INFORMATIVE DOCUMENT

RIVER BASIN MANAGEMENT PLAN OF THE JÚCAR RIVER BASIN DISTRICT

2016 - 2021

GOBIERNO DE ESPAÑA

MINISTERIO DE AGRICULTURA Y PESCA, ALIMENTACIÓN Y MEDIO AMBIENTE

CONFEDERACIÓN HIDROGRÁFICA DEL JÚCAR, O.A.

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Image: Turia river in Monterde de Albarracín

Addressing water demands, making compatible the different environmental and economic uses and interests, improving the quality of surface water and groundwater, reducing pressures, implementing ecological flows, evaluating the ecological, chemical and quantitative status of water bodies, defining environmental objectives, coordinating programmes of measures related to the water management in different administrations, encouraging and guaranteeing public participation in hydrological planning, etc.

The incorporation of all these objectives by integrating contributions of the stakeholders involved (users, administrations, non-governmental organisations (NGOs), trade union organisations, business associations, universities and other interested parties) is part of the complexity involved in the preparation of the River Basin Management Plan.

This informative document presents a summary of the contents of the River Basin Management Plan of the Júcar River Basin District, for the 2016-2021 planning cycle (approved by Royal Decree 1/2016, of January 8).

1. HYDROLOGICAL PLANNING

Hydrological Planning in Spain

Spain has a long tradition in water resources planning, going back to hydraulic works planning in the early XX century, and more recently to planning in the Water Act of 1985. Since its approval, planning in Spain has been carried out through the National Hydrological Plan and the River Basin Management Plans (RBMPs). The development of the latter was entrusted to the River Basin Authorities and were finally approved by the Government by means of Royal Decrees in 1998 and 1999. After entering into force, the National Hydrological Plan solved the discrepancies between the different plans, coordinating water resources to satisfy the different planning objectives in a balanced way.

The Water Framework Directive

In recent years, there has been a convergence process of water policies in Member States of the European Union, defined by the Water Framework Directive (WFD, 2000/60/EC).

The objectives of the WFD are to prevent deterioration, to improve the status of aquatic ecosystems and to promote the sustainable use of water. This Directive establishes a series of tasks with a strict compliance schedule, which affects all aspects of water management. To comply with the WFD requirements, the Spanish legislation has modified and adapted hydrological planning objectives, seeking to combine the achievement of the good status of surface water and groundwater with meeting water demands, through a rational and sustainable management.

In short, the WFD has meant a substantial change in European legislation, leading to the beginning of the so-called first hydrological planning cycle (2009-2015) which, in the case of the Júcar River Basin District, culminated with the approval of the River Basin Management Plan through Royal Decree 595/2014, of July 11.

Hydrological Planning Objectives

Hydrological planning, as established in Article 40 of the Revised Text of the Water Act, aims to achieve good status and adequate protection of water bodies in the District, to meet water demands and to balance and harmonise regional and sectoral development.

The planning process

The drafting procedure of the hydrological plans follows a series of regulatory steps established in the Hydrological Planning Regulation. The first step involves the preparation of the initial Documents, which include a working program, a timetable on the foreseen stages, a general study on the District and the consultation formulas.

The second stage is built upon the preparation of a Provisional Overview of Significant Water Management Issues in the River Basin District and the third phase involves the drafting of the River Basin Management Plan itself. This process must be repeated every 6 years. This informative document presents, in summary, the Hydrological Planning of the Júcar River Basin District, corresponding to the planning cycle 2016-2021.

Surface water	Groundwater	Protected areas	Artificial and heavily modified bodies
Objective to prevent the deterioration of water body status	Objective to prevent the deterioration of water body status	Compliance with applicable protection rules in an area	Objective to protect and improve water bodies
Objective to achieve good water body status	Objective to achieve good water body status	Achievement of specific environmental objectives	Objective to achieve good ecological potential of water bodies
Objectives related to the elimination or reduction of pollution by hazardous and/or priority substances	Objectives of prevention or limitation of pollution and reversal of trends	Environmental objectives and compliance with protection rules	Objective to achieve good chemical status of water bodies

Environmental objectives

Image: Mijares river in Cedrillas

The basic management unit of a hydrological plan is the water body. In the case of rivers, the water body corresponds to a differentiated and significant part of surface water that maintains certain homogeneous characteristics.

Among the over 5,400 km water bodies of river category of the Júcar River Basin District, bodies from almost 100 km long to smaller bodies, with only a few km of course, may be found, although the deterioration prevention objectives for achieving good status and reducing pollution are the same for all bodies.

