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REPORT ON SPANISH RIVER BASIN PLANS OF THE THIRD CYCLE: CLIMATE CHANGE AND KEY ASPECTS IN THE IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE

EXECUTIVE SUMMARY

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In this report, reports and documents prepared by the FNCA and WWF, which are cited in the bibliography, have been used extensively as references. In addition, various public participation documents (mainly allegations) from the following groups have been consulted: Fundación Nueva Cultura del Agua (FNCA), World Wildlife Fund (WWF), Asociación de municipios ribereños de los embales de Entrepeñas y Buendía, Cuenca azul, Ecologistas en Acción de la Región Murciana, Mesa Social del Agua de Andalucía, Red Ciudadana del Tajo, Xarxa per una Nova Cultura de l'Aigua al Xúquer, Xúquer Viu, Plataforma en defensa de los ríos Tajo y Alberche de Talavera de la Reina.

INTRODUCTION

Spain is a member state of the European Union (EU) whose water consumption pressure attains high levels in a territory that mostly has a Mediterranean climate with scarce, irregularly distributed rainfall. Climate change further exacerbates planning and management challenges, reducing the amount of water available in the face of growing demand.

In its 2021 report on the Water Framework Directive (WFD) the European Commission (EC) warned that unsustainable water use across Europe is exacerbated by climate change, leading to more extreme droughts, coupled with water scarcity in increasingly extensive areas of the mainland. Water needs to be planned and managed, whilst also bearing in mind the global challenges of climate, health, biodiversity and pollution.

Anticipating and managing the adverse effects of climate change - such as floods, river, coastal and soil erosion, the advance of desertification, meteorological droughts, heat waves and forest fires - are still a fundamental challenge in Spain which is one of the most affected countries in the EU.

The Water Framework Directive (WFD) of the European Union (EU) determines that the use of water must be sustainable and compatible with the good status of European water bodies in 2015, a horizon that has been put back and is currently being set for 2027. The WFD was approved in 2000 with a view to maintaining or achieving in three planning cycles the good chemical and ecological status of water bodies, as well as the ecosystems linked to them. This represented a paradigm shift in water management which up to that point had been focused on meeting the demands of uses. In addition to the aim of good status, the WFD established the principle of non-deterioration whereby no human activity can worsen the status of a water body except for duly justified exceptions. Within this legal framework, the EU left it up to each member state to implement this regulation in their laws and river basin planning.

The management of river basin districts in Spain is carried out by the relevant river basin authorities, such as Hydrographic Confederations (CH), through the river basin management plans (RBMPs) or Hydrological Plans (PH). These plans are valid for six years, a period during which they must be reviewed and subjected to a public participation process before being approved. The management plans of the first cycle according to the WFD pertained to the period 2009-2015 and those of the second cycle to 2015-2021. We are currently in the third planning cycle (2021-2027), with the plans approved in Spain in 2023.

However, despite the more than 20 years which have elapsed since the approval of the WFD, Spanish river basin planning is suffering from recurring deficiencies, which have been carried over to the plans approved for the third cycle (2022-27). This means that around half of our water bodies are not in good status today and are likely not to achieve this status by 2027 either. In general, aquatic ecosystems are under strong pressure in terms of the quantity and quality of water, with dramatic cases of protected spaces such as Doñana or the Mar Menor which are undergoing serious degradation.

Numerous organisations, groups and social movements have pointed out fundamental problems in river basin planning through reports and allegations. This report uses said information and verifies it with the analysis of the final documentation of the RBMPs. In the context of the plans approved for the third cycle 2022-2027, this work has focused on certain key deficiencies and non-compliance with the WFD in four large inter-community river basin districts: Ebro, Segura, Guadalquivir and Tagus (with information on some topics in the Júcar,

Tinto Odiel and Piedras districts). These river basin districts account for more than 50% of Spanish territory. Key topics include addressing climate change, the use of exemptions from good status objectives and environmental flows in river basin planning, as well as case studies demonstrating significant shortfalls such as the middle-course of the River Tagus, the Ebro Delta, Doñana, Mar Menor and the Alcolea dam project. It has been deemed important to consider what the draft Special Drought Plans (PES) say about adaptation to climate change.

The present *REPORT ON SPANISH THIRD CYCLE RIVER BASIN MANAGEMENT PLANS: THE CONSIDERATION OF CLIMATE CHANGE AND KEY ASPECTS IN THE IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE* is thus divided up into four parts:

1. **Consideration of climate change in the Spanish third cycle river basin management plans**: quantification of water resources, adaptation to climate change and allocation of resources to demands, the Water Exploitation Index (WEI), irrigation modernisation and drought plans.
2. **Exemptions to good status: derogations from articles 4.4, 4.5 and 4.7 WFD** (deadline extensions, less rigorous objectives and deterioration due to new modifications).
3. **The environmental flow regime in third cycle river basin management plans**: definition, calculation, inclusion in plans; degree of compliance and adaptive monitoring; repercussions on the state of ecosystems (fish indicators, solid flows and connection between surface and groundwater); protected areas, the Natura 2000 Network and coordination with other administrations; specific analysis of environmental flows in two case studies, the middle-course of River Tagus and the Ebro Delta.
4. **Case studies in other strategic areas**: Doñana (impacts on protected areas due to the poor quantitative condition); Mar Menor (Impacts on protected areas due to poor qualitative condition); Project for the realisation of the Alcolea Reservoir (deficiencies in the cost recovery estimate and strategic planning).

All of these are key aspects in water management in southern European countries and the Mediterranean basin, and represent strategic issues that will increasingly have to be addressed by the water management plans of other European countries as climate change advances.

This executive summary provides an overview of the report. Detailed information and full content of the report can be accessed at this link; or each of the parts of the report can be accessed at their respective links.

Figure 1. Geographic location of the river basin districts looked at in this report.

Source: prepared by the author from the sources cited in the image.

1. THE CONSIDERATION OF CLIMATE CHANGE IN THIRD CYCLE RIVER BASIN PLANS

Spain is a member state of the European Union (EU) whose water consumption pressure attains high levels. It is a territory with a mostly Mediterranean climate with scarce, irregularly distributed rainfall. As is well known, this shortage in rainfall is being significantly exacerbated by climate change. Anticipating and managing these adverse effects are still a fundamental challenge in Spain and the river basin management plans (RBMPs) are responsible for planning and managing in this regard. However, we find major shortcomings in these plans in terms of the effects of climate change and the consequent reduction of available water resources, the allocation of demands, the quantification of the water exploitation index, the consideration of irrigation modernisation as a measure against climate change and the relationship with drought plans.

1.1. QUANTIFICATION OF WATER RESOURCES

The evaluation of the water resources available for river basin planning in Spain is carried out using a predictive rainfall-runoff model. This model simulates natural runoff in the period 1940 – 2018 (long series) or 1980 – 2018 (short series). Owing to climate change, resources have suffered a significant decrease since 1980 and that is why the short series is much more realistic and should be used to calculate available water resources.

Analysing four RBMPs (Ebro, Tagus, Segura and Guadalquivir), we found a lack of homogeneity between them, disconnections and difficulty in finding information. Across the board, we see an unjustified increase in estimated resources which contrasts with climate change predictions.

In the Ebro RBMP we find an increase in available natural resources of 578 hm^3 per year from the second to the third cycle attributed to modifications in the model that are not detailed. The same thing happens in the Guadalquivir where they increase from 5754 hm^3/year in 2013 to 7092 hm^3/year in 2015. In other words, an increase of 1338 hm^3/year in two years without any clear justification. The trend of the Tagus, although less pronounced, is also upward. The Segura is the only basin that shows a reduction in natural resources in this new plan, but even so the total resources increase since they have 540 hm^3 maximum transfer from the Tagus and 302 hm^3 from desalination plants. Taking into account external resources such as desalination and water transfers (Segura), as well as taking into account irrigation returns in the available resources without calculating their possible reduction due to climate change and irrigation modernisation, is another deficiency which was found.

As regards the incorporation of the effects of climate change in the estimation of the resources available for planning, each river basin district applies a different percentage and in no case is it duly justified. In the Ebro they maintain 5% of the previous plan (arbitrary average between 2% of the RPC4.5[1] and 7% of the RPC8.5). In the Segura and Guadalquivir they apply the RPC8.5 scenario with a 9.9% and 9.29% reduction respectively, although other studies would point to higher values (14% on average). Even so, the resources available in the Guadalquivir are greater for the third cycle than in the second cycle. The Tagus only foresees a reduction of 16.4% for the 2039 horizon but this data is not justified.

In general, these data do not err on the side of caution since natural resources are increasing in the plans and reductions due to climate change are lower than others indicated by various studies. The plans should consider more conservative figures for reducing water availability, or at least express them in probability ranges or intervals, forecasting adaptive scenarios as and when the actual effects of climate change are verified. None of the plans analysed do so.

The availability of natural resources is the basis of all planning, it is a key item of data for calculating pressure indicators such as the Water Exploitation Index (WEI) and ultimately it can determine that planning grants more water to uses, increasing the pressure on the water bodies and making it more difficult to achieve their good status.

1.2. ADAPTATION TO CLIMATE CHANGE AND ALLOCATION OF RESOURCES TO DEMANDS

To manage climate change effectively, future resource reductions should be taken into account, based on the precautionary principle, and water use pressures reduced. River basin planning should provide for an orderly reduction of water uses, with legal criteria and viability and social and economic justice, especially in the most common uses such as irrigation. This would increase the guarantee of priority uses such as supply to populations and respect for environmental flows suitable for the good status of water bodies in accordance with the objectives of the WFD, reducing the vulnerability of the socioeconomic system.

[1] A Representative Concentration Pathway (RCP) is a theoretical projection of a greenhouse gas concentration path. The RPC4.5 scenario is considered moderate and the PRC8.5 scenario is the most pessimistic and, according to the latest studies, also the most probable.

The revised RBMPs recognise the problem of climate change and the reduction of resources, as well as the quantitative pressure on water bodies, but consider that these will be mitigated by future increases in efficiency and other technological improvements to be implemented, such as the modernisation of irrigation, and they do not manage current demand, and in some plans demands are even increased. All these plans refer to the need for more studies on climate change and the monitoring of adaptation strategies, ignoring abundant scientific and technical references that already exist, and incomprehensibly refusing to confront climate change through river basin planning measures. The four plans postpone until the next review of the RBMP in 2027, at the earliest, any solution for adaptation to climate change that involves the review or adaptation by reducing allocations to existing uses and demands despite the clear reduction in contributions, the high pressure that water resources already endure in many areas and the existing climate change forecasts and scenarios.

