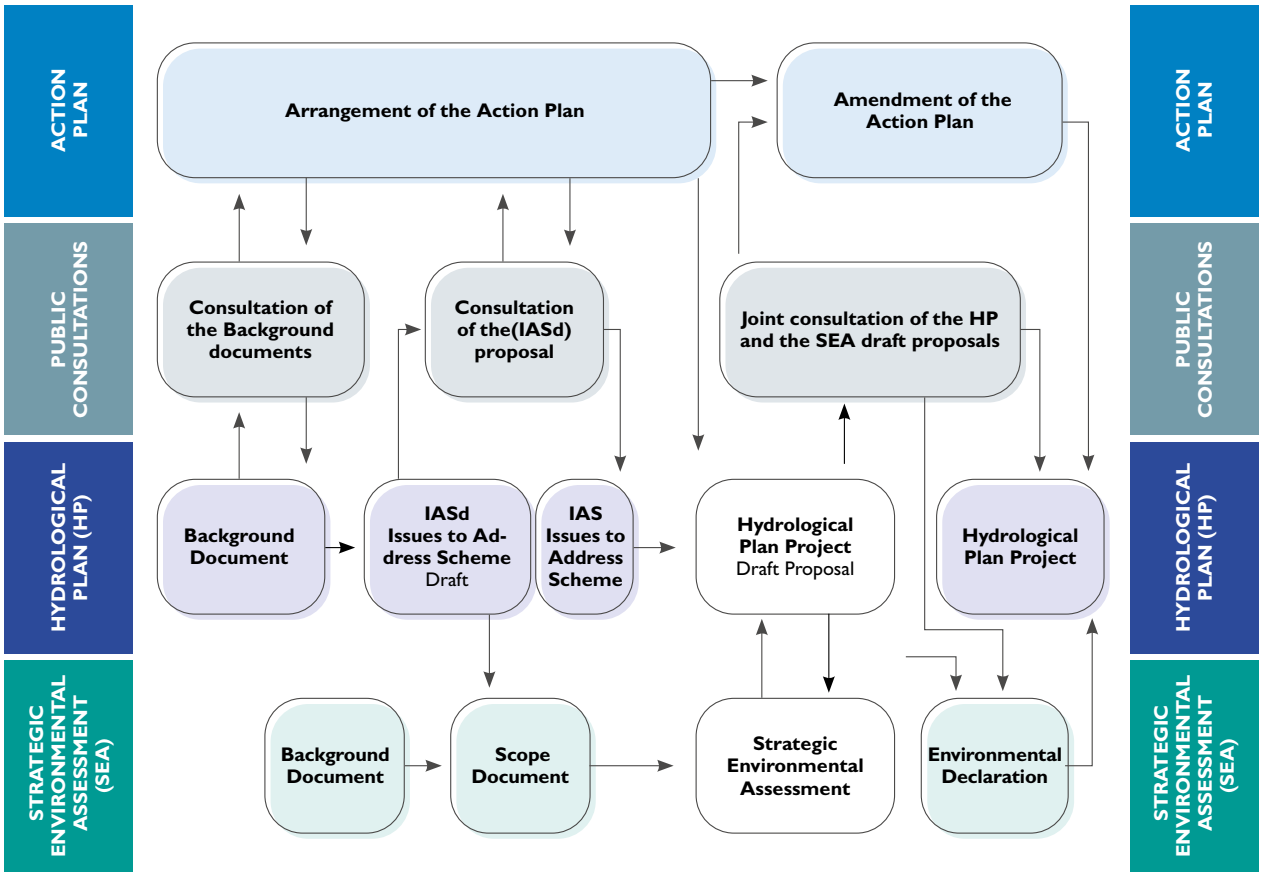
It seems proper to highlight that the backbone of these instruments will be the River Basin Management Plans (RBMP), the Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse Plan (DSEAR), the River Restoration Strategy, the Action Plan for Groundwater, the Special Drought Plans and the Flood Risk Management Plans, since these documents address the fundamental actions and measures of water management regarding climate change, risks, security and resilience, while other instruments may complement the aforementioned partially (Dams and Reservoirs Safety Plan, Water and Energy Strategy,...) or horizontally (digitization, internalization strategy, communication plan and corporate identity, …).

7.1. 3RD GENERATION RIVER BASIN MANAGEMENT PLANS | PHC

Spain currently hosts 25 river basin districts, whose competent authorities, some under the National Administration, in others, subordinate to Regional Administrations, have been planning their water resources in three successive six-year periods since 2009, in compliance both of the Spanish legislation itself contained in the Water Act and its Planning Regulations, as well as in the Water Framework Directive and its transposition into Spain's water legal framework.

Spain is currently developing its 3rd generation hydrological planning cycle. 1st generation plans corresponded to the 2010-2015 six-year period, followed by 2016-2021 2nd generation plans, still in force, and the 3rd generation plan cycle which will be in force throughout the 2022-2027. The basic documents of the plans are: the Background Documents, Issues to Address Scheme and the Hydrological Plan Project. These documents include an important public participatory process and a strategic environmental assessment process. An essential element to achieve the objectives of planning are the programs of measures.

RIVER BASIN MANAGEMENT PLANNING PROCESS



These plans have been aligned both to existing issues at any given time, as well as to the different planning objectives that Spanish and European regulations have been considering in recent years. Therefore, it should be noted that the main features that defines hydrological planning in Spain are those of being adaptive, flexible, dynamic and participatory.

For this reason, the 2022-2027 River Basin Management Plans differ from the previous ones in that they more extensively and explicitly contemplate the risk of climate change and the need for the water resources management to adapt to this risk, in order to increase water security and the system's resilience. It could not be otherwise, as the Climate Change and Energy Transition Act states so.

And no less important, it also states the need to contemplate the European and Global goals declared in different pacts, strategies, plans to which Spain has committed itself to achieve and that have already been mentioned in previous chapters.

Specifically, the European Green Deal poses as a backbone framework to make sectoral and environmental policies compatible with national and international commitments on the matter. For this reason, a fundamental axis to understand these new River Basin Management Plans is the fact that the environmental quality of water bodies is ranked as the top indicator of the robustness and guarantee of water management systems in Spain.

It is also necessary to highlight that this Water Strategy for the Ecological Transition is an ambitious project that should guide the Administration's action in the coming years. For this reason, any successive River Basin Management Plans that are approved since the year 2027, must be adapted to that horizon based on experience, new realities, the responses of natural and artificial water management systems and the uncertainties associated with climate change itself and its impact on water resources.

The plans are elaborated by the competent Basin Authorities, which draft their hydrological plan proposal, inspired by environmental, economic and social sustainability criteria in the use of water through integrated management and long-term protection of water resources, prevention of the deterioration of the state of water bodies, protection and improvement of the environment and aquatic ecosystems, pollution reduction and the prevention of the effects of floods and droughts.

Additionally, the River Basin Management Plans are coordinated with different sectoral plans in order to harmonize the needs of the different sectors that affect water policy, such as land use, energy policy or irrigation.

Prior to the drafting of each plan, each River Basin district carries out a phase of identification of Issues to Address, taking into account the basin specifics, issues and historical evolution. A participatory process states the main challenges to be undertaken. Amongst them, the following can be highlighted:

- Adaptation to climate change
- Wastewater treatment of urban discharges
- Fight against diffuse pollution
- Environmental recovery of riparian area and synergies with flood risk management
- Sustainable management of groundwater
- Environmental objectives in protected areas of habitats and species

River restoration at Zapardiel river, Douro river basin

River Basin Management Plans also incorporate important studies and measures to respond to both the important issues identified, as well as other elements mentioned in Spain's regulatory framework. As some of these important issues are addressed specifically in other plans and strategies, we will refer them below.

7.2. NATIONAL RIVER RESTORATION STRATEGY | ENRR

A water quality capable of creating healthy and diverse ecosystems is the best guarantee that the supply, society's water demands, is covered and that adaptation to climate change has higher expectations of success. For this reason, important elements of this strategy and hydrological planning have been considered, such as river restoration and wetland recovery.

The National River Restoration Strategy (ENRR) began in 2005, with the general objective of promoting the recovery of the water bodies of the inter-regional River Basin districts, thus contributing to them reaching good status or good ecological potential (concurrent with what is stated in EU's Water Framework Directive), providing a complementary response to other regulatory, technical and social demands. A little more than 15 years after its initial enactment, a 2nd generation ENRR is currently being addressed, to update the objectives and development mechanisms of the Strategy, taking into account the evolution of European and Spanish on water regulations, biodiversity and risk management, the greater scientific and technical knowledge in these fields, the evolution of social expectations about the role of rivers in human welfare, the provision of uses and services, and the protection of the environment and cultural heritage linked to rivers.