2. THE JÚCAR RIVER BASIN DISTRICT

Administrative boundaries

The Júcar River Basin District (JRBD) is formed by the addition of several river basins, and the Júcar river basin gives the name to the District. It is bordered by the districts of the Ebro and Segura rivers to the north and south, respectively, and the Tajo, Guadiana and Guadalquivir rivers to the west, bordering to the east with the Mediterranean Sea. The total surface of the District territory, excluding coastal waters, is 43,000 km^2, which accounts for approximately 8% of the Spanish territory.

This area extends within five Autonomous Communities (Aragon, Castilla-La Mancha, Catalonia, Valencia Region and Region of Murcia) and seven provinces: The totality of Valencia, a great portion of Albacete, Alicante, Castellon, Cuenca and Teruel, a small area of Tarragona, and a very small area of Murcia. The provinces of Valencia Region cover most of the territory of the river basin accounting for nearly 50% of its total area.

Province	Area per province (km^2)	Area per Autonomous Community (km^2)	Autonomous Community
Tarragona	88	88	Catalonia
Teruel	5,374	5,374	Aragon
Cuenca	8,681	16,089	Castilla-La Mancha
Albacete	7,409		
Castellon	5,785	21,120	Valencia Region
Valencia	10,813		
Alicante	4,522		
Murcia	64	64	Region of Murcia
Total JRBD	**42,735**	**42,735**	**Total JRBD**

JRBD surface per province and autonomous community

Autonomous Community	Percentage of JRBD contributed by the AC	Percentage of the total surface of the AC in the JRBD
Valencia Region	49.42%	90.52%
Castilla-La Mancha	37.65%	20.31%
Aragon	12.57%	11.27%
Catalonia	0.21%	0.28%
Region of Murcia	0.15%	0.57%

Participation rates of the ACs

Administrative boundaries of the Júcar River Basin District

2. THE JÚCAR RIVER BASIN DISTRICT

Physical framework

In the Júcar River Basin District there are two major environments: Mountainous inland, with altitudes over 1,500 metres and a coastal environment, formed by coastal plains, commonly known as “planas”.

The Iberian mountain range acts as a barrier for the sea fronts, causing most of the rainfall. This mountain range is the birth place of the main river of the District: the Júcar River. In addition, the Turia and Mijares rivers are also born there. The three rivers provide as a whole approximately 65% of average runoff of all territorial scope of the District. The final part of the mountains of the Baetic system lies on the south and southwest area, and at this point they spread out partially. This mountainous area is the birth of the Serpis and Vinalopó rivers.

The coastal plain is an alluvial platform delimited by the Iberian mountain range to the northeast, the Central Plateau to the west and the Baetic system to the south. It provides a nutrient-rich soil that supports the majority of the irrigated agricultural production of the District, with over 80% of the total population settled on this coastal plain.

Finally, the area of La Mancha has a relatively level surface with an average height of 650 m and it is located to the west of the scope, between the Iberian and the Baetic mountain ranges. This plain contains an aquifer of large dimensions called Eastern La Mancha aquifer, connected to the Júcar River during its passage through this area.

Another important feature of the District is the length of its coastal line, with a total of 574 km, and the occasional presence of small islands, such as Columbretes or Tabarca islands. These islands are protected by environmental legislation given the great diversity of sea birds that live within their territory.

In the coastal area, the humid areas named marshes, vast flood plains essentially fed by groundwater and, to a lesser extent, by surface water should be noted. Four of these wetlands are included in the Ramsar list, of which the most significant one, for its uniqueness and characteristics, is l'Albufera Lake of València.

Physical framework of JRBD

2. THE JÚCAR RIVER BASIN DISTRICT

Water resources systems

The hydrological planning, as established in article 19 of the Hydrological Planning Regulation (HPR) should define the water resources systems into which the District territory is divided.

A water resources system consists of surface and groundwater bodies, hydraulic infrastructure projects and facilities, water use regulations derived from the characteristics of the demand and of the exploitation rules that, using the natural water resources, and in compliance with their quality, enable the establishment of the water supplies that form the supply of available resources of the water resources system, in compliance with the environmental objectives (art. 19 of the HPR). The definition of the water resources systems is included in the hydrological planning regulations, in accordance with article 81 of the HPR.