Hence, the third cycle plans analysed in Spain do not clearly demonstrate how climate change projections have been considered in the evaluation of pressures and impacts, monitoring programmes and in the choice of measures for adaptation, including an analysis of existing concessions and the study of proposals to adapt them to current and future climatic circumstances, taking into account the priority of supplying populations and the prior restriction that environmental flows entail.

In Spanish water legislation, after considering environmental flows as a prior restriction, subsequently, the satisfaction of uses and demands will be carried out in accordance with legal priority criteria which RBMPs usually maintain: 1 Supply of population and low consumption industries; 2 Irrigation and agricultural uses; 3 Industrial uses for production of electrical energy; 4 Other industrial uses not included in the previous sections; 5 Aquaculture; 6 Recreational uses; 7 Navigation and water transport; 8 Other uses.

In relation to the consumption uses of water, agricultural uses (irrigated agriculture and livestock) represent by far the majority water use in the basins studied. Between 85% and 92% in Guadalquivir, Segura and Ebro. Only in the Tagus does agricultural use represent a lower value (57%) although on the other hand we must also consider the great pressure in terms of the supply to the metropolitan area of Madrid, the transfer to the Segura basin irrigation system and the great concentration of hydroelectric and energy uses. Agricultural allocations were carried out in all plans decades ago and they have not been reviewed or adapted. In some basins, an increase in irrigated surfaces is even expected, in the case of the Ebro in territories such as Monegros, a region with a very dry climate. In Segura, agrarian demands are increasing through the regularisation of irrigation whose legality is dubious or so-called “consolidated” irrigation. Specifically, in the Ebro third cycle RBMP, the irrigated surface will increase by more than 60,000 new hectares. It is said that the increase in demand would be “practically” offset by the modernisation of irrigation. But the annual increase in demand in 2027 is 474 hm^3, much higher than the 197 hm^3 savings expected, also taking into account that said savings due to modernisation are more than doubtful, as explained below.

The Guadalquivir plan expresses the intention to improve issues such as irrigation control and encourage the change to low-consumption crops, but in practice the basin has very high exploitation indicators, and territories with issues as serious as that of Doñana. This report will discuss the conflict between these low-consumption crops (woody) with other herbaceous crops, which reduces resilience to the system instead of contributing (woody crops must be watered every year, failing which there is a risk of losing the trees). Furthermore, it should be

noted that various groups and expert opinions agree on the Plan's underestimation of the irrigation extension and intensification processes.

In short, the RBMPs analysed recognise the issue of climate change and the reduction of resources, as well as the pressures to which water bodies are subjected. However, they do not include real measures to reduce uses and are generically referred to future increases in efficiency and other technological improvements, referring to the need for more studies on climate change. In this way, the indicated third cycle RBMPs do not yet include measures specific to river basin planning in relation to adaptation to climate change.

1.3. WATER EXPLOITATION INDEX (WEI)

The WEI (Water Exploitation Index) provides a measurement of the proportion of water use compared to the existing renewable resources in a territory. The WEI represents the proportion of water collected for all uses, both consumptive and non-consumptive, whilst the WEI+ represents the proportion of water used in consumptive uses, in other words, water collected minus returns. Both are widely recognised indices and form part of the Central Indicator System of the European Environment Agency. It is used to refer to basins stressed by the use of water, and with possible issues due to water stress. Eurostat determines the following categories:

Table 1: WEI index values.

WEI	System status
<10%	Without stress
>10% and <20%	Low stress
20%	Alarm threshold
>40%	Severe stress

Source: prepared by the author based on Eurostat criteria.

It also appears as a selection indicator within the EU Taxonomy for sustainable activities, indicating that in areas with a WEI+ above 20%, projects related with water use should not increase it.

Some of the plans analysed, such as the Ebro or Segura, indicate that the WEI+ is a quantitative indicator which is not completely representative as a management indicator, and hence its water stress thresholds should be subject to the specific management characteristics of the systems. However, the WEI+ is a suitable tool which is widely used in the EU to identify basins with water stress, functioning as an alarm system to identify this problem.

Except for the Guadalquivir plan, the rest of the RBMPs consulted do not provide a global WEI or WEI+ figure for the river basin district. In the Ebro plan it is broken down by exploitation systems and in the Tagus plan by water bodies. The Segura refers to it for groundwater bodies. In any case, the confusion in relation to the WEI data is worrying because, once estimated, the values of this index show a very generalised water stress situation. This situation is especially serious in the **Segura basin**, where the RBMP recognises a structural deficit of 311 hm^3 annually and 69% of said deficit is covered by the exploitation of non-renewable resources, in other words, by the overexploitation of aquifers. The WEI+ value provided in this river basin district is 77%, already very high, but calculated with official resource and demand data it would be around 100% if the resources from the Tagus-Segura water transfer and desalination are included; if these resources are excluded, as required by the methodology, the WEI+ increases by **185%**. In the river basin district of **Ebro**, 14 of the 23 exploitation systems are above 20%, and 9 of them

are above 40%, up to a maximum of 67.6%. In the river basin district of **Guadalquivir** a WEI+ of **48%** is indicated for the basin, with only one exploitation system below 20%, this without taking into account the uncertainties in the quantification of resources and their very probable overestimation. The **Tagus** plan indicates that 28% of surface water bodies have an index greater than 40%, 16 of which exceed 70%; and above 20%, an indicator of stress, there would be 77% of water bodies in the river basin district. An internal calculation puts the global WEI of the Tagus river basin district at **47%**, all of which gives us an idea of the high stress due to water use in this territory too.

It is worth mentioning that in the Tagus plan, in the significant pressures' section, it has been observed that the significant pressure rating due to hydrological alteration indicated by the WEI is subject to other biological indicators which do not attain good status; in other words, if the water body has a strong alteration in its flows, but the macroinvertebrate and diatom indicators are good, it is not deemed to be under significant pressure. However, these indicators do not relate well with the hydrological alteration of rivers (they have been designed to respond mainly to organic pollution) and the ichthyofauna indicator, which does relate better to circulating flows, is not used in the assessment of the Tagus RBMP owing to its low level of confidence. This is important because it assumes that there are many water bodies with high WEIs whose severe water stress may not be reflected in significant pressure owing to *an alteration to the hydrological regime*, or an impact due to *habitat alterations owing to hydrological changes*.

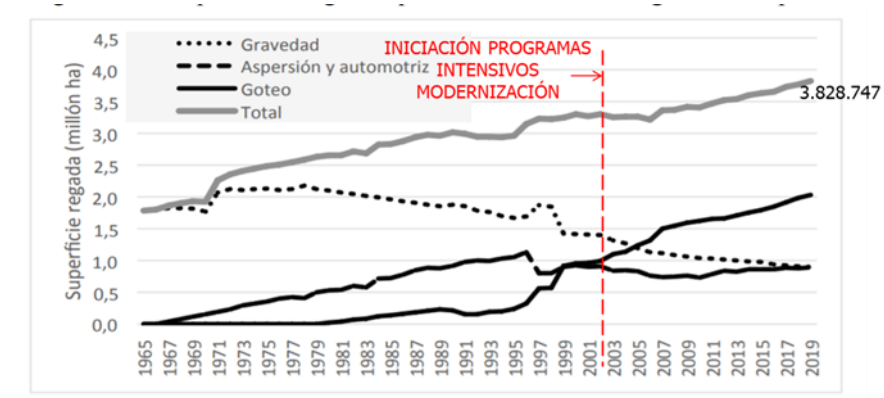
Basically, despite being a key indicator at European level, the third cycle RBMPs analysed would suggest that the WEI+ is not of interest as a management indicator and they show confusing, incomplete and sometimes biased values. With the data that they do show us, we would warn that there is a worrying overexploitation of water without the plans establishing measures to reduce it.

1.4. IRRIGATION MODERNISATION

Irrigation modernisation is the main and practically only measure of adaptation to climate change proposed by the RBMPs analysed. This measure is regarded as environmental in the plans, given that its stated objective is to save water which, it is assumed, will contribute to improving the status of the bodies. Based on this premise, it represents a very significant part of the planned investments (most of them deriving from public funds) in the programmes of measures. In the Ebro, for example, it represents 48% of the investment. As regards the effectiveness of this measure, numerous studies show that not only does it fail to meet its water saving objectives, but it is counterproductive. The European Court of Auditors itself said in a 2021 report that this measure probably promotes higher water consumption. With the modernisation of irrigation, production and hence net water consumption increases. The false perception of the greater availability of more water leads to crop intensification through double cropping, greater planting density, crop changes and, in some cases, an increase in irrigated perimeters. As far as water quality is concerned, there is another negative effect whereby as the water returns from modernised systems are smaller, they tend to be more concentrated in terms of contaminants.

The following graph shows the increase in irrigated surface area in Spain along with the start of irrigation modernisation programmes.

Figure 2. Evolution of the total official irrigated surface area and by type of irrigation.



Source: FNCA 2021, adapted from Espinosa et al., 2020 (indication of the start of intensive self-modernisation programmes).

In all likelihood aware of this, a Seventh Additional Provision of the Decree approving third cycle RBMPs was introduced whereby irrigation modernisation investments are subject to conditions, citing that "*In cases where a net reduction in extraction pressure is not ensured or reliable information is not available about the extent to which modernisation will affect extractions and returns, the action will be included in the programme of measures geared towards the satisfaction of demands or an increase in water resources instead of those aimed at achieving environmental objectives*". However, this is not the case in any of the revised RBMPs, where all irrigation modernisation measures are included amongst those to reduce pressure by extraction, without detailed information about the impact on consumption.

At this juncture there are few irrigation systems left to modernise: in the Guadalquivir almost 80% has been modernised, in the Segura 73%. And yet the pressure on water resources remains very high. The Ebro plan itself states that there is an overestimate of savings. The measure is merely introduced as a flawed response to the overexploitation issue. In actual fact, the modernisation of irrigation is a sectoral economic measure which affords production advantages, but not a reduction in water consumption. This is because this modernisation is not conditional on the reduction of water concessions, thus without guaranteeing lower real water consumption.

In view of the high level of public funding used, and the fact that the modernisation of irrigation does not result in the improvement of the status of water bodies, but is even counterproductive, the cost recovery principle of the Water Framework Directive should be thoroughly analysed in relation to this issue.