ENRR is oriented towards integrated compliance with the EU Directives on water and biodiversity, the National Plan for Adaptation to Climate Change (PNACC), the 2030 National Strategic Plan for Natural Heritage and Biodiversity, the National Strategy for Green Infrastructure and Connectivity and Ecological Restoration (EIVCRE) and the Strategic Plan for Wetlands (2022-2030). For this reason, ENRR intends the restoration and structural and functional reconnection of 3,000 km of rivers between 2022 and 2027, in line with the River Basin Management Plans principles; such as follow-up indicators monitoring over time, linear and areal connectivity criteria, and any methodologies arising from the European Commission recommendations on river management.

ENRR's most outstanding lines to take are the following: improvement of the hydro-sedimentary regime of riverbeds, restoration of longitudinal connectivity through the removal or "permeabilization" of crossing obstacles, restoration of crossing connectivity through reconnection of riverbeds and floodplains, the restoration of aquatic and riparian habitats, the eradication and control of invasive species in continental aquatic and riparian environments, the development of specific actions for adaptation to climate change, the recovery of ecosystem services of the water bodies, including cultural and recreational services, the execution of informative and awareness-raising activities and the development of actions to improve knowledge and innovation.

A key element to understand river restoration and frame it into in concrete and representative actions is the catalogue of Hydrological Reserves, which constitute a new water protection tool that aims to preserve those bodies of water with little or no human intervention and in very good ecological condition. Currently, 135 Riparian Nature Reserves (RNF) have been declared, to a total length of 2,684 km, belonging to ten River Basin districts under the State domain.

River Basin Management Plans include those 135 reserves and include specific measures for their protection and improvement, trying to avoid any possible risks that could endanger them.

In the first image, an obsolete weir in the Manzanares river, Tajo basin, in El Pardo (Madrid). In the second image, the weir has already been removed

Due to the review process of the River Basin Management Plans for its 3rd generation planning cycle (2022-2027), a series of stretches of rivers, lakes and aquifers have been identified whose characteristics qualify them as hydrological reserves. After carrying out detailed studies on its status, pressures and impacts, the proposal has been included into the River Basin Management Plans drafts, subjected to a six-month public consultation period. During 2022 it is expected a Council of Ministers Agreement which will declare new hydrological reserves in Spain's inter-regional River Basin districts. With approval, the National Catalogue of Hydrological Reserves will comprise 289 reserves, of which 161 are river nature reserves, 19 lake nature reserves and 22 underground nature reserves.

Special mention deserves the climate change monitoring initiative that is proposed to be carried out in 37 of the 135 interregional RNFs. River nature reserves constitute, a priori, an exceptional potential observatory for monitoring the effects of climate change, as river systems are defined by their high sensitivity, and because the RNFs are free of significant anthropic interference. The absence of relevant impacts of anthropic origin in the RNF will make possible to discern the effects on river ecosystems due to climate change, determining their natural evolution under new environmental conditions, from those others that may be determined by the influence of human activity derived factors. The establishment of a network that makes it possible to observe, in the long term and in detail, the evolution of these natural systems under this new scenario, will allow deepening the knowledge of their functioning and dynamics, enabling the establishment of future strategies for adaptation to climate change and its consequences.

CLIMATE CHANGE MONITORING NETWORK IN RIVER NATURAL RESERVES

7.3. STRATEGIC PLAN FOR WETLANDS | PEH

Regarding the wetland recovery, the role that wetlands can play is outstanding: mitigating climate change, reducing floods, offering water security and enriching the biodiversity of the ecosystems. For such reasons, the role of wetlands in water management must be invigorated in the coming years, and this is reflected in the Strategic Plan for Wetlands (PEH).

Avoid, stop and reverse the loss and degradation of wetlands in Spain, helping to guarantee the maintenance of the ecosystem services they offer and the habitats and species they support and to increase their resilience, ensuring their sustainable use and management and addressing and promoting their recovery.

In regards to green infrastructure, the "*National Strategy for Green Infrastructure and Ecological Connectivity and Restoration*" approved in 2021 aimed to guarantee ecological connectivity and the ecosystem functionality, mitigation and adaptation to the effects of climate change, the defragmentation of strategic areas for connectivity and the restoration of degraded natural systems, taking special account of wetland ecosystems, which are dealt with in a particularly thorough manner.

PEH identifies the main challenges that impact Spanish wetlands: changes in land use, alterations in flow regimes, pollution, hydromorphological alterations, invasive alien species and climate change. It also establishes numerous lines to take concurrent with the objective of revitalizing these ecosystems for their undoubted social, environmental and economic values. Each of these lines to take has a set of associated specific measures.

Among these lines we highlight the following: awareness about wetland heritage; protection, conservation and management of wetlands; enhance and restore wetlands and reduce their threats; international commitments on wetland conservation; wetland finance and governance; participation of the public and corporate sector on wetland management discussions.

7.4. FLOOD RISK MANAGEMENT PLANS | PGRI

The issue associated with the extreme phenomena of river flooding has been common in the Spanish geography, due to the traditional irregularity in the presentation of rainfall, especially in the basins of the Mediterranean arc, although without ruling out other areas of our geography where virulent phenomena associated with this cause have also historically occurred. As it has been shown, climate change will aggravate these issues in the future, so the Strategy must address this challenge without forgetting the long tradition of measures that the water administration has adopted to relieve these issues.

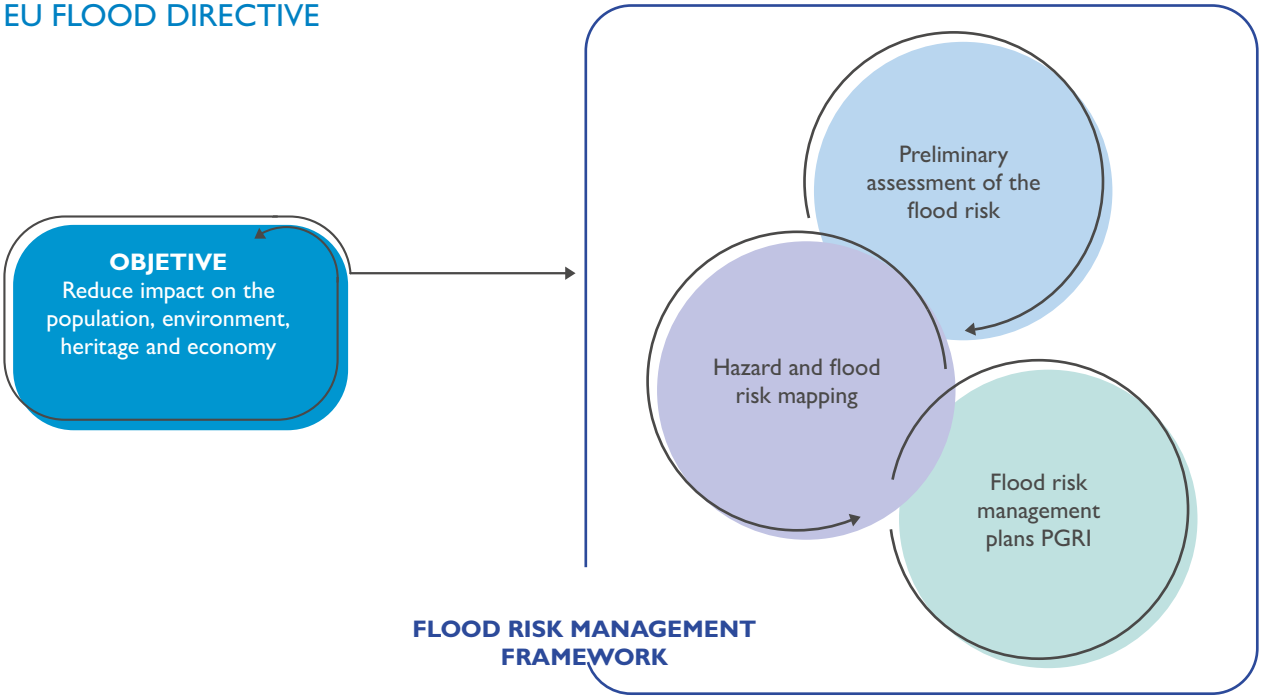
According to data from the European Environment Agency, Spain is the EU country with the greatest extreme precipitation events, and specifically our Mediterranean arc has precipitation intensity indices that are difficult to compare with other European areas, where the maximum daily precipitation may match the average annual precipitation. This causes, in conjunction with the basins' features and the hydromorphology of our rivers, a great imbalance between the extreme events' flows and the average flows that the rivers carry, up to figures that are not comparable with other rivers in Europe.