As observed in the figure below, the water resources systems tend to adapt to the river basins that form the District. The corresponding geospatial entities are publicly available through the services of the SDI (Spatial Data Infrastructure) of the River Basin Organisation, in the website: www.chj.es

Water Resources system	Area including coastal waters (km^2)	Area excluding coastal waters (km^2)
Cenia - Maestrazgo	2,322	2,033
Mijares - Plana de Castellon	5,069	4,819
Palancia - Los Valles	1,131	1,087
Turia	7,532	7,232
Júcar	22,359	22,187
Serpis	1,186	985
Marina Alta	1,172	839
Marina Baja	750	607
Vinalopó - Alacantí	3,348	2,948
Total JRBD	**44,871**	**42,735**

Area of the water resources systems of the JRBD

Water resources systems of the JRBD

Image: Flamingos at l'Albufera of València

Wetlands play a very important role in the preservation of a large number of birds.

Only in l'Albufera Lake, approximately 250 species of birds use the ecosystem regularly and over 90 species use it for reproduction, which makes l'Albufera one of the most important places of Western Europe to hibernate.

3. IDENTIFICATION AND DELIMITATION OF WATER BODIES

Surface water bodies

A total of 349 surface water bodies have been defined in the Júcar River Basin District.

- 304 water bodies belong to the river category, of which 257 correspond to natural rivers, 43 to heavily modified water bodies and 4 to artificial water bodies.

- 19 bodies belong to the lake category. 16 of these water bodies have been defined as natural water bodies. The other three have been identified as heavily modified water bodies.

- 4 bodies have been defined in the transitional water body category, all of which have been identified as heavily modified.

- 22 coastal water bodies have been defined, 6 of which have been designated as heavily modified due to the presence of ports.

Category	Nature	Number of water bodies	Length (km)	Surface (km^2)
Rivers	Natural	257	4,808	-
	Heavily modified	43	587	-
	Artificial	4	72	-
Total rivers		304	5,467	-
Lakes	Natural	16	-	16
	Heavily modified	3	-	26
	Artificial	-	-	-
Total lakes		19	-	42
Transition	Natural	-	-	-
	Heavily modified	4	-	15
Total transition		4	-	15
Coastal	Natural	16	-	2,010
	Heavily modified	6	-	126
Total coastal		22	-	2,136
Total natural		289	4,808	2,026
Total heavily modified		56	587	167
Total artificial		4	72	-
Total		**349**	**5,467**	**2,193**

Summary chart of surface water bodies

Water bodies of the river category are classified into ecotypes that are shown in the following map where it can be observed that the predominating ecotype is “Mineralised rivers of low Mediterranean mountain” followed by “Calcareous Mediterranean mountain rivers”.