1.5. SPECIAL DROUGHT PLANS

Periodic droughts are a natural part of the Mediterranean climate. However, due to climate change, these are going to be exacerbated in terms of their intensity and frequency, as we are already beginning to see. The aim is to respond to this problem not only in the RBMPs but above all through the Special Drought Plans (PES), which must prevent and mitigate the impacts of droughts on uses and ecosystems, avoiding the deterioration of the water bodies. However, the updated PES drafts (2023) of the four basins analysed show serious structural deficiencies because they seem focused on maintaining uses and not on applying the necessary measures to achieve the sustainable use of water and the good status of the water bodies.

The PES do not present specific measures related with the adaptation to climate change; for instance, in the Tagus they only refer to studying the evolution of the impact of climate change. On the other hand, any measure proposed by the PES, given that these are not binding, could not be applied; for instance, in the Segura basin in 2023 the restriction measures for irrigation proposed by the basin organisation were annulled through a vote by the majority users (agrarian users).

There is also an abuse of the concept of prolonged or exceptional drought. In the Tagus, the months classified as prolonged drought represent 10-15% of the analysis period, in the Guadalquivir 20-25% and in the Ebro 26-31%, in other words, there would be a prolonged drought in one every 3 or 4 years, a situation that cannot be considered exceptional or unforeseeable. We are thus talking about ordinary droughts which should be looked at in RBMPs. With good management, a meteorological drought (due to a lack of rainfall) does not have to lead to water scarcity. However, this variability is not integrated into ordinary planning and so the PES are of a reactive nature. Furthermore, a water scarcity scenario should be the result of the existence of a prolonged drought whose consequences end up generating lack of resources. By contrast, an imbalance between resources and demands caused by poor planning and management, which puts a territory in an emergency situation owing to scarcity of water, suffices for an extraordinary drought to be declared.

According to the Spanish PES, the misinterpretation of these concepts allows the justification of the deterioration of water bodies, violating article 4 (6) of the WFD, since this requires, amongst other conditions, 1) a demonstration that said deterioration is due to an exceptional prolonged drought which is not reasonably foreseeable and 2) a demonstration that all practicable steps have been taken to prevent further deterioration of the water body. In fact, all RBMPs and PES consider the application of a less demanding environmental flow regime in the event of drought without first considering a reduction in the water assigned to socioeconomic uses, which, according to Spanish water legislation, have a lower priority (with the exception of supply) than that of environmental flows. In general, the PES do not recognise the vulnerability that human activities generate in aquatic ecosystems in the event of drought. It is evident that avoiding deterioration in water bodies is not a priority of the PES, rather it is about minimising as far as possible the effects of droughts on the satisfaction of demands.

The updated PES provide a better diagnosis of the Municipal Emergency Plans for Drought PEM, which the majority of the population in the inter-community river basin district already has. The PES seek to involve urban agents in drought planning, but not so much agricultural or industrial users, the largest consumers of water. However, in the Green Paper on Water Governance (2020), agricultural users proposed the need to have sectoral drought emergency plans. The extensive livestock and dry land sectors, greatly affected by droughts, are not given sufficient consideration. Some current measures, such as agroinsurance, are insufficient and costly in droughts. A reformulation of climate change adaptation and drought mitigation strategies is needed, addressing both the management of blue water (flowing in rivers, lakes and aquifers) and green water (rainwater stored in the soil and by vegetation).

Basically, in territories with severe stress (Water Exploitation Index or WEI of 40% or more) temporary water scarcity and its impacts will be more frequent and serious. However, ordinary climatic fluctuations must be managed in regular water planning and management, in other words, in RBMPs. Only exceptional droughts due to their intensity and duration require exceptional measures and there are simple statistical tools to identify them objectively and differentiate them from ordinary droughts. The latter are part of the usual fluctuating regime of

water resources in peninsular climates and they are predictable. Furthermore, the scarcity depends on the vulnerability due to exposure (population and existing irrigation etc.) and each use (e.g. different in arboreal or herbaceous irrigation). The lower the demand and the better the management, the lower the risk of shortages. The management of demands and their vulnerability requires long-term strategies which must be framed within ordinary planning. In light of the risks, the most effective, most cost-effective and most resilient strategy is always prevention and not a reactive approach.

You can access the detailed information and complete content of this first part of the report in section 1 thereof "THE CONSIDERATION OF CLIMATE CHANGE IN THIRD CYCLE RIVER BASIN MANAGEMENT PLANS" (link)

2. EXEMPTIONS TO GOOD STATUS

The WFD in its article 4 "Environmental objectives" establishes the obligation to apply the necessary measures to achieve the good status of all water bodies by 2015, extendable until 2027. One of the most important principles of this article is the principle of non-deterioration. In other words, no human activity can worsen the ecological status of a water body. However, Article 4 provides for a series of extensions and exemptions from the good status or non-deterioration objective which would not constitute a breach of the Directive in duly justified cases. These are:

Article 4.4: determines the conditions for establishing extensions. These are summarised by the fact that good status cannot be reached within the set out timescales for technical or natural reasons (recovery of aquifers) or disproportionate costs. This being the case provided it is suitably justified and the necessary measures are taken to progressively achieve the objective.

Article 4.5: determines the conditions for establishing less stringent objectives (LSO). These conditions are that the needs of said human activity cannot be achieved in any other way, that the best possible status is guaranteed and that it complies with the principle of non-deterioration. Conditions that must be properly justified.

Article 4.6 establishes the conditions to allow the temporary deterioration of water bodies if this is the result of exceptional or unforeseen natural events, such as extreme floods or prolonged droughts. In the section pertaining to Drought Plans in the first part of this report, we specifically refer to this exception in the temporary deterioration due to drought.

Article 4.7: requirements so that in exceptional cases the deterioration of the bodies due to new human modifications does not imply a breach of the WFD. These exceptional cases would be that the actions are in the overriding public interest and that the benefits of said actions outweigh those deriving from the good status of the body, that there are no alternatives which avoid deterioration for reasons of technical feasibility or disproportionate costs, and that all possible measures have been taken to mitigate the adverse impact of said actions. All these conditions must also be properly justified.

In general, an excessive use of the exceptions and extensions included in the WFD by Spanish river basin planning has been detected, which defers or relaxes environmental objectives in water bodies without sufficient justification. In this second part of the report we have analysed in these four RBMPs approved in 2023 how the exceptions of articles 4.4, 4.5 and 4.7 of the WFD have been applied.

Below is the summary of extensions and exemptions considered in the third planning cycle for the four districts analysed.

Table 2: Application of WFD exemptions in the plans studied.

River basin district	Total number of water bodies		Extension to 2027 (art. 4.4)		LSO (art 4.5)		New modifications (art. 4.7)	
	SUBT	SUP	SUBT	SUP	SUBT	SUP	SUBT	SUP
EBRO	105	814	39*	240	0	17	0	2
SEGURA	63	114	18**	50	0	0	0	4 coastal
GUADALQUIVIR	86	455	45***	161****	0	2	4	7
TAGUS	26	512	2*****	201	0	0	0	

Source: drawn up by the author based on the respective hydrological plans. SUBT (groundwater bodies); SUP (surface water bodies).

*23 of them beyond 2027, *due to natural conditions*.
**5 bodies by 2039 due to the technical infeasibility of recovering nitrate contamination.
***15 beyond 2027; *due to natural conditions;* 9 owing to *their quantitative status and 6 owing to their chemical status.*
****10 beyond 2027 *due to natural conditions*.
*****1 in 2033, *due to natural conditions*.

Many of the water bodies that in the second cycle took advantage of article 4.5 on Less Stringent Objectives (LSO) take advantage in the third cycle of article 4.4 regarding extension until 2027, which is why the LSO have practically disappeared (except in the Ebro (there are still 17). We observe a very high number of water bodies that fall under article 4.4, in some cases with extensions beyond 2027, or even until 2039 (for example in the water bodies related with the Mar Menor in Segura). The application of article 4.4 in the plans analysed is based, however, on an incorrect interpretation of that which is established by the WFD since there are no temporary exemptions or exceptions owing to "natural causes" if all or the same necessary measures have not been applied or if said measures, in view of the trends observed, are not effective. However, this is not the case, because there is no evidence of quantitative or qualitative improvement in many water bodies in which article 4.4 is intended to be applied, so either measures have not been applied, or the latter have not been effective.

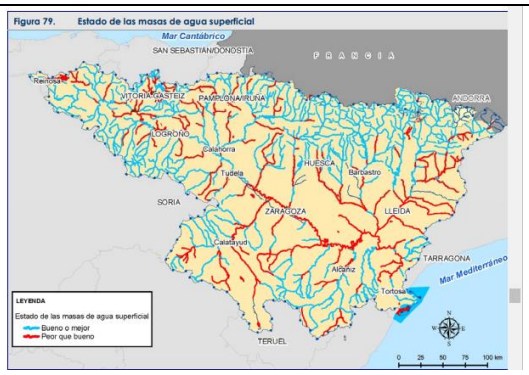
The plans analysed show that the water bodies with good status are mainly in the headwaters, with low human pressure and no expectations of increased activity. They are short water bodies which can lead to overestimating the proportion with “good status” if only the water body units are considered and not the kilometres of river. By contrast, the water bodies that have not yet met environmental objectives and have extensions until 2027 (or later) are in territories with strong pressures due to water use and pollution. Hence, in order for the good status objectives to be realistic, RBMPs need more effective measures than the current ones, or those that have been applied in previous plans.

For example, the case of the River Tagus, in the centre of the Iberian Peninsula, is significant, since practically none of the water bodies of this river, from its headwater reservoirs to Portugal, attain good status and are subject to the extension of 2027. The Tagus is a very degraded river with great alteration due to detraction, flow regulation and serious pollution. It needs effective measures to reduce or eliminate pressures in order to improve its status before 2027. Furthermore though, most of its water bodies are in protected areas of the Natura 2000 Network and in application of article 4.1.c) of the WFD, no extensions or exceptions would be allowed to achieve all the environmental objectives (WFD) and conservation objectives (Habitats

Directive). The Supreme Court of Spain itself indicated in several rulings in 2019 that, for the above reason, the temporary exemptions or extensions established in the water bodies of the middle section of the River Tagus by the second cycle RBMP were void, and also failed to justify the conditions of article 4.4 of the WFD. However, these extensions have been included again in the Third Cycle Plan.

Besides the misuse of exemptions, it is not clear how all water bodies will be able to reach good status by 2027 since the measures required to solve the underlying problem (overexploitation and pollution) are not being applied, nor is any trend towards improvement being observed. We see this exemplified in the Ebro basin where from the second to the third cycle the status of practically no surface water body has improved (Figure 3).