Lately, the estimated population living in the highest risk flood-prone areas in the Spanish interregional basins has risen from 2,481,000 inhabitants to 2,730,000 inhabitants. The delimitation of the different affected land uses has improved and emphasis has been placed on the most vulnerable land uses such as urban and associated urban uses.

Wetland of La Nava, Ebro basin, in Alfaro (La Rioja)

Currently there are 19,900 km of bounded and published flood-prone areas, but it is necessary to extend this length to at least 25,000 km, as well as to generate new cartography of the hydraulic public domain and flood zones of at least 6,000 km of river courses.

EU FLOOD DIRECTIVE



Both the flood risk management plans and the measures contained in the River Basin Management Plans must be undertaken in synergy with the environmental recovery of the fluvial territory, an European Green Deal priority. For this reason, the 2030 Biodiversity Strategy aims to restore the free-flowing condition of 25,000 km of riverbeds in the European Union, of which Spain will recover 3,000 km.

This group of measures offers a very favourable cost-benefit ratio, with clear synergistic effects such as of mitigating flood risk, contributing to the achievement of environmental objectives, adapting to climate change protecting and improving biodiversity and ecosystem values.

For all these reasons, hydromorphology has become more prominent not only in the assessment of the ecological status of water bodies, but also in its positive relationship with flood risk management. In response to this issue, many actions oriented towards nature based solutions have been incorporated into the plans, which seek to return rivers, lakes and wetlands, and our transitional and coastal waters, to their natural domain. Measures are also included for the sediment mobilization and others for the demolition and removal of grey infrastructure, such as berms or weirs in disuse that interrupt the longitudinal and lateral continuity of our rivers.

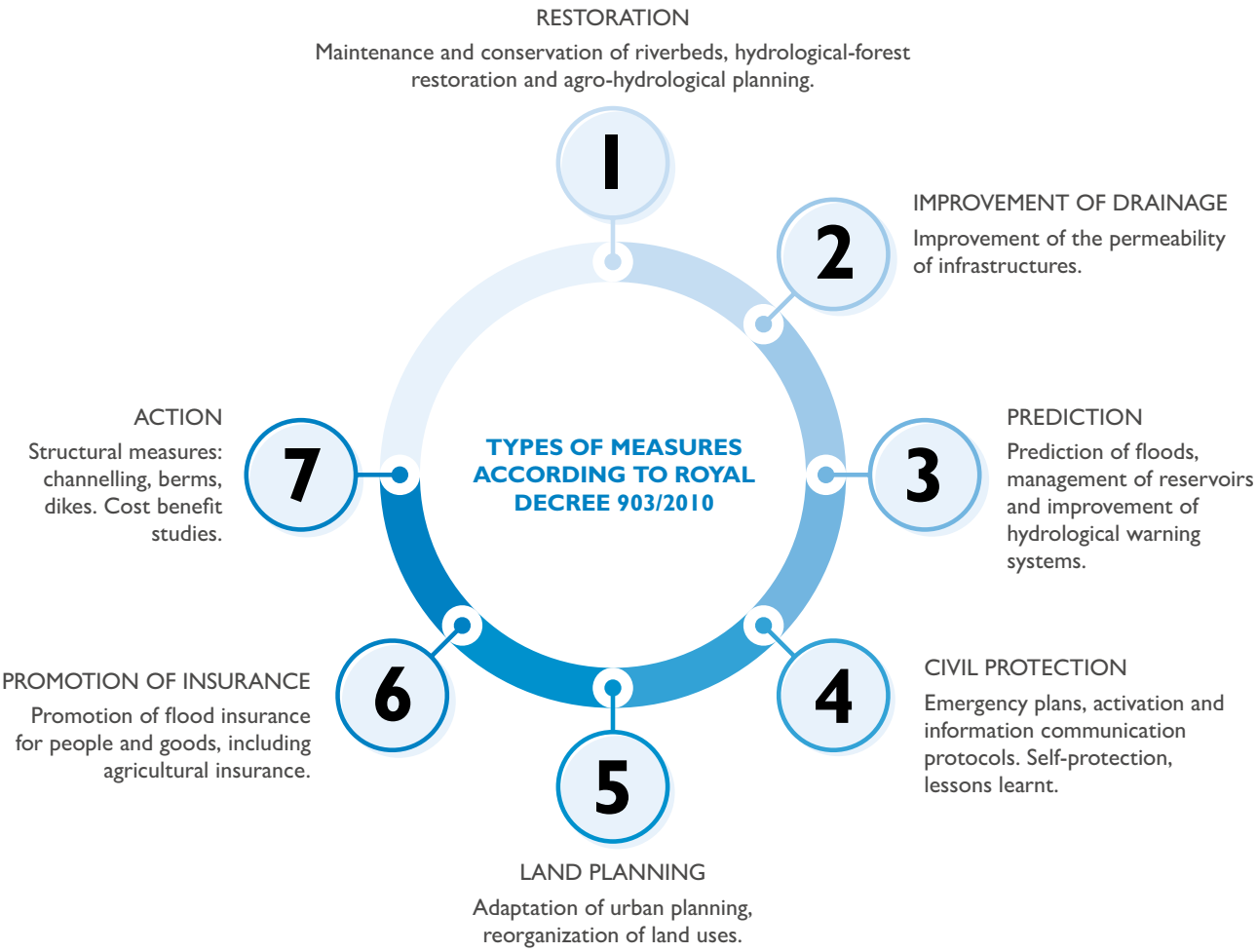
At urban level, where rivers are often classified as highly modified water bodies, these types of solutions are more difficult if not impossible to execute. But as the UN Report on Water and Climate Change highlights, urban planning a so-called soft or non-structural measures that offer excellent opportunities to mitigate flood risk.

Specifically, greater resilience to flood risks can be achieved through the development of sustainable urban drainage systems, integrated into the design of urban infrastructure to provide safe spaces during a flood. The city thus acts as a "sponge", limiting the rise in water levels and releasing rainwater as a resource. Also, self-protection measures are to be carried out in streets, buildings, garages or basements, whose mission is to reduce the adverse effects of rising water levels and avoid, with low-cost measures, the damage increase to urban heritage.

A fundamental element to highlight in flood management is the fact of complementarity, and therefore, that the solution of each issue does not only depend on one type of measure alone, but on a consistent set of actions of different nature (infrastructural, environmental, legal, social, etc.)

One element of vital importance in flood risk management is communication, and for this reason, a National Strategy for Communication against flood risk and adaptation to climate change is to be launched. The improvement of public awareness in preparation for floods, the increase in risk perception and the adoption of self-protection strategies are essential to be able to successfully apply the rest of the measures contemplated in the PGRI. The objective is to achieve coordinated and planned action by all administrations, also counting on the role of the media and new technologies, with precise objectives to achieve a long-term view, and with an assessment system to really assess its impact.

TYPES OF MEASURES INCLUDED IN FLOOD RISK MANAGEMENT PLANS



Related to this is the improvement of early warning and meteorological and hydrological forecasting systems and their proper coordination with all civil protection protocols. The management of the flood emergency corresponds to the Civil Protection authorities, who, based on information from the meteorological and the hydrological information networks, among other data, establish the different alert levels in accordance with the thresholds and previously established communication protocols. In this sense, two tools contemplated in Act 17/2015 of the National Civil Protection System will be implemented. On the one hand, the National Information Network on Civil Protection (RENAIN) with the aim of interconnecting all the data and information necessary to guarantee effective responses to emergency situations, to which all the competent Public Administrations will contribute. And on the other hand, the National Alert Network (RAN), which will constitute the system for communicating emergency warnings to the competent authorities in matters of civil protection and, in particular, with regards to floods, meteorological alerts and hydrological, so that essential public services and citizens are informed of any emergency threats.

7.5. SPECIAL DROUGHT PLANS | PES

The highly irregular rainfall pattern that our country suffers implies that management systems have to be prepared to address the two extreme events of floods and droughts. In both cases, these phenomena seem likely to be aggravated by the effects of climate change, which makes managing the extreme episodes of drought a fundamental element of water management in Spain.