Surface water bodies

3. IDENTIFICATION AND DELIMITATION OF WATER BODIES

Groundwater bodies

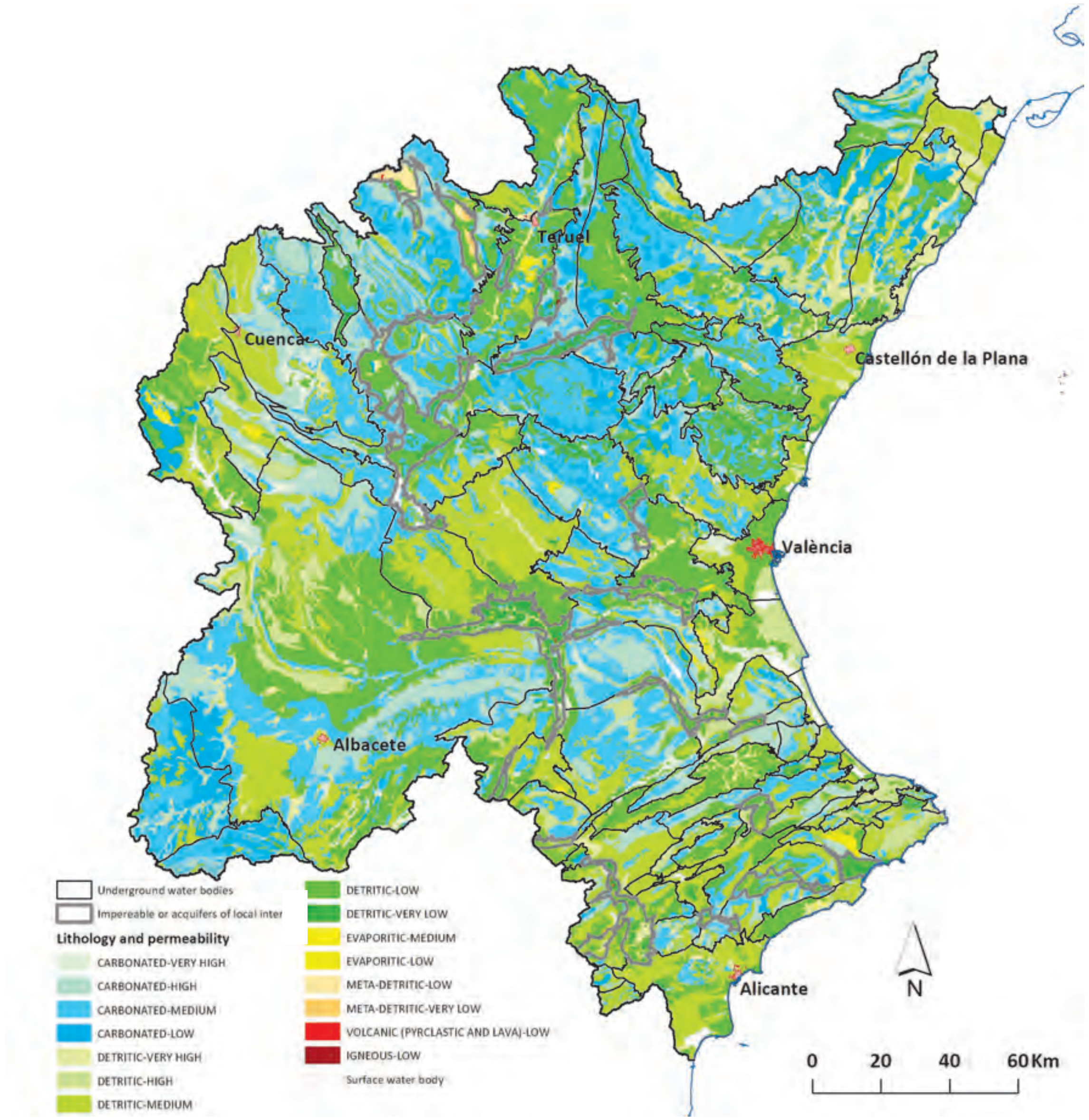
In the Júcar River Basin District, 90 groundwater bodies have been defined, with no changes with regards to groundwater bodies defined in the planning cycle 2009-2015, approved in July, 2014.

The surface of water body areas ranges between 7,118 km^2 in eastern La Mancha (080.129) and 10 km^2 of the body of Javea (080.180), which has the smallest area. With regards to hydraulic properties, the majority of the bodies are considered mixed (with free and confined sectors).

Hydraulic properties	Percentage of water bodies
Free: The upper limit is formed by a phreatic or free surface, in which water pressure equals atmospheric pressure	20%
Confined: The phreatic level exceeds the atmospheric pressure	1%
Mixed (free/confined)	47%
Predominantly free	8%
With no information	2%
Watertight bodies or aquifers of local interest	22%

Main hydraulic properties of groundwater bodies in the JRBD

The major part of the territory of the District is occupied by water bodies of carbonated or detrital type, as it is shown in the figure below.



Groundwater bodies. Predominating lithology and permeability

4. HYDRAULIC HERITAGE

Introduction

The high water variability and the lack of resources in the Júcar River Basin District has led, during the second half of the 20th century, to the construction of a great number of hydraulic infrastructure. This infrastructure expansion was designed to meet the demands for irrigation water as well as regulating resources and distribution to the end consumer and it constitutes an important hydraulic heritage. Examples of this infrastructure include water treatment and reuse facilities, desalination plants, flood prevention or river basin adjustments.

Reservoirs and small dams

The 27 most important reservoirs of the Júcar River Basin District add a total capacity of water storage of 3,300 hm^3, with Alarcon, Contreras and Tous in the Júcar River, and Benageber in the Turia River, being the biggest reservoirs. In addition, there are nearly 1,200 deviation small dams, 850 of which are located in water bodies, which allow the use of surface water resources.

Main channels and pipelines

In the District there is a total of 95 relevant channels and pipelines in operation which underpin the different distribution systems in order to meet the different existing demands, adding a total of 1,172 kilometres.

Other infrastructures

In addition, there are several other relevant infrastructures in the District to be considered in the hydrological planning, such as Waste Water Treatment Plants (WWTP) or the desalination plants.