Figure 3. Maps of the status of the surface bodies at the start of the last two planning cycles in the Ebro basin (in blue, good condition, in red, condition worse than good).



Overall status of RBMP surface bodies 2015-2021

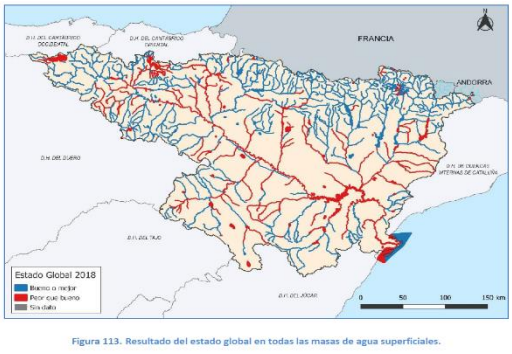


Figura 113. Resultado del estado global en todas las masas de agua superficiales.

Overall status of RBMP surface bodies 2022-2027

Source: drawn up by the author based on the figures of the respective RBMPs.

In the case of article 4.7, this applies in nine Spanish river basin districts. Of those studied, in the Ebro we found two water bodies pertaining to new dams, in the Guadalquivir we found eleven water bodies mainly related with mining and in the Segura we found four water bodies with exemptions due to new deterioration on the coast owing to port actions; in the Tagus there is none. It should be noted that some sections affected by new actions are not classified as bodies of water due to their short extension and they are thus not considered. Furthermore, the cases are very poorly justified and with analysis carried out a posteriori to "go through the motions", and they do not withstand true socioeconomic viability studies, they include alternatives which are unrealistic , or directly discarded, such as alternative 0 which would often be the best for society and the most cost/effective. Some infrastructures to meet irrigation demands are masked by other purposes such as the enlargement of the Agrio reservoir.

Detailed information and the full content of this second part of the report can be found in section 2 of the report "EXEMPTIONS TO GOOD STATUS" (link)

3. THE ENVIRONMENTAL FLOW REGIME IN THIRD CYCLE RIVER BASIN MANAGEMENT PLANS

Despite having already had two complete planning cycles and being in the process of addressing the third, and although all the necessary legal tools are available, the issue of environmental

flows in the basins analysed, and generally in Spanish territory, can be summarised as being a failure.

The European Guide for the implementation of environmental flows (EC, 2016) states very clearly that the hydrological regime plays a primary role in determining physical habitats which, in turn, determines the biotic composition and supports the production and sustainability of aquatic ecosystems. The need to implement sufficient, adequate flows in sections with hydrological alteration is even more important if we take into account the foreseeable reduction in contributions from rivers as a consequence of the predictions of climate change models.

In Spain, water legislation is very complete and clear in this regard and it indicates that environmental flows must maintain at least the fish population which would naturally inhabit or could inhabit the river, as well as its riverside vegetation. But environmental flows must also contribute to meeting the aforementioned objective that habitats and species related with water in protected areas (Natura 2000 Network, Ramsar wetlands etc.) maintain or achieve a favourable conservation status. Under Spanish legislation, environmental flows are a fundamental measure for achieving the environmental objectives that must be established in the RBMPs for all surface water bodies in accordance with the WFD. It is important to point out the legal nature of the general prior restriction of environmental flows with respect to the rest of water uses, except for supplying populations under special circumstances.

Despite all of the above, it is very common for Spanish hydrological administrations to have given de facto priority to meeting demands over and above environmental objectives and have reduced environmental flows to minimum circulation with insufficient seasonal modulation, meaning that, in many cases, they cease to be truly environmental flows as they cannot fulfil all their functions. In general terms, the process of implementing an environmental flow regime in Spain has many shortcomings and has a lot of room for improvement. The main shortcomings associated with environmental flows that the European Commission detected in the second cycle RBMPs generally remain unsolved in the revised documents of the third cycle, such as the issue of control over compliance or the development and use of a fish indicator.

3.1. DEFINITION, CALCULATION AND INCLUSION OF ENVIRONMENTAL FLOW VALUES IN RIVER BASIN MANAGEMENT PLANS

The establishment of the environmental flow regime constitutes an obligation included since 2001 in Spanish water legislation which requires its inclusion in RBMPs. According to the Hydrological Planning Instruction (IPH), environmental flows consist of 5 components, namely:

Minimum flow rates (Qmin) which must be overcome at all times. They have the aim of maintaining the spatial diversity of the habitat and its connectivity.

Maximum flow rates (Qmax) which must not be exceeded in the ordinary management of infrastructures. They set out to protect the native species most vulnerable to these flows.

Distribution over time or seasonality (Qt) of the previous minimum and maximum flows.

Flood flows or generators (Qg). They aim to restore to some extent the important ecological and hydromorphological functions of floods, such as improving sediment dynamics and controlling the presence and abundance of species.

Exchange rates (Tc) in order to avoid the negative effects of a sudden variation in flow rates, typical of hydropower production.

All surface water bodies in the river basin districts should have defined, at least, the minimum environmental flows with their seasonal modulation since all are liable to suffer hydrological alteration due to extractions. The rest of the components must be defined where there is an infrastructure capable of altering them, in general reservoirs of a certain size capable of flood control or of producing hydro-peaks and of reversing the hydrological regime.

As regards the definition of environmental flows in the RBMPs observed, progress is shown in terms of minimum flows, which are finally established in almost all river water bodies already in this third cycle (after more than 12 years of planning and with there being a legal obligation since 2001). The river basin authorities have technical studies which may have certain shortcomings and are sometimes criticised by environmental organisations and groups for responding to pressure from user sectors, but they form a basis that fortunately in the third cycle, at this juncture, has already been defined in the vast majority of water bodies.

However, such advances are very slight in generating flows and exchange rates (as we see in Table 4), two components that are equally obligatory and have an undoubted effect on the ecological status of the rivers, as well as on the maximum flows in most cases. Furthermore, the seasonal modulation of these flows is effected on a quarterly scale, with four annual values. The calculation of the values is sometimes questioned by experts, such as in the Ebro basin where flow values have been extrapolated to determine the minimums from other rivers with studies instead of deploying established methodologies.

Table 3: Degree of application of the components of the environmental flow in the river basin districts studied.

River basin district	Total no. of bodies	Qmin	Qmax	Qg	Tc
Ebro	686	686	11	11	11
Tagus	512	503	17	15	15
Segura	77	77	11	7	5
Júcar	337	337	19	7	41
Guadalquivir	455	455	455	0	0

Source: drawn up by the author based on the respective RBMPs.

As mentioned, to define other components such as flood flows, the plans refer to the need to carry out studies during this cycle in the Ebro and Guadalquivir too (even of the minimum levels, in this case). In the Guadalquivir basin, no generating flows or exchange rates have been established yet. It is worth highlighting the anomalous situation of the river Tagus where minimum flows (instead of environmental ones) have been defined throughout the previous cycles. In the current third cycle these values have been increased, but their implementation has been planned in stages so that only in 2027 will the minimum environmental flows in the Tagus be reached. All of which is geared towards maintaining the transfer to the Segura basin, once again prioritising socioeconomic uses over environmental flows. Where generating flows have been defined, they are incomplete and have not been calculated in some regulation reservoirs without this being justified by their flood control capacity or other technical criteria. Furthermore, in general, the latest hydrological series are used as a reference to reflect the effects of climate change, as has been clearly found in the Segura and Júcar basins. However, the recent hydrological series affected by climate change do not respond to a natural situation and this represents added pressure on ecosystems already highly stressed by the reduction in circulating flows due to excess water extraction and regulation.

The environmental flows, after being calculated using the relevant methods, are consulted and agreed upon with the users and stakeholders through a consultation process, before including them in the RBMPs. The process is debatable in itself and in practice it usually results, in all the basins observed, in downward revisions of the environmental flows because they are adapted to the existing permits or concessions. The reasons for the reduction are not for technical reasons, nor does it comply with the obligation established in the Spanish Water Law that environmental flows are a prior restriction to the assignment of demands and uses.

3.2. DEGREE OF COMPLIANCE AND ADAPTIVE MONITORING

As regards compliance with environmental flows, it should be noted that the network of gauging stations used to evaluate it is generally limited, so for many water bodies there remains uncertainty about their degree of compliance, especially when taking into account the numerous groups which in public participation processes highlight especially serious non-compliance with minimum flows. The information is almost non-existent in the case of other components such as maximum levels, floods or exchange rates.

Table 4: Degree of monitoring and compliance with the environmental flows established in the river basin districts studied during the second planning cycle.

River basin district	Qe second cycle	Monitoring	Non-compliances
Ebro	69	52	miscellaneous
Tagus	19	17	1
Segura	75	25	11
Júcar	205	61	26
Guadalquivir	?	17	30 – 0*

Source: drawn up by the author based on the respective RBMPs.

* Between 30 in 2018, 0 in 2019 and 5 in the latest report in 2021
? It has not been found

In the Segura basin, for example, a significant lack of foronomic control is mentioned, which must be reversed during this planning cycle. These are measures that could have been carried out during the last two decades when the planning process began in accordance with the WFD and they constitute an example of the fact that the investment priorities of river basin planning are not to ensure compliance with environmental flows and environmental objectives. We must take into account the great pressure on water resources to be found in many territories, as seen in previous sections, which represents a risk that there will be numerous non-compliances and the entire process of implementing environmental flows will not work in practice.

Monitoring should also serve to evaluate whether environmental flows are effectively fulfilling the function for which they were designed: the maintenance or recovery of the good status of the rivers, and if not, modify or improve environmental flows following an adaptive monitoring approach. No such thing has been found in any of the plans analysed, except in the case of the River Tagus which seeks to link the activation of incremental jumps (in the minimum flow) to the achievement of the good status of the river bodies between the Bolarque dam and the Valdecañas reservoir. This means that the only time that adaptive monitoring is specifically proposed in the river basin district is to revise downwards minimum environmental flows, which various groups already describe as insufficient (despite the fact that their value has increased) with the sole objective of facilitating attention of the agricultural demands of another basin.

3.3. THE IMPACT OF ENVIRONMENTAL FLOWS ON THE STATUS OF ECOSYSTEMS: FISH INDICATORS, SOLID FLOWS AND CONNECTION BETWEEN SURFACE AND GROUNDWATERS

Many of the water bodies with insufficient environmental flows reported by groups in the public participation do not achieve good status and have high exploitation rates; the river basin planning is not proposing to increase flows in these cases which would be a basic measure to achieve the environmental objectives of the WFD.