It should be noted that the special drought plans do not deal with the issue of structural scarcity, associated with permanent issues of demand coverage, and not the result of a temporary situation caused by the irregularity in rainfall. Structural scarcity must be assessed, evaluated and resolved through ordinary hydrological planning.

However, water management systems cannot be designed to operate normally in temporary situations of extreme scarcity, because this would mean assuming extraordinary costs and installing an excess of idle infrastructure for most of the time. It would be like wanting to build highways so that there would never be any congestion, and therefore making additional lanes that would only be needed for a few days a year. For this reason, the Special Drought Plans (PES) are not, in any case, a framework for the approval of new infrastructure investments, but rather management plans for existing resources and infrastructures in extreme situations. They propose and collect specific measures to mitigate the impacts of droughts, which makes possible to prevent and correct its adverse effects on the environment and favour sustainable development even in the most exceptional moments. These measures are as follows:

- **Measures on the demand side:** Aimed at adapting the volume of water resources demanded by users to the availability of water resources (citizen awareness, modification of supply guarantees, restrictions on uses - of type of cultivation, of irrigation method, recreational uses, penalties for excessive consumption, etc.).
- **Measures on the supply side:** Mobilization of strategic reserves, especially groundwater, activation of alternative sources of obtaining the resource and temporary adaptation of the exploitation regimes of reservoirs and aquifers to the drought situation.
- **Measures on the managerial side:** Define the leaders and the necessary structure for the execution and monitoring of the special plan and to intensify the coordination between stakeholders linked to the issue (administrations and public or private entities).
- **Measures on the water environment side:** Temporary actions for environmental protection, especially aimed at safeguarding the impact of scarcity on the water environment and in particular on aquatic ecosystems.

The Special Drought Plans (PES) include an indicator system, whose basic principle for the indicator's creation is that they respond adequately and realistically to the situation they seek to define. The indicators needs to be an objective and useful tool for decision making. Therefore, it is essential that their selection and threshold assignment make the diagnosis coincident with the situation that is intended to be assessed. In the case of prolonged drought, due to the continuous lack of rain, the indicators to be used will basically relate to rainfall or to contributions that can be considered very close to those of the natural regime. The threshold for defining prolonged drought will discriminate through the criterion that under such threshold, the situation is consistent with a temporary deterioration compliant with environmental objectives or requires to reassign the ecological flows to those defined for prolonged drought status. In the case of short-term, non-structural scarcity, the thresholds to be established for entering the pre-alert, alert and emergency phases must be equally consistent with these situations. Thus, with the application of measures in the pre-alert and alert phases, an emergency situation must be avoided, which would mean a situation of serious scarcity.

7.6. GROUNDWATER ACTION PLAN | PAAS

As stated in this Strategy, groundwater is an essential resource for meeting water demands together with other types of resources within the framework of integrated water resource management. They also constitute a strategic resource in drought situations. On such grounds, achieving and maintaining good quantitative and chemical status of groundwater bodies is a priority objective of the strategy.

Groundwater bodies have a critical influence on the ecological flows and on the good condition of the surface waters, since they are responsible for maintaining the base flows of the rivers. Additionally, their overexploitation, as well as their pollution, impact on biodiversity and the environmental recovery of our rivers, as approximately one third of the renewable water resource in Spain comes from groundwater (35,000 Hm^3/year on average), and that some 8,000 Hm^3/year of groundwater are currently allocated to comply with environmental restrictions.

The River Basin Management Plans include many measures related to the management and protection of the almost 800 bodies of groundwater catalogued in Spain. But given that there are still 40% of water bodies in poor condition in Spain, and due to the fact that no significant improvements have been seen in recent years, there is a need to enhance their understanding and correct management through the Groundwater Action Plan (PAAS).

The overall challenge of the aforementioned plan is to achieve good quantitative and chemical status of the groundwater bodies and the objectives of the protected areas and associated ecosystems, making it compatible with the sustainable use of groundwater for different uses.

Manual measurement of the groundwater level

The two most important historical issues that groundwater management would have to address are overexploitation and pollution by nitrates and pesticides. Both issues are causing respectively the salinization of aquifers, the deterioration of drinking water and effects on dependent ecosystems, in addition to giving rise to infringement procedures by the European Commission for non-compliance with EU regulations. For example, diffuse pollution by nitrates currently affects 23% of the groundwater bodies located in interregional basins in Spain.

The main lines to take considered in the Plan are the following:

- Improved understanding of groundwater, which would range from the collection, analysis and public disclosure of existing data, to promoting the development of flow and quality models, or the new assessment of underground resources based on the work of CEDEX and IGME where base and field work will have a special relevance.
- Expansion and improvement of control networks: piezometry, hydrometry, quality.
- Analysis of the representativeness of the data and its public disclosure.
- Measurement, monitoring and control of the uses of groundwater: digitization and dissemination of data.
- Research the nexus of groundwater bodies with rivers, wetlands and dependent ecosystems.
- Protection against the deterioration of groundwater, particularly against nitrates and pesticides, emerging pollutants, marine intrusion.
- Promotion of tools such as protection perimeters.
- Improvement of groundwater governance, strengthening the management capacity of Basin Authorities and enriching the administration-user relationship through the Groundwater User Communities (CUAS) and their functions.
- Amendements in the Consolidated Text of the Water Act (TRLA) and subsidiary regulations such as the Nitrates (RDN) and the Hydraulic Public Domain Royal Decrees (RDPH).

It should also be noted that an Assessment Guide for the state of groundwater bodies has been put together, which notably improves the contents of the previous instalment and will help to better describe their state, together with the definition and declaration as Underground Natural Reserves on those aquifers, fountains and springs that have a special environmental relevance and that for this reason must be specially protected.

7.7. WASTEWATER TREATMENT, SANITATION, EFFICIENCY, SAVING AND REUSE PLAN | DSEAR

The DSEAR Plan preparation commenced in the summer of 2018 and was approved by Ministerial Order in 2021 with the aim of reviewing the acting strategies substantiating Spain's water policy in issues such as wastewater treatment, sanitation and reuse. Previous operating models had led Spain to an unwanted situation of non-compliance with EU regulations regarding the protection of water bodies, repeatedly ratified by the EU Court of Justice. To deal with these issues, DSEAR Plan was developed to assess the originating causes and propose solutions to address them, moulding itself as a governance instrument and not as an investment catalogue. It should be taken into account that the River Basin Management Plans, currently under review, are the instruments that include detailed listing of the measures concerning sanitation and wastewater treatment.

Specifically in matters of wastewater treatment and sanitation, the latest data show that nearly 500 Spanish urban settlements have not yet reached conformity with Directive 91/271/EC. These settlements encompass almost 11 million inhabitants equivalent, which means the non-compliance of more than 25% of the urban settlements over 2,000 inhabitants equivalent declared in Spain.

The DSEAR Plan is not a planning tool *stricto sensu,* as it does not define what, when, how and who carries out certain actions, nor is it associated with an investment catalogue. It is a governance instrument that establishes a critical assessment of the wastewater treatment, sanitation and reuse sectors in Spain, classifies the issues detected into seven areas or governance objectives and develops a set of action proposals for their improvement. The governance objectives are as follows: define criteria for prioritizing measures, enhance administrative cooperation, refine the definition of actions to be considered as of general interest to the State, improve efficiency, energy and overall, of treatment plants and reuse of wastewater, perfect the financing mechanisms of the proposed actions, promote the reuse of wastewater and promote innovation and technology transfer in the water sector.

7.8. WATER CYCLE DIGITIZATION | PERTE

The significance of digitization was already determined in the Green Paper on Water Governance in Spain published in March 2020, where a series of proposals were put together to promote digitization of the water sector in Spain. Digitization is not an end in itself but rather a key instrument to achieve the objectives of this Strategy.

Digitization of the water sector is an essential task regarding the efficient and fair management of water, either by collecting data and information on water resources, by its disclosure so that administrations, water users and citizens can access or facilitate online business between citizens and the Water Administration.

Although significant progress has been made in digitization in recent years through various actions, programs and plans, there is still significant room for improvement, especially since the actions set out in Spain's 2025 Digital Agenda, aligned with European digital transition policies, have to be systematically incorporated.

In a context in which climate change generates greater atmospheric and climatological variability that cause more extreme natural phenomena, and greater uncertainty in the availability of the resource, it is essential to evaluate water reserves, current supplies, usage, and future demands more precisely. Accurate and up-to-date information allows decision makers greater ability in the control and management of water, as well as allows users to make more educated decisions in the efficient and rational use of the resource, which results in the benefit of all, and in the long-term protection of water resources.