In the scope of the District, the total number of WWTP corresponding to the equivalent agglomerations of over 2,000 inhabitants is 291. Besides, there are 3 desalination plants in operation in Javea, Alicante and Mutxamel, and other 3 under construction in Oropesa, Moncofa and Sagunto.

Main pipelines in the Júcar River Basin District

Image: Tous dam in the Júcar river

The Alarcon dam, built in the 1950's and with a maximum capacity of approximately 1,100 hm^3, constitutes the biggest dam of the Júcar River Basin District.

Conventional water resources

The majority of available water resources in the District are resources generated by the action of the hydrological cycle. Over 80% of the total precipitation returns to the atmosphere as vapour, either by direct evaporation or by the action of plant transpiration. The other resources, either stream on the surface forming the surface run-off, or infiltrate into the ground, recharging the aquifers.

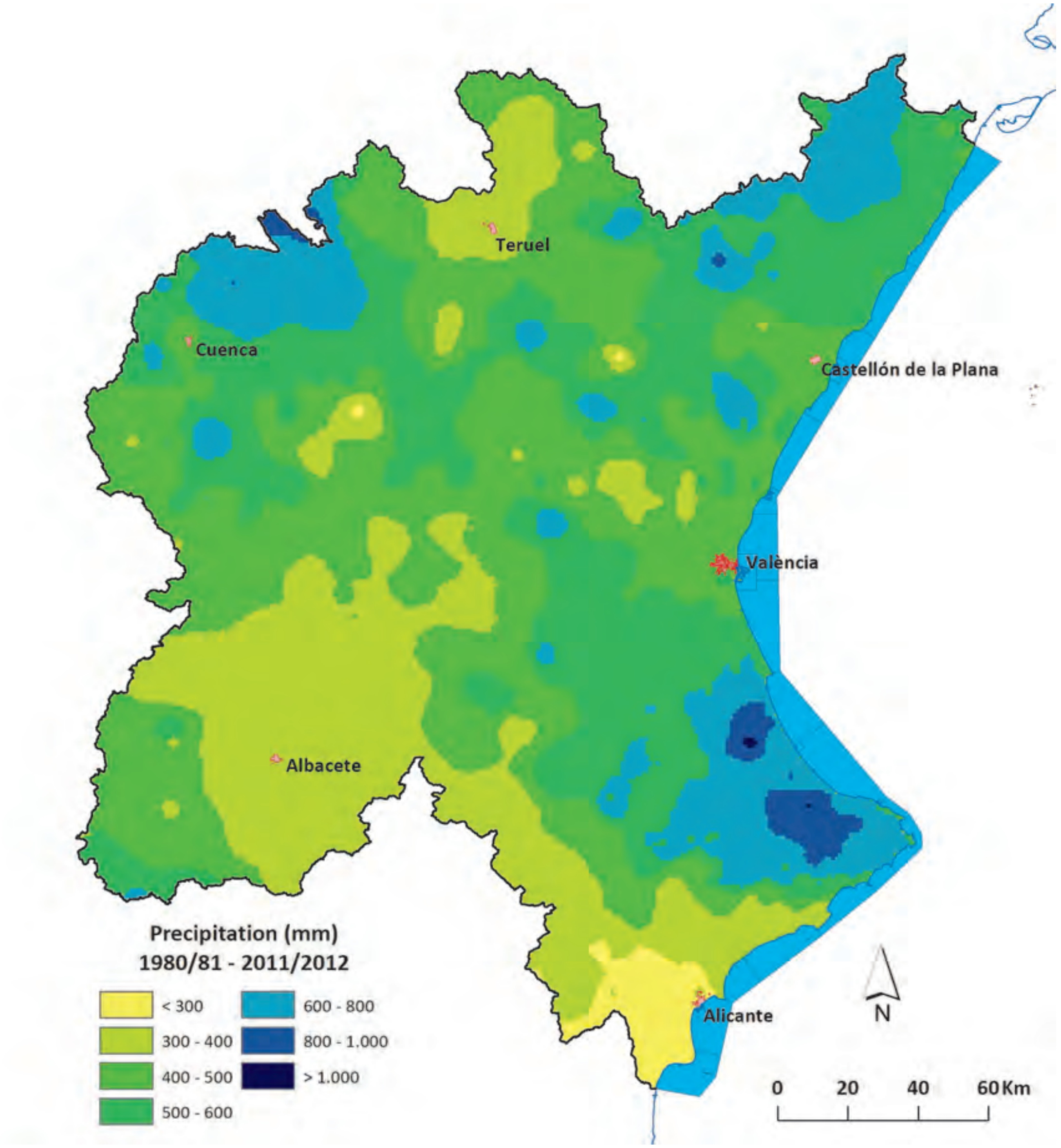
The precipitation varies greatly both in time and space. With regards to the time distribution, the average precipitation ranges between 780 mm annual maximum and up to 300 mm annual minimum, showing values in the last 10 years of 487 mm; similarly, the precipitation varies within the hydrological year, reaching maximum levels in autumn in the coastal strip and in spring in the inland, with minimum precipitation in summer.