Furthermore, there is some difficulty when it comes to knowing the repercussions that the environmental flows implemented have on the status of the water bodies, due to the systematic use of indicators such as macroinvertebrates, diatoms and physicochemical, which are not sensitive enough to the hydromorphological conditions. Ichthyofauna indicators (the integrated EFI+ index) are being developed and data on fish are being collected, but except in the Ebro and Júcar (and not in all water bodies), said indicators are not used in the status assessments in the river basin district studied. Hence, after two complete planning cycles, a generally appropriate fish indicator is still not available for Spanish basins.

However, the European Guide on Environmental flows recommends that Member States urgently develop specifically sensitive metrics. Classification of a water body subject to significant hydrological pressures using only biological methods that are not sufficiently sensitive to hydrological alteration will result in an overestimation of ecological status. Other very relevant hydromorphological aspects are beginning to be evaluated, but in any case they carry less weight in the assessment and are not used to establish whether or not a water body has good status (they only distinguish between good and very good statuses).

Sediment transport, closely related to the flow regime and particularly to flood flows, is largely absent from RBMPs despite its importance in the formation of the habitats of river ecosystems, with such notable cases of problems such as the regression of the Ebro Delta. In this basin, some pilot tests of sediment mobilisation have been carried out, all at a study stage.

Nor is the relationship with groundwater really addressed when studying the problem of circulating flows; however, it is known that in many rivers with a Mediterranean climate, base flows from aquifers are essential when there are low water levels. According to the river basin plans, to assess the quantitative state of groundwater bodies, two tests should be carried out: 1) a test on surface water bodies associated with groundwater to evaluate whether a surface water body has low status or whether the ecosystems associated with it fail to achieve good conservation status. 2) Another test on groundwater-dependent ecosystems to evaluate whether groundwater extractions are a significant reason why dependent ecosystems fail to reach a good conservation status. There is no evidence that this information, where it has been prepared (in some plans it is incomplete), is used in the implementation and evaluation of environmental flows.

3.4. PROTECTED AREAS, THE NATURA 2000 NETWORK AND COORDINATION WITH OTHER PUBLIC AUTHORITIES

As regards protected areas, the European Commission report on the Spanish RBMPs recommended in the first cycle that a comprehensive study be carried out, together with the authorities responsible for nature, to determine the quantitative and qualitative needs of the habitats and protected species. There are areas of the Natura 2000 Network with approved

management plans which indicate the obligation by the competent authority to establish an environmental flows regime with the aim of achieving or maintaining the good status of the water bodies and conserving priority habitats, the species of the Natura Network and migratory species. Many of the water bodies which fail to attain good status, such as the majority of water bodies in the middle-course reaches of the Tagus, are also river habitats within areas of the Natura 2000 Network. However, none of the plans studied have taken into account, when defining environmental flows, the needs of these species and habitats. This is a clear example of the lack of coordination between administrations in Spain, in this case the water ones (river basin authorities, in general Hydrographic Confederations) and the environmental ones (regional governments or Autonomous Communities). Apart from mentioning these regional plans in their sections on Plans and related programmes, and including lists of habitats and species linked to water, the RBMPs do not include details on how they will take these spaces into account in practice.

In summary, positive progress has been made in relation to environmental flows in this third planning cycle, but at the same time, it is clear that the priorities in Spanish river basin planning since the first cycle have focused on demands and not on environmental objectives: at this point in the third planning cycle, it is still being considered to undertake studies, define maximum flows, flood and exchange rates, improve the control network... all of which could have been carried out during the last two decades, when it began the planning process under the WFD.

The exploitation rates and the water consumption pressure on the system are such that there is very little room for manoeuvre, as is the amount of water that is allowed to circulate. In the best possible scenarios, when minimum flows are defined and met, the river has a minimum amount of its flow each quarter, without natural variations. Along with the lack of floods and sediment supply, we have the situation of the general deterioration of the morphology of our rivers. Hydromorphology is a control factor of river ecosystems. Around half our water bodies do not reach good status, but when hydromorphological indicators are used in the assessment or the ichthyofauna does so rigorously, and this is carried out in a more realistic way, we fear that this number will shoot up.

The lack of complete definition of all the components of the flow regime (maximum levels, generators, exchange rates) together with the low levels of the minimum flows in many cases, the existence of unjustified non-compliance and the absence of any assessment as to whether the flows implemented allow or fail to allow any guarantee of the good status of the water bodies, go to make up a frustrating panorama.

3.5. SPECIFIC ANALYSIS OF THE MINIMUM ENVIRONMENTAL FLOWS ON THE RIVER TAGUS (MIDDLE-COURSE REACHES)

The International River Basin District of the Tagus is the most populated on the Iberian peninsula with about 11 million inhabitants (8 million in Spain and 3.2 million in Portugal). It has an extension of 80,629 km^2, 70% of which is distributed in Spain and 30% in Portugal. The Tagus, which flows into Lisbon, is the longest river on the peninsula, crossing its centre to the Atlantic.

Figure 4. River Tagus in the Iberian Peninsula and Spanish part of the Tagus basin.

Source: prepared by the author from the sources cited in the image.

In its Spanish part, this river basin district extends through five autonomous communities, of which Castilla-La Mancha, the second in terms of population, is the one that occupies the most territory. Madrid, despite occupying only 14% of the territory, contributes more than 80% of the total population of the basin, with almost 8 million inhabitants. The fact that the metropolitan area of Madrid, which is one of the largest in Europe after Paris and London, is located entirely in this basin (in its upper part), represents an important peculiarity of the Tagus basin, both as regards the need for a guarantee regarding supply, as well as the significant volume of waste water discharges in this metropolitan area.

The Tagus-Segura water transfer diverts between 45.6% and 60% on average of the water from the Tagus Headwater reservoirs to the Segura basin, although there are years in which the water transferred exceeds 100% of the contributions received in these reservoirs. In this way, Spanish planning transfers the effects of the "unsustainability" of the large volume of irrigation from the Segura basin to the upper part of the Tagus basin, and to the main river thereof in its middle-course reaches which, for this reason, suffers serious overexploitation with a WEI index of 71% in 2014. In the 1970s it was estimated that the headwaters of the Tagus had a surplus of up to 600 hm^3/year that could be transferred. This calculation was based on assuming average annual contributions to the Entrepeñas and Buendía reservoirs of about 1,400 $hm.^3$/year. However, after the beginning of the transfer in the 1980s, contributions have been much lower than expected, 50.6% less per year on average.

The regulations for the Tagus-Segura water transfer and the National Hydrological Plan have always indicated that only "excess" water can be transferred from the Tagus basin which is not necessary for other uses in the transferring basin, including environmental ones. However, environmental flows have never been established in the river Tagus that could be applied as a conditioning factor prior to the transfer. In the Segura basin, on the other hand, resources from the Tagus are deemed to be available whose quantity is neither guaranteed nor previously

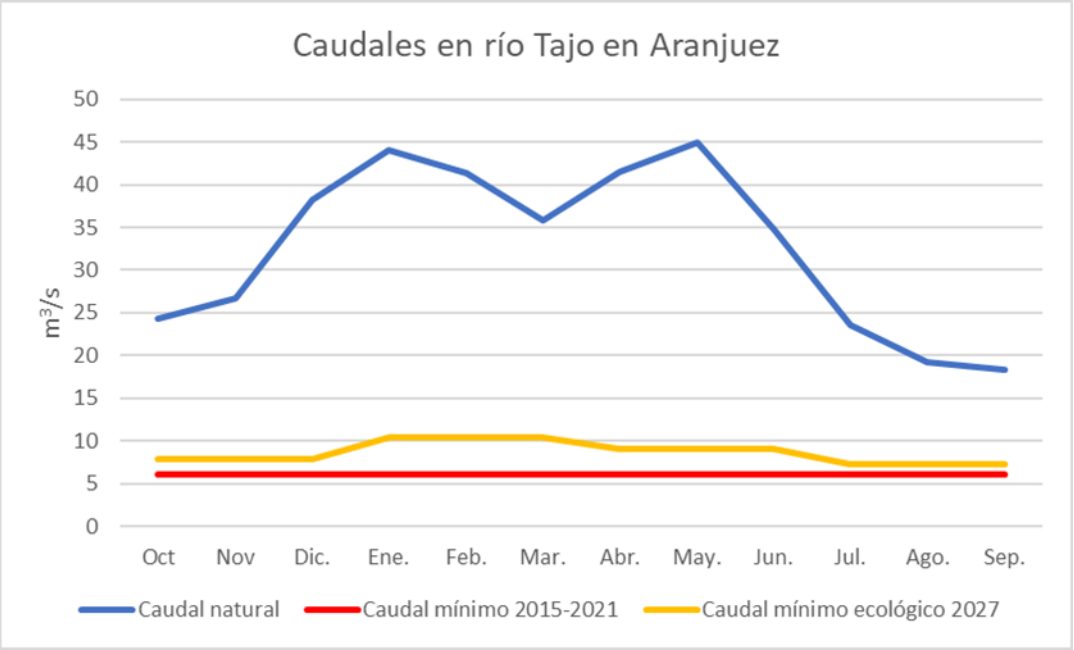
determined. Maintaining an environmental flow regime in the Tagus will imply a certain reduction in the maximum volume transferable to the Segura basin, but in any case, the main reason for the reduction will be climate change. This is not a future threat, but rather a clear reality. Climate change has already very seriously affected the natural contributions at the headwaters of the Tagus, which have been reduced by 50% compared to the average of the historical series and this reduction will continue to worsen in the future. In RCP8.5, it is envisaged that the average transferable volume would be reduced to 77 hm^3 per year, increasing the duration and frequency of periods without transfer.

In the first and second planning cycles of the Tagus basin, minimum environmental flows were only set at 5% of the river-type water bodies. In three of these bodies pertaining to the middle-reaches, only a non-environmental minimum circulating flow was established, without seasonal variability, the same for all months of the year (6 m^3/s for the Tagus in Aranjuez and 10 m^3/s in Toledo and Talavera de la Reina). These flows were lower than the minimum environmental flows previously proposed by basin planning documents (10.86 m^3/s in Aranjuez, 14.10 m^3/s in Toledo and 15.92 m^3/s in Talavera de la Reina) along with its quarterly distribution. The Tagus was thus the only large river in Spain without any environmental flow regime. In 2019, the Supreme Court annulled the provisions on environmental flows and environmental objectives of the Tagus RBMP for violating current legislation, and ruled that the water administration must establish environmental flows, and all applicable components, in all water bodies in the river basin, including the river Tagus. In the third planning cycle, environmental flows are defined for all river-type bodies. However, in 19 bodies of the Tagus axis (almost 400 km of river) the application is carried out progressively in three periods, until reaching the minimum environmental flow regime in January 2027. This means that, from the Almoguera Reservoir to the Estremera Reservoir, which is located upstream of Aranjuez, until December 2025 the minimum flow established at 6.50 m^3/s is less than the PSH value[2]50% (7,283 m^3/s) and, what is more striking, even lower than the value of the 5th Percentile, which theoretically cannot be lowered (6,895 m^3/s).