On such grounds, the Strategic Project for Economic Recovery and Transformation (PERTE) for the digitization of the water cycle was approved by the Council of Ministers on March 22nd, 2022. It is expected to allocate 3,060 million Euros in the coming years in public and private investments, and will activate the creation of nearly 3,500 qualified jobs, opening new professional niches in water management with special attention to engineering professionals, data processing, science and telecommunications.

The program will finance aid programs to promote the digitization of the different water users. The main objective of these grants is to promote environment protection, enhance water resource management and stand up to the demographic challenge and climate change.

Automatic Hydrological Information System (SAIH) | Tagus River Basin Authority

Throughout this year 2022 and in 2023, MITERD will open several calls for grants addressed to urban water cycle competent entities and administrations, industry, and irrigators' and groundwater users' communities. This line of action assigns a direct investment of 1,700 Million Euros, which will draw an additional allocation of 1,120 million Euros from public-private partnership.

200 Million Euros will be allocated to digitization in irrigation. Among other measures, these grants will be aimed at increasing the implementation of water metering in water intakes and land plots, enhancing soil moisture and conductivity control systems, increasing fertilizer input measurement or automating irrigation systems.

PERTE proposes an investment of 225 Million Euros to promote and upgrade digitization in Basin Authorities and Automatic Hydrological Information Systems. Beyond facilitating the digitization of administrative procedures, the project will serve to strengthen discharge monitoring and control through real-time monitoring systems.

Regarding the regulatory framework that accompanies all these changes, the PERTE contemplates, among other measures, amendments to the Water Act that includes advances in digitization and an update of the Public Hydraulic Domain Regulation, which are committed to the monitoring and control of water use and state the digital requirements for any new uses. Additionally, PERTE will create the Spain's Observatory for Water Management, a governance tool that will allow the maintenance of all the digital infrastructure that is to be implemented.

On the other hand, the National Plan for Adaptation to Climate Change (PNACC) 2021-2030 establishes the basic planning instrument to promote coordinated action against the effects of climate change in Spain. Being the promotion of water management and water resources in general one of its priorities, the PNACC establishes 6 lines to take in matters of water and water resources in general, all heavily dependent on a deep understanding of water management and associated ecosystems, aspects in which the digitization of the water cycle becomes essential.

7.9. IMPROVEMENT OF WATER GOVERNANCE | LVGA

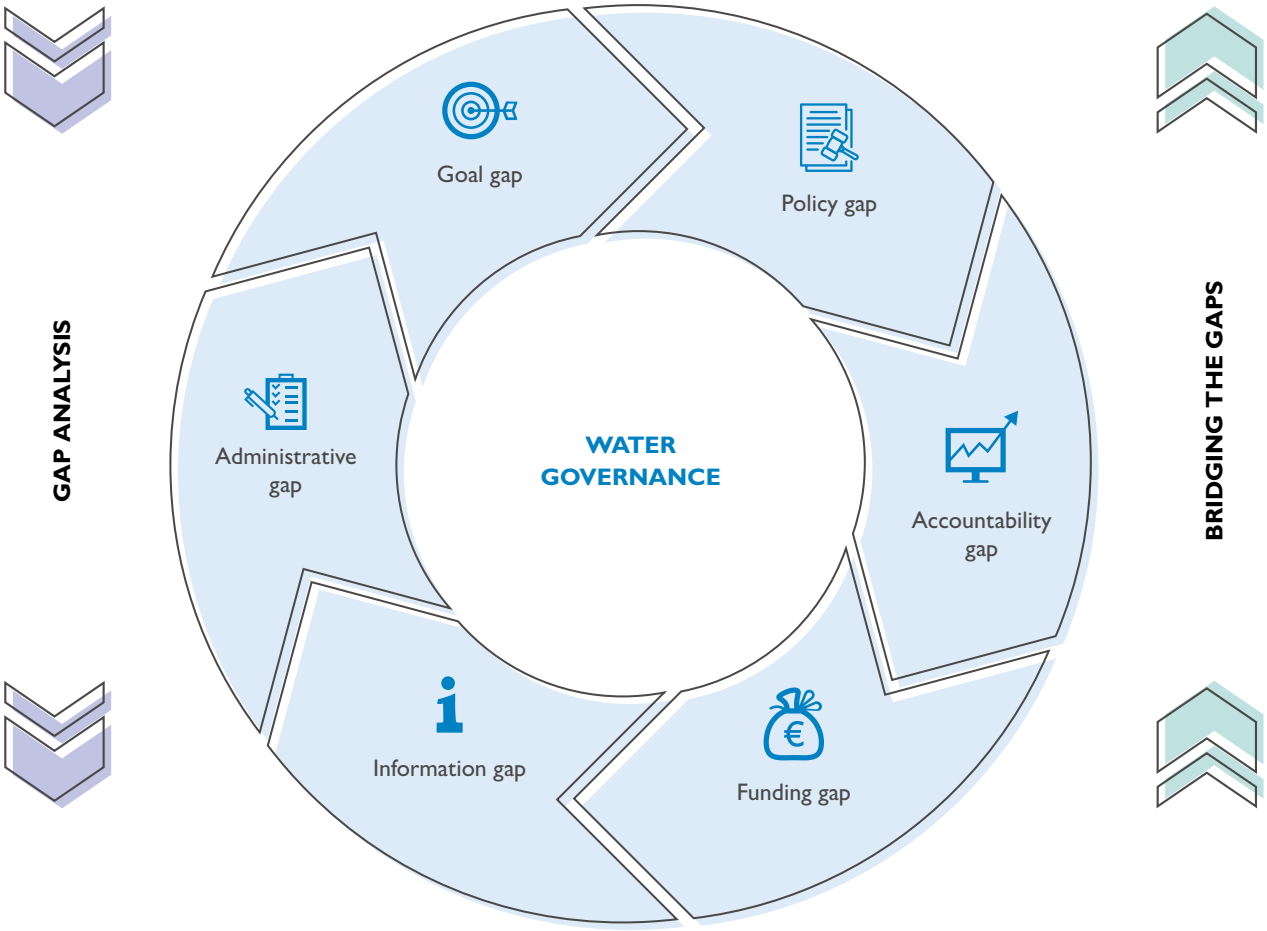
Water governance addresses how, when and by whom decisions are made regarding integrated water resources management. On such grounds, how are water resources governed? What necessary amends are needed for a better performance? Water governance distinguishes itself from governability and is defined as a continuous, dynamic, flexible and necessary process to achieve good integrated water management.

All countries host a more or less explicit water governance structure that establishes the customary and legal processes that govern decisions and institutional arrangements on how to manage water. Governance implies a certain institutional design that is essential for good comprehensive management by river basin, for the conservation of water resources and compliance with the human right to water, based on deliberative and democratic processes. Therefore, governance comprises the review and strengthening of legal and regulatory frameworks, the generation of institutional arrangements, the coordination and institutional mainstreaming of water policy, the participation of all relevant stakeholders, access to information, transparency and accountability as preliminary stages for participation, and very importantly, the review of the financial mechanisms that are known, have worked and may work.

Spain has committed to the OECD water governance principles, which rely on this ambition: "Addressing future water challenges raises not only the question of what to do, but also who does what and why, at what level of government and how. Policy responses will only be feasible if they are consistent, the actors are correctly coordinated, the current regulatory frameworks are well designed, adequate and accessible information is available, and there is sufficient capacity, integrity and transparency. To face the future, institutions must adapt to changing circumstances, and political will and policy continuity are key in the transition to more inclusive and sustainable practices."

Since 2010, OECD has provided evidence on the main management gaps that hinder the formulation and implementation of water policies, and has suggested a series of policy responses and good practices for their resolution. The "OECD Multilevel Governance Framework: Mind the Gaps, Bridge the Gaps" was developed as an analytical framework and tool for policymakers to identify challenges and overcome governance gaps that affect, to a greater or lesser extent, to all countries regardless of their institutional configuration, availability of water or degree of decentralization. In Spain, and inspired by this OECD scheme, MITERD carried out an ambitious study in 2020 to detect these governance gaps and propose institutional, legal, participatory and financial solutions, in the "Green Paper on Water Governance in Spain", a document that provides adequate guidance on how to deal with water governance in Spain in the coming years.