The same variability is noticed in terms of spatial distribution, with areas such as Marina Alta with average values of annual precipitation of approximately 730 mm with maximum values of 1,325 mm and areas such as Vinalopó-Alacantí where precipitations are a lot scarcer, showing average annual values of 345 mm and minimum values of 190 mm. The average input of water to the river network is estimated in 3,100 hm^3/year.

Non-conventional and external water resources

Water resources coming from the desalination of marine water, from the reuse of urban waste water or from other river basin districts, are also leveraged in the District, although these volumes are relatively small compared to conventional resources. The volume from desalination is, at present, very small, although it is expected to increase shortly once the different infrastructures recently completed are in operation.

The resources from urban waste water reuse reach nowadays around 120 hm^3 annually, approximately 25% of the total treated volume. Eventually, external water resources amount to around 80 hm^3 annually.



Spatial distribution of total annual precipitation (mm/year) for the period 1980/81–2011/12

Image: Dam in the Júcar River, Alcalá del Júcar

In the JRBD there are nearly 1,200 diversion dams (580 located in water bodies) that enable the use of surface water resources.

Some of these dams are currently out of service.

With the purpose of improving the longitudinal connectivity, the Júcar River Basin Authority (JRBA) is conducting a specific programme of dam permeation in collaboration with NGOs and universities and in accordance with the National River Restoration Strategy.

6. USES AND DEMANDS

The current water demand in the District is estimated at approximately 3,200 hm^3/year, with agricultural demand involving a greater volume, namely 80% of the total.

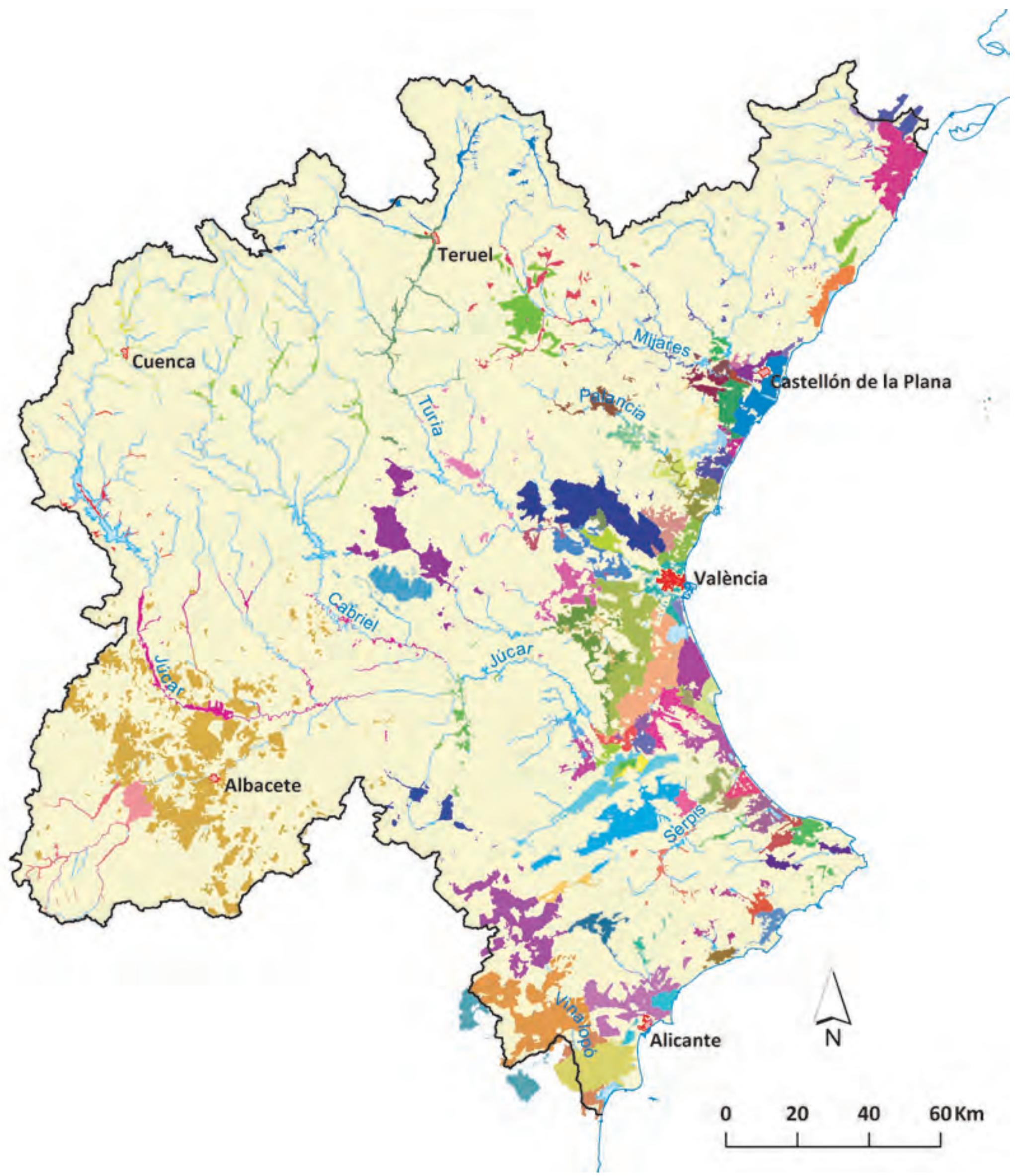
The agricultural sector has to provide for an irrigated area of approximately 390,000 ha. This volume of demand will predictably decrease in the future due to the development of the scheduled modernisation works through which the transformation of part of this surface into localised irrigation, is foreseen. The main irrigated areas are located in the Plana of Castellon, València and the lower basin of the Turia river, eastern La Mancha, Júcar river bank and the lower basin of the Júcar river, as well as the irrigated lands of the valleys of Vinalopó and Monegre rivers, the main crops of which are citrus fruits, grain cereals, grapevines for wine-making and vegetables.