The water bodies of the middle-course reaches of the Tagus do not currently attain good status, nor are these new minimum environmental flows - despite the increase in their scale - going to bring significant improvements (see Figure 5) to a river that has lost its fluvial dynamics, flooding spaces, sediment transport, banks in good condition and the capacity for self-purification and dilution. The circulating flows during practically the entire year are the established minimums and so the water flow remains practically constant, and the absence of the hydromorphological function of the river makes it very difficult to reach a good ecological status in accordance with the provisions of the WFD. Furthermore, between the second and third planning cycles there has been a deterioration in the ecological status/potential or chemical status of eight of the water bodies of the River Tagus between the Bolarque reservoir (Guadalajara) and the Valdecañas reservoir (Cáceres), an aspect that contradicts the non-deterioration principle of the WFD.

[2] PSH: Potentially Suitable Habitat. Measurement used to determine the biotic factors that condition the environmental flow.

Figure 5. Comparison of flows of the River Tagus in Aranjuez.

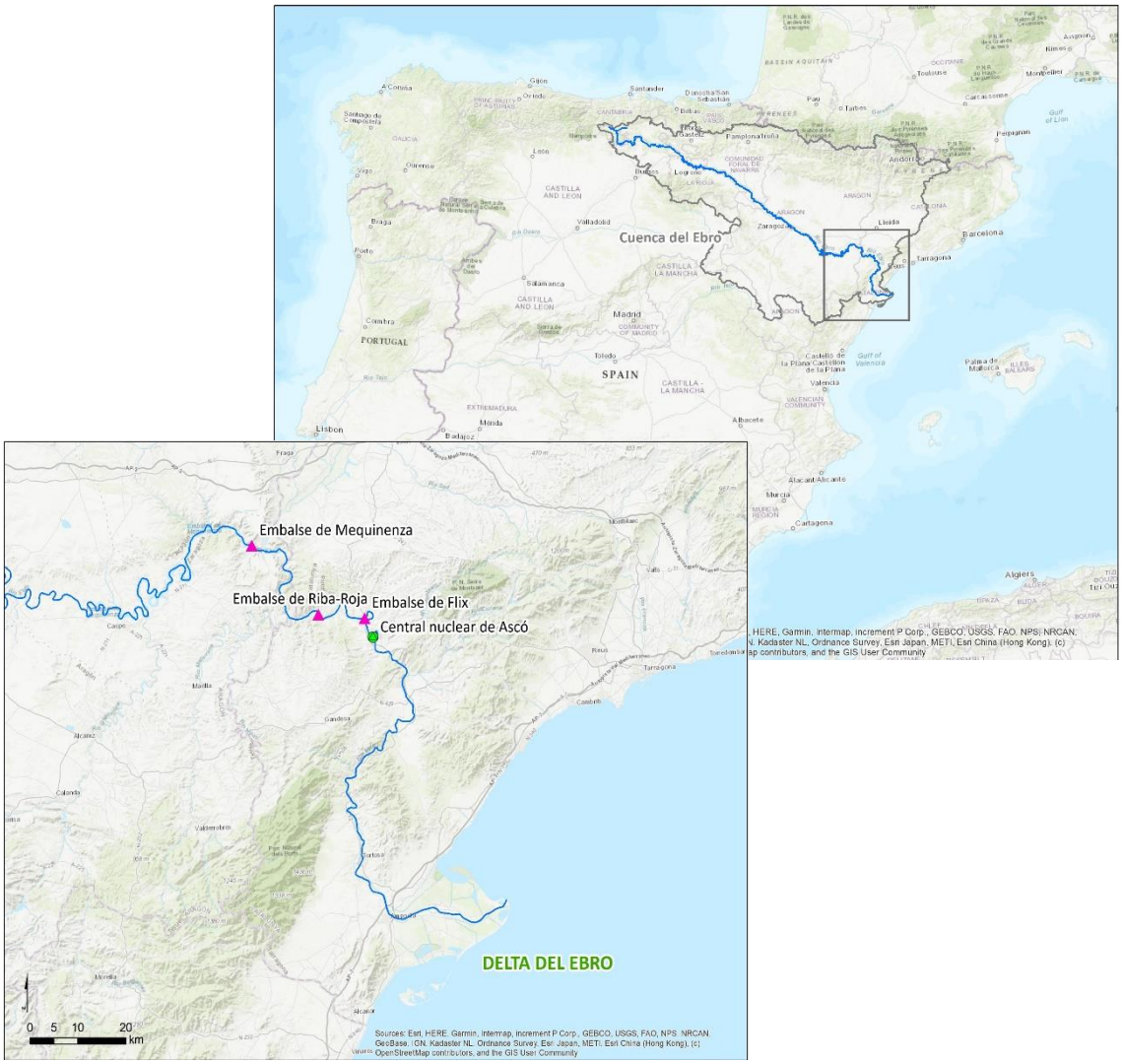


Source: Prepared by the author based on information from the 2016 and 2023 Tagus RBMPs.

3.6. ENVIRONMENTAL FLOWS IN THE EBRO RIVER (DELTA)

The Ebro Delta is a very unique space in the geography of the country; it is a large wetland created by the historical accumulation of sediments from the Ebro river. At present, a major part of the delta is a protected area of the Natura 2000 Network (SCI/SPA) and has been declared as a natural park, included in the Ramsar Convention List and a Biosphere Reserve. It is home to numerous species of protected fauna and flora, as well as an agrosystem in which rice cultivation stands out.

Figure 6. Location of the Ebro Delta



Source: prepared by the author from the sources cited in the image.

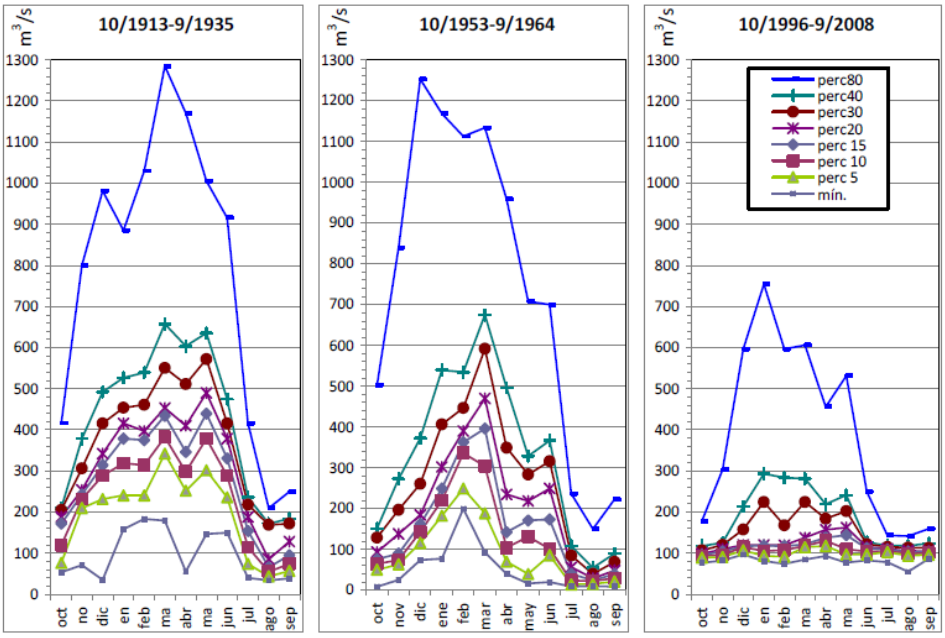
The regulation of the lower reaches of the Ebro by a system of reservoirs (Mequinenza, Riba-Roja and Flix) has caused the delta not only to slow its growth, but also to begin its regression and climate change poses a very real threat to a large part of its territory. The status of the delta depends entirely on the flows carried by the Ebro river, as well as its contribution of sediments.

The third cycle RBMP maintains the environmental flows established in the two previous plans for the final section of the Ebro river (between the Mequinenza reservoir and the mouth of the Ebro). To determine this minimum environmental flow, several studies were carried out by both the Ebro Hydrographic Confederation and the Catalan Water Agency and others. Given the wide range of results of these studies, the Confederation chooses those with lower flows and accepts as valid the arbitrary value that was provisionally set in 1999. In fact, their conclusion, is not that the necessary environmental flow is 100 m^3/s, but 50 m^3/s would be sufficient, but that "the lower section of the Ebro river has the possibility of having greater flows thanks to the existence of the Lower Ebro exploitation system with the Mequinenza-Ribarroja-Flix reservoirs." These biased results and the way they are presented show the inclination of water planning to promote uses such as those of hydroelectric plants, to which the reservoirs belong, over the ecological needs of the Ebro river and its delta. In addition, it leaves open the possibility of lowering the minimum flow even further. Subsequent management, based on these minimum values, is one

of complete regularisation of the flow and no sediment transport, which completely denatures the river, altering the substrate of the channel and the quality of the water, destabilising the natural cycles and making the floods disappear almost totally. The measure proposed by the confederation to address these problems is the generation of controlled floods from the reservoirs, but it only applies two annual discharges of eight hours and a total contribution of 21.6 hm^3 of water per year. This measure is totally insufficient and does not meet its objectives at all.

The minimum environmental flow is established as a daily flow and not as a specific minimum. We can see this in the evolution of the flow percentiles in Tortosa before and after the construction of the reservoirs (Figure 7). The implementation of flood flows, as well as exchange rates and maximum flows seem to be aimed more at going through the motions and complying with IPH regulations than at seeking a real improvement in the ecological status of the rivers.

Figure 7. Monthly percentiles in Tortosa for three periods with different water uses and regulations. Post-reservoir era with hydroelectric uses and greater regulation (1996 - 2008).