MULTILEVEL GOVERNANCE FRAMEWORK: MIND THE GAPS, BRIDGE THE GAPS



Source: OECD (2011), *Water Governance in OECD: A Multi-Level Approach*, OECD Publishing, Paris.

According to OECD, water governance should rely on the following guidelines:

- Clearly assign and distinguish the "roles" and responsibilities for water policy design, policy implementation, operational management and regulation, and promote coordination between the competent authorities.
- Manage water at the appropriate scale(s) within the integrated basin governance system.
- Promote policy consistency through effective cross-cutting coordination, especially between water and environment policies, health, energy, agriculture, industry, land planning and land use planning.
- Adapt the level of ability of the entitled authorities to the complexity of the water challenges they have to address.
- Produce, update, and share consistent, comparable, and relevant data and information on water issues in a timely manner, and use them to guide, evaluate, and improve water policies.
- Ensure that governance frameworks help mobilize water finance and allocate financial resources in an efficient, transparent and timely manner.
- Ensure that sound regulatory frameworks for water management are implemented and enforced effectively in the public interest.
- Promote the adoption and implementation of innovative water governance practices among competent authorities and relevant actors.
- Incorporate practices of integrity and transparency in all water policies, water institutions and water governance frameworks for greater accountability and trust in decision-making.
- Promote the involvement of stakeholders in the design and implementation of water policies.
- Promote water governance frameworks that help manage arbitration between water users, rural and urban areas, and suppliers.
- Promote regular monitoring and evaluation of water policies and water governance, share the results with the public and make adjustments where necessary.

Guadiana River Basin Authority personnel

These principles are consistent with those promoted by Spain's *Green Paper on Water Governance,* and which inspire this Strategy:

- Coordination and consistency of sectoral policies so that they align and serve the objectives and goals of the policy and water management in such a way, for example, that agricultural and industrial policies do not contradict the objectives of hydrological planning, that urban development has guarantees of an adequate supply or that water is not a restriction for the transition to a new energy model.
- Cooperation between the different levels of the Public Administration since the water cycle and its management must be conceived as a unitary set of shared responsibilities that converge within the framework of water management.
- Participation and co-responsibility. Water management affects very diverse social and economic interests. On the other hand, water security depends on maintaining the good condition of aquatic ecosystems, degraded by human action. The complexity that derives from this multiple dimension of water requires a new way of communicating with society. This requires, on the one hand, the development of mechanisms for the direct and effective participation of the social sectors interested in all areas of water management. Public participation implies regulated, objective and complete access to information, and total transparency and publicity of the agreements adopted by the decision-making bodies.
- Continuous information, monitoring and assessment to apply decision criteria in the prioritization of public actions.

The first necessary condition to move towards goal-oriented water management is to establish a new culture of ex ante and ex post assessment that is based on socially relevant assessment criteria such as effectiveness, efficiency and sustainability and not only on operational or procedural aspects such as the level of investment for the construction of infrastructure, budgetary expenditure or excessive respect for established procedures.

Progress towards this type of assessment can form the basis of a new relationship with stakeholders, whose concerns are affected by the objectives of the water policy, making visible the important contribution of the Administration to the solution of issues perceived as such by citizenship.

Specifically, the Green Paper highlights the following priority lines to take regarding water governance in Spain:

- Regarding the proposed legal reforms, the revision of the economic-financial regime of the Water Act and the amendment of the legal text to guarantee its utility regarding climate change, incorporating any new regulations that are generated (Climate Change and Energy Transition Act and others).
- In order to adapt water legislation to community acquis, it is considered a priority to modify the planning objectives, emphasizing the guarantee of sustainable management and integrating the requirements of protection and good status in the strategies of the sectoral plans, eliminating the servitude of hydrological planning to sectoral policies.

Irueña reservoir, Douro river basin (Salamanca, Castilla y León)

- To facilitate adaptation to climate change, it is a priority to rely on a publicly accessible Water Registry with expanded functionalities, linked to the use of periodic telematic declarations to report on the use of the Public Hydraulic Domain (DPH) in the conditioning of concessions.
- With regard to the amendment of the concession regime, it is considered a priority to submit the availability of the flows granted to their evolution due to natural reasons or climate change and to the achievement of environmental objectives.
- With regard to the amendment of the groundwater regime, uses below 7,000 m^3 per year should be introduced into the concession system. It is also considered a priority to advance in the complete demanialization of groundwater, closing the normalization processes of already existing extractions.
- Regarding water taxation and financing reforms, a need to revise and expand the current regulation regarding the regulation fee and the usage fee becomes imperative, aiming them as a useful recovery tool for state investment costs in regards to supply, irrigation, sanitation and wastewater treatment infrastructure.
- The recent modification of Article 112 bis of the TRLA is already heading in that direction of cost recovery, insofar as it applies a hydropower fee on energy production, and whose 50% of the collection is directed to the River Basin Authorities to execute actions to protect and improve the water environment.
- Regarding the reorganization and strengthening of the water administration, it is considered a priority to evaluate the economic, environmental and social feasibility of works of general interest. It is also considered essential to increase the effectiveness and efficiency of the operation of the River Basin Authorities, providing them with greater autonomy in their operation.
- With regard to inter-administrative coordination and the functioning of the participation bodies, it is considered important to reinforce and sanction the mechanisms and forums for collaboration between the technical teams of the General Directorate of Water and the Basin Authorities and with other water administrations, as well as amend and strengthen the Committees of Competent Authorities and the Water Councils.
- Finally, regarding the participation and co-responsibility of society in water management, the priority proposals are related to user communities. These include encouraging the creation of communities of groundwater users and to promote land stewardship agreements with local organizations and entities.

Coordination of agents involved in the Ebro Resilience Strategy. Regions of Navarre, La Rioja, Aragón with MITERD and Ebro River Basin Authority

7.10. REGULATORY FRAMEWORK REVIEW | TRLA

Closely related to water governance, the legal and regulatory framework establishes the bases on which to build the institutional structure in which water planning and management will be developed. For this reason, the strategy dedicates a section to establishing the legal basis for such management, highlighting those new elements that it would be advisable to introduce into the existing regulations with the aim of promoting water management in accordance with the principles and objectives established by this strategy.

The Consolidated Text of the Water Act (TRLA) is the main regulation that establishes the bases for water management in Spain. A text originally approved in 1985, since then has been succesively amended, due to new European legislation on water, but also trying to improve different aspects related to the more effective management of water resources and environmental protection. For this reason, the Strategy states the need to approve a new amendment to the TRLA with the aim of establishing a clearer and more structured text that attempts to resolve the numerous issues in water management that have been noted in recent years, putting the focus on environmental protection and water security and seeking a more agile and modern water administration.

The proposed amend of the Water Act must address the following issues:

- Update objectives and principles, stating that the sectoral strategies and plans established by the Public Administrations will be subject to the demands required for the protection of the water environment.
- Include adaptation to climate change and its impact on hydrological planning.
- Improve the basic organization of the Public Water Administration and guide its actions by updating its functions and tasks.
- Create a Water Cycle Observatory, which will hold complete and truthful information on water management in Spain.
- Guarantee water security, which will only be compromised by the necessary adaptation to climate change, promoting sustainable development.
- Influence the protection of surface and underground water bodies, providing services to associated ecosystems in accordance with the richness of Spanish biodiversity.
- Strengthen aspects related to diffuse pollution and the protection of water bodies.
- Incorporate the basic principles of drought planning and management.
- Influence the protection and management of groundwater and measures to improve its governance.
- Simplify and streamline the processing of water concessions and their modifications, in order to increase the efficiency of the administration.
- Facilitate and simplify the termination of concessions, as well as their reversion.
- Simplify the infringement regime, collecting new types and increasing the penalty fees.
- Consider actions that promote the conservation of river hydromorphology and river restoration.
- Promote land stewardship and river stewardship, promoting co-responsibility and cooperation on the part of the owners and managers of the land and water users in protecting the good state of the water bodies and their biodiversity.
- Clarify the Declaration of Works of General Interest to the State.
- Promote the digitization of the Water Administration and users.
- Strengthen the aspects related to the direct monitoring of water uses and permits.
- Regulate the obligation of all Administrations to provide the necessary data required by citizens and the EU.
- Develop an information system for the whole of the Spanish territory to collect all water planning information submitted to the European Commission.
- Update the economic and financial regime, extending the principle of cost recovery already transposed to the legislation, including the creation of integrated water systems.