Urban demand, with 16% of the total, is the next most important demand. The current population of the District is estimated at approximately 5,200,000 inhabitants, which increases up to 5,700,000 inhabitants if the effect of seasonal population is considered. The main urban and tourist centres are located along the Mediterranean coast, especially in the surroundings of the area of València, in the Júcar river bank, in the coast of Alicante and in the valley of the Vinalopó river: in the inland areas, the province capitals are particularly notable, namely Albacete, Cuenca and Teruel.

With regards to other demands, industrial demand should be highlighted, including the demand for electric energy production as well as the demand required for the manufacturing industry. In this regard it should be noted that most of the industrial energy demand is non-consumptive except for the refrigeration of the nuclear power plant of Cofrentes. Regarding the demand for the manufacturing industry, a very important part is supplied through the urban supply networks, which is therefore accounted within this demand. Total non-connected industrial demand is estimated at approximately 4% of the total, and it is concentrated mainly in the Turia, Júcar and Vinalopó-Alacantí systems.

Scenario	Demands (hm^3)				
	Urban	Agricultural	Industrial	Recreational	Total JRBD
2012	525	2,581	123	12	**3,241**

Total demand for use in the Júcar River Basin District



Main irrigated areas of the District (Agricultural Demand Units)

Images:
1. Orange trees on the Júcar river bank in Cullera
2. Cereal crops in Cuenca
3. Vineyard in Requena
4. Horticultural crops in Minaya
5. Rice fields in Sueca
6. Crops in the area of Los Llanos, in Eastern La Mancha (image taken by remote sensing)

The importance the citrus-fruit crops in the District is highlighted, and it occupies almost half of the irrigated surface (43%).

The second most important group are grain cereals with 12% of the irrigated surface, followed by wine grape vines (9%) and outdoor vegetables (9%).