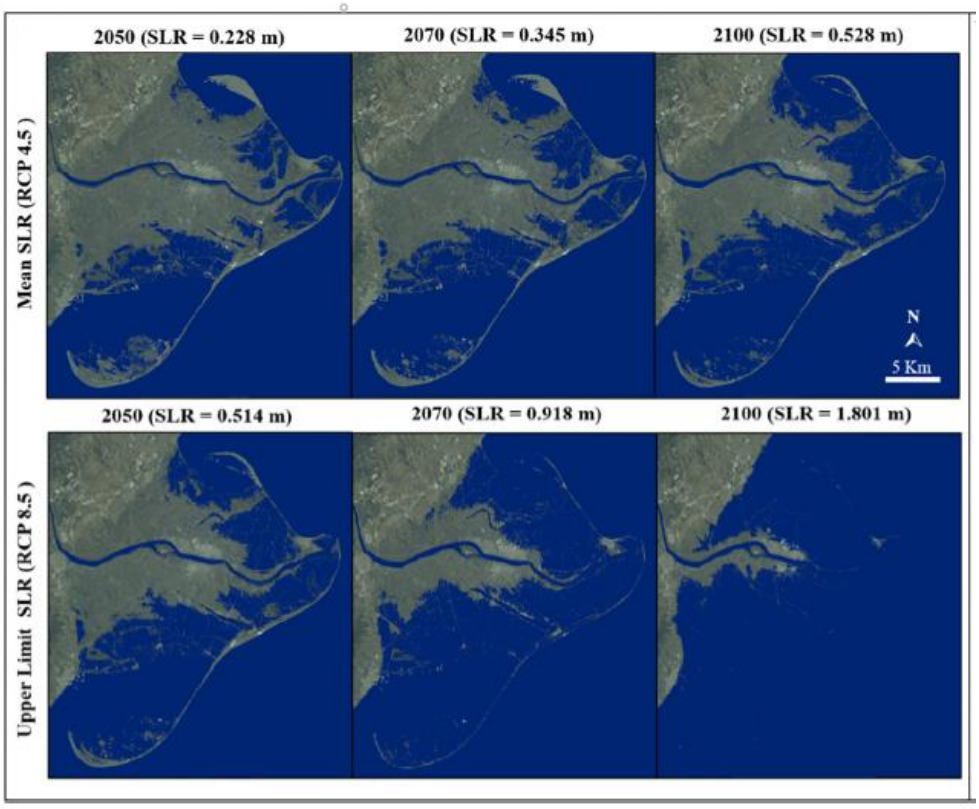


Source: CHE (2012).

All of this has tangible consequences which go against the non-deterioration principle of the WFD. Of the 20 water bodies that affect the Ebro Delta (1 river type, 14 transitional and 3 coastal) 17 do not reach good ecological status. The unfavourable evolution, at an alarming rate, in recent years of the Ebro Delta shows how the criteria employed in previous plans have not complied with European and state regulations for the conservation of protected ecosystems. The Hydrologican Planning Instruction (IPH) aspirations for the role of environmental flows are completely overlooked when calculating this flow. Climate change forecasts foresee catastrophic scenarios if urgent measures are not taken in the Ebro Delta (see Figure 8), but these scenarios are not taken into account in the third cycle RBMP either. None of the monitoring of fauna or ecological status of rivers is used to review environmental flows or whether they are meeting their objective. The tendency is rather to justify the management that

is already being carried out, establishing values for the different components of environmental flows which do not represent any change to the already defined regime.

Figure 8.Flood forecast in the Ebro Delta for the medium (RCP 4.5) and extreme (RCP 8.5) scenarios of the sea level rise (SLR).



Source: Genua-Olmedo et al., 2022.

Detailed information and full content of this third part of the report can be found in section 3 thereof: "THE ENVIRONMENTAL FLOW REGIME IN THIRD CYCLE RIVER BASIN MANAGEMENT PLANS" (link)

4. CASE STUDIES: ABOUT STRATEGIC ZONES

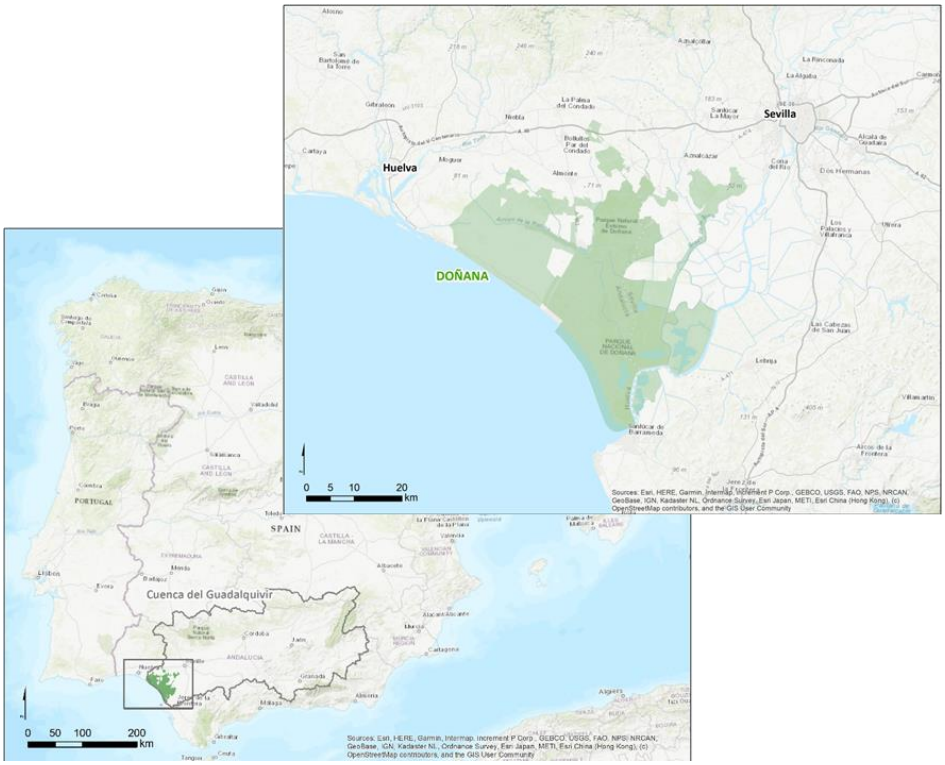
In this report we wanted to highlight certain emblematic cases or strategic areas in which there are serious problems due to water use that is neither sustainable nor compatible with the good status of the water bodies. Two of them refer to natural spaces of very high value, which are strongly degraded though as a consequence of unsustainable agricultural territorial models: Doñana and the Mar Menor. The third deals with the Alcolea dam project whose usefulness and viability is very doubtful.

4.1. IMPACTS ON PROTECTED AREAS DUE TO POOR QUANTITATIVE STATUS. THE CASE OF DOÑANA

Doñana is a wetland at the mouth of the Guadalquivir River which is extremely important for biodiversity, especially as a refuge and breeding site for migratory birds from across the

European continent. Doñana is declared a National Park, Natural Park, space of the Natura 2000 Network (LIC[3], SPA[4], ZEC[5]), List of the Ramsar Convention, Protected Natural Area, Biosphere Reserve and UNESCO World Heritage Site.

Figure 9. Location of the Doñana natural space.



Source: prepared by the author from the sources cited in the image.

Doñana is closely linked to the aquifer that feeds its wetlands. These groundwaters are subject to great overexploitation, mainly owing to industrial farming in a large part of the territory (for the cultivation of strawberries and red fruits). Part of this irrigation is thus illegal. In recent decades, there has been a whole forestry, urban planning and, above all, agricultural transformation process in the territory surrounding Doñana and linked to the marsh. All this has led to significant effects on hydrology and the drying out of numerous wetlands. Furthermore, in the 1970s works were carried out to drain the marshes and divert water for agriculture.

In 2014, the special management plan for the irrigated areas located north of the Doñana forest crown, better known as the "strawberry plan," was approved. This plan was widely discussed and agreed upon by various administrations and stakeholders and received approval from the Doñana Participation Council. At that time, the farms considered as irrigable agricultural surface area were regularised (those that were irrigated before 2004 and had not transformed forest areas into agricultural areas without permits), and the obligation was established to eliminate the irrigated surface area without any permit which failed to meet the two requirements mentioned previously.

But this plan has not been complied with either: many more hectares have been put into cultivation, soils have been deforested to convert them into cultivation areas, hundreds of illegal

[3] Sites of Community Importance
[4] Special Protection Areas for Birds
[5] Special Conservation Areas

wells have been excavated and the measures considered have not been implemented. In 2021, the Court of Justice of the European Union (CJEU) passed judgment against the Spanish State for the "disproportionate extractions of groundwater" in the Doñana Natural Area which violate EU law, specifically, the Water and Habitats Framework Directives. Despite the judgments and the high degradation of one of the most important wetlands in Europe, the Andalusian Government promoted a bill in February 2023 that sought to revoke the strawberry plan. They proposed changing the irrigation regulation (from those before 2004 to all those before 2014) as well as the legalisation of the change in cultivation from forestry to farming without the permits required previously. According to a WWF study, this bill would result in up to 1,900 regularised hectares, more than double that which the government declared. Finally, in November 2023, thanks to the involvement of citizens, environmental entities and the scientific world, the parliamentary initiative to propose the bill was paralised.

The Guadalquivir RBMP does not refer to illegal uses and does not take them into account in the planning, it is only mentioned in the specific section of Doñana, assuming the facts but without suggesting any solution for them. The RBMP states that "In Doñana, the competition for water between conservation and economic activities is evident." And farming is viewed as the main economic driver of the area, but the natural services offered by this protected area are not highlighted. This follows the line of all RBMPs of putting economic uses before environmental values.

The measures proposed to improve the status of Doñana are based on bringing external resources with the transfers of Chanza – Piedras de 5 hm^3/year (already existing) and a new one from the river basin district of the Tinto, Odiel and Piedras rivers of 20 hm^3/year with the construction of a new dam in Alcolea. The latter one is controversial since there is no guarantee it will serve its purpose, and it is another case that we will discuss later. Meanwhile, the status of the water bodies linked to Doñana continues to worsen (see, as an example, Table 6 on groundwater).

Table 5: Exploitation indices (IE) and status of the groundwater bodies of Doñana in the previous planning cycle and in the current one.

MASb code	MASb Name	Second cycle RBMP		Third cycle RBMP	
		IE	Status	IE	Status
ES050MSBT000055101	**Almonte**	**50.70%**	**Good status**	**78%**	**Poor status**
ES050MSBT000055102	**Marshes**	**125%**	**Poor status**	**125%**	**Poor status**
ES050MSBT000055103	Doñana Marshes	0%	Good status	0%	Good status
ES050MSBT000055104	Doñana Coastal Eolian Mantle	14.88%	Good status	18%	Good status
ES050MSBT000055105	**La Rocina**	**106.69%**	**Poor status**	**95%**	**Poor status**

Source: drafted by the author based on the second cycle and third cycle RBMPs

As far as surface waters are concerned, the situation is equally worrying:

- Arroyo Madre de las Marismas: currently it does not attain good status due to phosphorus contamination and the biological indicator of diatoms.