7.11. ECONOMIC AND FINANCIAL REGIMES' REFORM

The objectives related to the economic and financial regimes are clearly reflected in both European and Spanish water regulations. In Spain, continental water is essentially publicly owned and integrated into the public hydraulic domain, which everybody is obliged to conserve and protect. The first recital of the Water Framework Directive states that *"water is not a commercial good like the others, but rather a heritage that must be protected, defended and treated as such"*.

The reform should render the polluter pays and the cost recovery principles effective, and of course, regarding the human right to water, achieve a fair distribution of costs and benefits aware of social inequality and the demographic challenge. Therefore, a just transition to take place in water management.

It is appropriate to remember that, in accordance with Spanish legislation, what is collected for the use of water is only intended to recover the costs that the administration commits to water supply. Even so, the current economic system only recovers 70% of the water costs, which is transferred to the water end users. The existing cost collection gap is a significant hurdle to materialize the necessary measures to achieve environmental objectives in the water environment throughout all the Spanish river basins.

In the coming years, steps should be taken to enable full cost recovery, with the exceptions already stated in current regulations. Additionally, the possibility of taxing water extraction for private use should be evaluated, in accordance with the concept of resource cost established in the Water Framework Directive and transposed to our legislation.

On the other hand, it should be noted that environmental costs have been marginalized by the Water Administration. Thus, it can be stated that only part of them have been assumed in terms of spending, while another significant part has not. These non-internalized environmental costs correspond to the actions necessary to compensate for the impacts of availability and use, which have not yet come true. An example of this is the huge pending investment in Spain to complete the urban wastewater treatment system. Other examples of trade-offs are the non-internalized environmental costs and the overexploitation of many aquifers or the contamination due to excess fertilization that our water bodies receive.

The costs of water services in Spain have been estimated at 13,500 Million Euros per year, which are distributed as follows: 51% are operating costs, 35% are investment costs and the remaining 14% are the formerly mentioned non-internalized environmental costs; that is, a figure close to 2,000 Million Euros per year.

For such reasons, it is essential to address legal and administrative reforms that lead to achieving the economic and financial objectives of water. Specifically:

- Reform the regulatory fee, introducing improvements derived from the court rulings on the accrual concept, the identification of direct and indirect beneficiaries or its application in intra-regional basins.

Muniellos Lake, Western Cantabrian Basin (Asturias)

- Reform the water use fee. It is necessary and urgent to clearly expand its taxation scope, with special reference to the various types of works on which it must be applied, whose execution and exploitation is necessary to maintain the supply, sanitation, wastewater treatment and reuse services, desalination processes and others.
- Reform the discharge control rate, increasing the coefficient applied to unauthorized discharges, so that it becomes a deterrent to malpractice.
- Study the possibility of taxing the extraction of water for private use, in accordance with the resource cost recovery concept.

7.12. MILESTONES, IMPACTS AND REQUIRED INVESTMENTS

To develop this Strategy, articulated in the previously described sectoral plans and all of them coordinated with the National Plan for Adaptation to Climate Change, the year 2030 is established as a time horizon, with four significant time milestones:

- **Year 2022:** Approval of the main water planning instruments: River Basin Management Plans, Flood Risk Management Plans, Strategy National River Restoration and Groundwater Action Plan.
- **Year 2025:** Completion of the first work program of the Work Plan of the National Plan for Adaptation to Climate Change.
- **Year 2027:** Completion of the 3rd generation River Basin Management Plans and the 2nd generation Flood Risk Plans.
- **Year 2030:** Completion of the horizon of the Strategy and the National Plan for Adaptation to climate change.

The following table summarizes of the specific milestones, most relevant impacts and estimated investments of the main instruments of the Strategy. The investment figures collected in the corresponding column should not be added up since, on the one hand, they correspond to instruments that do not always are allocated in the same time span and, while on the other, the action plan of the River Basin Management Plans includes many of the investments which are later split into different specific strategies or plans.

La Pesga WWTP, Tajo basin (Cáceres, Extremadura)

INSTRUMENTS, TERMS, IMPACTS AND INVESTMENTS

Instruments	Expected approval date	Main impacts	Estimated Investment (€)
River Basin Management Plans	4Q 2022	Recovery of 1,500 surface water bodies and 300 groundwater bodies (year 2027)	€34,000 M all Public Administrations in Spain of which *€10,000 M GSB**
		Significant improvement in water security in 50 exploitation systems out of a total of 150.	
National River Restoration Strategy	4Q 2022	Over 100 river restoration projects	€2,500 M GSB (year 2030)
		3,000 km of rivers restored (year 2030)	
Flood Risk Management Plans	4Q 2022	Risk reduction for 3 million people through early warning systems, protection against floods and nature-based solutions (year 2027).	€3,600 M Public Administration of which *€2,300 M GSB*
Special Drought Plans	2Q 2023	Optimize water management during drought periods, minimizing economic, social and environmental impacts	No investment required, these are management measures
Groundwater Action Plans	4Q 2022	Improve monitoring in 400 groundwaterbodies. 1,000 new control points, 250 new protection perimeters and 100 numerical simulation models for groundwater bodies at risk.	€500 M GSB (year 2030)
DSEAR-Purification, Sanitation, Efficiency, Savings and Reuse Plan	Approved July 2021	Make about 400 urban settlements under infringement procedures compliant with the European Wastewater Directive. *Governance instrument.*	Investments included in RBMPs to an estimate of €3,500 M GSB
PERTE Digitization of the water cycle	Approved March 2022	Improved water use efficiency	€2,000 M GSB €1,000 M from other Public Administrations and the private sector
		Digitization of Basin Authorities	
		Digital supply systems in towns 20,000+	
		Availability of water use information	
		Creation of water cycle observatory	
		3,500 new jobs	
Modification of the Water Act and dependant regulations	2Q 2023	Clearer and more structured Water Act text that will solve numerous problems in water management, focusing on environmental protection and water security and seeking a more agile and modern public service.	
		Includes the modification of the financial and economic regimes to increase cost recovery from users	

*) GSB: General State Budgets

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INDICATORS FOR MONITORING THE STRATEGY

Camporredondo reservoir, Douro river basin (Palencia, Castilla y León)

This Strategy aims to guide Spain's water planning and its management in the coming years. Thus, it is essential to provide the Strategy with some metrics that allow checking its performance over time, on how the water management system in Spain aligns to the objectives of the Strategy. To this end, this Strategy includes some monitoring indicators identified regarding the water management objectives.

Most of the indicators are available through the information and data that the Water Administration collects on a daily basis, either to carry out its ordinary water management and planning activities, or to inform the EU as required by the different Directives in the matter.

These indicators are to be accounted for every 3 years since the date of approval of the Strategy, published jointly with a monitoring and risk report. In order to describe the baseline condition, the Water Administration will publish a reference document that will collect the value of these indicators in previous years.

The indicators, grouped by typology, are shown in the following table.

MONITORING INDICATORS

No.	Indicator	Source	Unit	Frequency
		Climatic		
1	Evolution of Rainfall (Monthly and Annual totals)	AEMET	(mm)	Annual
2	Evolution of temperatures (Monthly and Annual average)	AEMET	Average Temperature (ºC)	Annual
		Pressure on Water Bodies		
3	Population (Census and Seasonal)	INE	No. of people	Annual
4	Irrigated Surface	MITERD. Annual RBMP monitoring report	Surface (Ha)	Annual
5	Hydropower (Installed Capacity and Outcome)	MITERD. Annual RBMP monitoring report	Capacity (MW) Production (MWh)	Annual
6	Urban, agricultural and industrial consumption	MITERD. Annual RBMP monitoring report	Volume (Hm^3)	Annual
7	2,000+ inhabitants equivalent urban settlements compliant with EU's Wastewater Directive.	MITERD. Directive 91/271 Reports	No. of settlements	Biennial
8	Load treated in urban settlements over 2,000 inhabitants equivalent compliant with EU's Wastewater Directive.	MITERD. Directive 91/271 Reports	Share of load treated in accordance (%)	Biennial
9	Excess nitrogen in soil originated from fertilizer use	MAPA	(Ton/Ha) per year	Annual
10	Registered discharges at the National Discharge Census.	MITERD. CNV annual reports	Number of discharges (units) & Volume(Hm^3)	Annual
11	Share of municipalities or urban settlements with registered discharges at the National Discharge Census.	MITERD. CNV annual reports	Percentage of municipalities or settlements (%)	Annual
12	Registered user permits and volumes at the Water Registry.	MITERD. Water Registry Implementation reports	Number of inscriptions (units) & Volume (Hm^3)	Annual
		Protection and improvement of the status of water bodies		
13	Share of surface water bodies in good status(global, ecological, chemical)	MITERD. Annual RBMP monitoring report	Percentage (%) by typology	Annual
14	Share of surface water bodies in the river category non-compliant with ecological flow requirements	MITERD Annual RBMP monitoring report	Percentage (%) by typology	Annual