- Arroyo de la Rocina: it does not attain good status either also due to phosphorus and the biological indicators of diatoms and benthic invertebrates.
- Guadiamar: the water body is transitional and is declared as highly modified. In the third cycle it does not attain good status either due to phosphorus, ammonium and indicators of benthic invertebrates.

Doñana is protected by the largest national, European and international legal protection provisions. Even so, the regional and state governments have not ensured adequate compliance with these laws, with this being a fundamental fact in the deterioration of one of the most important wetlands in Europe.

To find out further information on this case study, see section 4.1. of the report: IMPACTS ON PROTECTED SPACES DUE TO POOR QUANTITATIVE STATUS. THE CASE OF DOÑANA" from the full report (link)

4.2. IMPACTS ON PROTECTED AREAS DUE TO POOR QUALITATIVE STATUS. THE CASE OF THE MAR MENOR

The coastal lagoon of the Mar Menor and its peripheral wetlands make up an ecosystem that had exceptional ecological value and unique characteristics in the Mediterranean. The largest coastal lagoon (135 km^2) in the western Mediterranean, with hypersalinity and oligotrophy conditions. With biodiversity of great value, protected and highly threatened species such as the seahorse, eel or the fan mussel (*Pinna nobilis*). The protection provisions applied to these wetlands are, San Pedro del Pinatar Regional Park, Protected Landscape of Open Spaces and Islands of the Mar Menor, SPA (Special Protection Area for Birds) and SCI (Sites of Community Importance) of the Natura 2000 Network, the Ramsar area (Wetland of International Importance under the Ramsar Convention) and SPAMI (Specially Protected Areas of Mediterranean Importance).

Figure 10. Location of the natural space of the Mar Menor.

Source: prepared by the author from the sources cited in the image.

In the 1980s, the Tagus-Segura water transfer was launched, bringing with it a profound transformation of the basin due to expectations of increased water resources. This increase was later lower than expected and insufficient to supply all the new crops. This deficit was made up for by increased exploitation of aquifers. The Mar Menor basin was one of the areas with the greatest expansion of irrigation, as a result of this process. For three decades the Mar Menor has received a large contribution of nutrients from diffuse pollution, mostly from agricultural activities, especially from irrigation fertilisers. Despite the great resilience of this ecosystem and of the warnings of the scientific community, in 2016 the eutrophic crisis occurred due to the great excess of nutrients and the massive growth of phytoplankton, which turned the "sea of glass" into a "green soup" in record time. This led to the disappearance of 85% of the seabed meadows and the death of numerous organisms, including protected species, some in danger of extinction. The dead grasslands, in turn, released nutrients accumulated over decades, contributing to the eutrophic state. In 2019, torrential rains washed away massive amounts of nutrients from the basin, which added to those already present in the lagoon. Furthermore, the difference in salinity (with the upper layer fresh owing to the contribution of rain) created a barrier preventing the transfer of oxygen from the surface water to the deeper water. The almost total absence of oxygen in the deepest layers promoted a process known as euxinia which generated highly toxic sulfides in the water, resulting in the massive mortality of aquatic organisms.

Regional authorities insisted on attributing the mortality to the torrential rains. But these would not have had such a devastating effect if the lagoon had had good ecological status and the basin had not been saturated with the nutrients that were washed away. In fact, in 1987 there was a rainy episode with a third more accumulated rainfall and there were no notable negative impacts on the lagoon. Eutrophication has not occurred overnight. Since 2001, Campo de Cartagena has been declared a Nitrate Vulnerable Zone and yet the regional government, showing itself to be aligned with agrarian interests, has allowed the creation of thousands of new irrigated hectares and has not reduced the input of fertilisers.

As regards measures to improve the poor status of the Mar Menor, the regional government and irrigators propose lowering the level of the aquifer highly contaminated by nitrates, since they argue that it is the main contamination route. However, recent studies show that groundwater contribution is around 20-25% of the total input, compared to 75-80% of surface water input. Based on this argument, the irrigators would endeavour to shift the focus away from their responsibility (there are currently judicial proceedings in this regard) and would also take advantage thereof to extract water from the aquifer, recondition it and use it again for irrigation, resuming the nutrients generation and export cycle. Another issue with this measure is that it does not specify who is going to pay for it.

In the meantime, the ecological status of the waters linked to the Mar Menor continues to worsen (see Table 7). The third cycle Segura RBMP continues to have major shortcomings as it does not recognise the main reasons for diffuse pollution, does not include measures to reduce agricultural demand and continues with regulations that allow illegal irrigation to be regularised. Almost 80% of water bodies in the Segura river basin district do not have a maximum nutrient surplus limit. In the case of the groundwater body affecting the Mar Menor, they extend the good status objective beyond 2039. This is an objective which, in addition to not being in line with the WFD, is too unambitious taking into account the seriousness of the situation in the Mar Menor and its environmental importance.

Table 6: Evolution of the status of the three water bodies linked to the Mar Menor in the three planning cycles.

EVOLUTION STATUS OF THE WATER BODIES IN THE MAR MENOR									
MASS	**FIRST CYCLE - STATUS**			**SECOND CYCLE - STATUS**			**THIRD CYCLE - STATUS**		
	ECO	**CHEM.**	**OVERALL**	**ECO**	**CHEM.**	**OVERALL**	**ECO**	**CHEM.**	**OVERALL**
MAR MENOR	Mod	Worse than good	Moderate	Mod	Worse than good	Moderate	Poor	Worse than good	Worse than good
RAMBLA DEL ALBUJÓN	Mod	Good	Moderate	Def	Good	Deficient	Def	Worse than good	Worse than good
	QUANT.	**CHEM.**	**GLOBAL**	**QUANT.**	**CHEM.**	**GLOBAL**	**QUANT.**	**CHEM.**	**GLOBAL**
CAMPO DE CARTAGENA	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor

Source: drawn up by the author based on the documentation of the Segura RBMPs.

For more information on this case study, see section 4.2. of the report: "IMPACTS ON PROTECTED SPACES DUE TO POOR QUALITATIVE STATUS. THE CASE OF THE MAR MENOR" (link).

4.3. SHORTCOMINGS IN THE COST RECOVERY ESTIMATE. THE CASE OF THE ALCOLEA RESERVOIR

The Alcolea dam, on the Odiel River, is a large hydraulic infrastructure whose construction began in 2012 and came to a standstill in 2015 with 23% completed. The Guadalquivir RBMP assumes for this planning cycle 20 hm^3 per year coming from this dam. The main problem in this project is the fact that the Odiel River has serious problems with contamination by acid and heavy metals due to mining activity in the basin.

Figure 11. Location of the planned Alcolea dam.

Source: prepared by the author from the sources cited in the image.

The regional government of Andalusia commissioned a report from an international consultancy that was initially favourable to the Alcolea dam. As a result of the work of WWF and the Fundación Nueva Cultura del Agua (*New Water Culture Foundation*), it was learned that the data provided by the regional government was incomplete and biased. With the new data, the consultancy rectified its report, warning of the possible poor water quality expected in the future reservoir in terms of pH and heavy metals. Incomprehensibly, the regional government has not published this new report nor has it modified the positive assessments of Alcolea's water quality in the RBMP.

The Interim Overview of Significant Water Management Issues (EpTI) of the third cycle RBMP contains 16 references to the poor quality of Alcolea's waters and the probability that the quality of the water in the future reservoir will not be suitable for irrigation use. On the other hand, the final Overview document (ETI) cites the study that supported the reservoir to conclude the matter. It goes so far as to say that the reservoir is a measure to improve the status of this river (with the precipitation of heavy metals) that can only be achieved in this way. Another justification for the construction is the demand for irrigation and, in turn, the use for irrigation is justified with the construction of the reservoir. Everything is focused on meeting demands and not on reducing pressures.

This project would breach the WFD in several ways: It is proposed under article 4.7 regarding the exemption to good status (see section 2) making misuse, once again, of the overriding public interest. The fact of systematically boosting the economy of rural territories by increasing irrigation should be viewed as a poor adaptation to climate change. At the same time, they claim that they are going to improve the status, when what is actually going to happen is that they will transform a river into a highly modified body. And finally, the cost recovery of the entire

Trigueros dam and canal project has been calculated inadequately and offers up many doubts, since it is not clear that it will fulfil its mission.

For more information on this case study, see section 4.3. of the report: “SHORTCOMINGS IN THE COST RECOVERY ESTIMATE. THE CASE OF THE ALCOLEA RESERVOIR” (link)

CONCLUSIONS

This report highlights that water management in Spain during this third planning cycle continues to fail to meet the conservation and improvement objectives required under the Water Framework Directive (WFD).

At least half of the water bodies in Spain do not have good status due to prolonged structural pressures. Climate change will exacerbate these problems by increasing water demand by cultivation and decreasing water availability. The short-term benefits of intensive agriculture mask long-term costs, such as the depletion of renewable resources and the loss of ecosystem services.

The current water management model, based on increasing supply through the construction of infrastructures, has been exhausted due to the deterioration caused by massive water extraction and pollution, with the loss of river ecosystem services, as well as the reduction in water resources brought about by climate change. The basic idea that should guide current water policy is that fresh water is a limited, irreplaceable element. The future availability of quality water depends on the recovery and maintenance of surface and groundwater with good status, and the adaptation of uses to guarantee its sustainability, without which certain socioeconomic activities will not be possible.

However, the third cycle RBMPs analysed continue to prioritise socioeconomic uses over good water status objectives, which perpetuates a situation of unsustainability. To achieve good water status, rivers need to regain functionality, including better connections between surface and groundwater, healthy and functional riverside forests and more water for ecosystems. This will improve society's resilience to climate change and other challenges.

One of the issues that has been most highlighted by civil and environmental organisations interested in the public participation processes of RBMPs, is the pressing need for the joint, holistic management of the basin, where sectoral policies follow a territorial model instead of following independent routes which are often incompatible. Water is a clear example of how objectives can be in conflict: the uses of water versus its good status; irrigation farming and hydroelectricity versus environmental flows, or the quality of fresh water. Most problems affecting water bodies go beyond river basin planning and depend on other sectoral policies. Hence, effective coordination between administrations is essential, with a long-term vision and focused on the common good.