No.	Indicator	Source	Unit	Frequency
	Protection and improvement of the condition of Water Bodies			
15	Share of groundwater bodies in good status (full, quantitative, chemical)	MITERD. Annual RBMP monitoring report	Percentage (%) by typology	Annual
16	Number of groundwater bodies that do not achieve good chemical status due to nitrates or pesticides.	MITERD. Annual RBMP monitoring report	Percentage (%) by typology	Annual
17	Sample points with nitrates or pesticides over the risk thresholds.	MITERD. Environmental Profile of Spain	Percentage (%) by typology	Annual
18	Number of water bodies affected by invasive alien species	MITERD. Annual RBMP monitoring report	Number and Percentage (%) by typology	Annual
19	Number of Hydrological Reserves declared by type (fluvial, lacustrine or underground) and associated area or length.	MITERD. National Catalogue of Hydrological Reserves	Number and area (Ha) or length (km)	Annual
20	Length of restored rivers	MITERD. Environmental Profile of Spain	Restored length (km) and length of connected rivers (km)	Annual
21	Area of restored wetlands	MITERD. Environmental Profile of Spain	Area (Ha)	Annual
	Water Security within Integrated Water Resource Management			
22	Reservoir volume for consumptive use	MITERD. Annual RBMP monitoring report	Reservoir volume (Hm^3)	Annual
23	Installed capacity of reversible pumping hydropower systems	MITERD. Annual RBMP monitoring report	Power (MW)	Annual
24	Reused water (Maximum capacity and volume used)	MITERD. Annual RBMP monitoring report	Hm^3	Annual
25	Desalinated water (Maximum capacity and volume used)	MITERD. Annual RBMP monitoring report	Hm^3	Annual
26	Average allocation to urban water use	MITERD. Annual RBMP monitoring report	Hm^3	Annual
27	Upgraded irrigation area	MITERD. Annual RBMP monitoring report	Hm^3	Annual
28	Average allocation to irrigation use	MITERD. Annual RBMP monitoring report	Hm^3	Annual

No.	Indicator	Source	Unit	Frequency
		Water security within Integrated Water Resource Management		
29	Estimated population located in preferential flow zones or flood-prone areas	MITERD Annual PGRI follow-up reports	Estimated number of inhabitants	Annual
30	Relevant flood episodes and flood compensations paid by the Insurance Compensation Consortium.	MITERD Annual PGRI follow-up reports	Number & compensation (M€) by Basin district	Annual
31	Length of riverbeds with flood-prone areas mapped in the National Flood-Prone Area Mapping System.	MITERD Annual PGRI follow-up reports	Length of riverbeds (Km) by Basin district	Annual
32	Territorial Scarcity Units in emergency status	MITERD. Annual monitoring Drought Plans report	Number of units	Annual
33	Territorial Drought Units in prolonged drought status	MITERD. Annual monitoring Drought Plan report	Number of units	Annual
		Governance		
34	Number of land stewardship agreements	MITERD. Environmental Profile of Spain	Number of agreements	Annual
35	Share of unregistered urban water and losses throughout Spain	MITERD. Drinking water Directive implementation reports	Percentage (%) and associated volume (Hm^3)	Biennial
36	Volume and Share of water by use obtained from volumetric control systems.	MITERD. Implementation reports PERTE Water cycle digitization	Percentage (%) and associated volume (Hm^3)	Annual
37	Number of users and associated volume of water registered at the Water Cycle Observatory web portal by type of concessionaire.	MITERD. Implementation reports	Percentage (%) and associated volume (Hm^3)	Annual
38	Investment in water security actions	MITERD. Annual RBMP monitoring report	Millions of euros (M€)	Annual
39	Investments in sanitation and wastewater treatment	MITERD. Annual RBMP monitoring report	Millions of euros (M€)	Annual
40	Investment in public water domain management actions, water protection and environmental recovery.	MITERD. Annual RBMP monitoring report	Millions of euros (M€)	Annual
41	Share of cost recovery	MITERD. Annual monitoring report RBMP	Percentage (%)	Annual
42	Share of environmental costs in relation to total costs	MITERD. Annual monitoring report RBMP	Percentage (%)	Annual

ACRONYM LIST

AEMET: Spanish National Meteorological Agency.

CADC: Commission for the Application and Development of the Albufeira Convention.

CEDEX: Centre for Studies and Experimentation of Public Works.

CODIA: Conference of Water Directors of Ibero-America.

CUAS: Communities of Underground Water Users.

DPH: Hydraulic Public Domain.

DPSIR: Driving forces – Pressures – State – Impacts – Responses.

DSEAR PLAN: Wastewater Treatment, Sanitation, Efficiency, Savings and Reuse Plan.

DSS: Decision Support System.

EIVCRE: National Strategy for Green Infrastructure and Ecological Connectivity and Restoration.

ENRR: National River Restoration Strategy.

EU: European Union.

FEDER: European Regional Development Fund.

GSB: General State Budgets

IGME: Spanish Geological Survey - Geological and Mining Institute of Spain.

IPPC: Intergovernmental Panel on Climate Change.

IWRM: Integrated Water Resources Management.

LCCTE: Climate Change and Energy Transition Act.

LVGA: Green Paper on Water Governance in Spain.

MENBO: Mediterranean Network of Basin Organizations.

MITERD: Ministry for the Ecological Transition and the Demographic Challenge.

OECC: Spanish Office for Climate Change.

OECD: Organization for Economic Cooperation and Development.

PCH: River Basin Management Plans

PEH: Strategic Plan for Wetlands.

PERTE: Strategic Project for Economic Recovery and Transformation.

PES: Special Drought Plans.

PGRI: Flood Risk Management Plans.

PNACC: National Plan for Adaptation to Climate Change.

PRTR: Recovery, Transformation and Resilience Plan.

RAN: National Alert Network.

RBMP: River Basin Management Plans.

RDPH: Hydraulic Public Domain Regulation.

RENAIN: National Information Network on Civil Protection.

RNF: Riparian Nature Reserves.

SAIH: Automatic Hydrological Information System.

SDG: Sustainable Development Goals.

TRLA: Consolidated Text of the Water Act.

UN: United Nations.

WFD: Water Framework Directive.

WMO: World Meteorological Organization.

REFERENCES

CEDEX (2017)
Assessment Report on Climate Change in water resources and droughts in Spain.

European Commission (2021)
EU Strategy for Adaptation to Climate Change: Forging a climate-resilient Europe.

European Commission (2020)
Farm to Fork Strategy.

European Commission (2020)
EU Biodiversity Strategy for 2030.

European Commission (2019)
European Green Deal.

High-Level Political Forum on Sustainable Development (2020)
SDG6 Global Acceleration Framework.

Government of Spain (2021)
Spain 2050: Foundations and proposals for a Long-Term National Strategy.

Government of Spain (2019)
Agreement on the general guidelines of the National Strategy against the Demographic Challenge.

Ministry of Agriculture and Fisheries, Food and the Environment (2017)
Climate change adaptation strategy for the Spanish coast.

Ministry of the Environment and Rural and Marine Affairs (2010)
Principles of the National River Restoration Strategy.

MITERD (2022)
Framework of Priority Actions to Recover the Mar Menor.

MITERD (2021)
National Strategy for Green Infrastructure and Ecological Connectivity and Restoration.

MITERD (2021)
Climate Change Impact Report and Risk Assessment in Spain

MITERD (2021)
DSEAR Plan.

MITERD (2020)
Just Transition Strategy.

MITERD (2020)
Spanish Circular Economy Strategy.

MITERD (2020)
Green Paper on Water Governance in Spain.

MITERD (2020)
National Plan for Adaptation to Climate Change.

OECD (2011)
OECD Multilevel Governance Framework: Mind the Gaps, Bridge the Gaps.

UN (2020)
UN Report on Water and Climate Change.

UN (2015)
2030 Agenda for Sustainable Development.

UN (2010)
Resolution 64/292 of the General Assembly of July 28, 2010: The human right to water and sanitation.

UNFCCC (2021)
Synthesis report on measures adopted in the field of water.

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