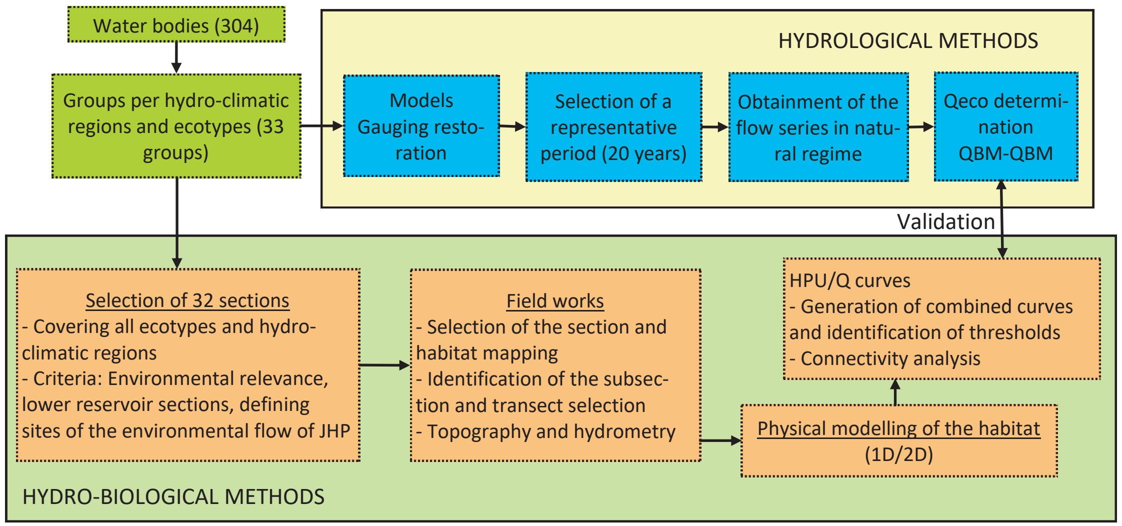
In the other irrigated surface (27%) the different types of crops are grouped, among which corn and rice should be highlighted.

7. ECOLOGICAL FLOWS

Definition of ecological flows

As for to ecological flows, these could be defined as the minimum and maximum ecological flows and exchange rates that allow to maintain a sustainable functionality and structure, both in aquatic ecosystems and in the terrestrial ecosystems associated therewith, thus contributing to achieving the good status or ecological potential.

Minimum flows of the ecological flow regime have been determined by means of the application of hydrological methods and habitat modelling methods of different fish species. This has been carried out by selecting homogeneous and representative periods depending on the hydrological nature of the water body and on the biological cycles of indigenous species, as indicated in the Hydrological Planning Instruction (HPI) and in the methodological scheme shown in the following figure.



Scheme of the methodologies used to determine the minimum flow regime

In the first planning cycle (2009-2015), regimes of ecological flows were established in 39 monitoring sites located in 37 water bodies. In the second cycle (2016-2021), the component of minimum tides of the ecological flow regime has expanded to all water bodies of river type of the District, except for the bodies of river-reservoir type and the bodies called “without water at sampling”. This change has involved moving from 37 to 185 water bodies where, on a regulatory basis, minimum flow is established.

Minimum flows defined increase during some months of the year depending on a seasonal modulation factor of the hydro-region where the water body is located.

Hydro-region group	Unified hydrological regions	Month number											
		10	11	12	1	2	3	4	5	6	7	8	9
1	Mijares-Cenia	1	1	1	1	1	1	1.2	1.2	1	1	1	1
2	Upper Júcar river-Middle Júcar river-Eastern La Mancha-S.Alcaraz -Upper Turia River-Alfambra	1	1	1	1.2	1.2	1.2	1.2	1.2	1	1	1	1
3	Almansa-Lower Júcar river- Lower Turia River-Palancia	1	1	1	1.2	1.2	1	1	1	1	1	1	1
4	Serpis river-Marina Alta-Marina Baja-Vinalopó-Alacanti	1	1.2	1.2	1.2	1.2	1	1	1	1	1	1	1

Seasonal modulation factor of the hydro-region

With regards to prolonged drought situations, minimum flows have been defined as established in the HPI, which allows to decrease these minimum flows under this circumstance. However, the ecological flow regime associated with prolonged drought situations, as established in the HPI, does not apply in the course sections included in areas of the Natura 2000 network. In addition, and as established in the Hydrological Plan, it does not apply either in special protection areas or in natural river reserves. For all these reasons, only in 1% of the bodies the drought flow is lower than the flow in normal situation.

In addition, a maximum flow regime and exchange rates have also been included in the regulatory text of the plan at the most relevant sites with the objective of minimising the effects caused by the large regulation infrastructures on river ecosystems.

Image: Alfambra River in Teruel
Pictures: Brook trout, chub and Mediterranean barbel

Brook trout, chub and Mediterranean barbel are some of the target native species used in the habitat modelling methods for the achievement of ecological flows.

These methods are based on hydraulic simulation, attached to the use of preference curves of the physical habitat for the target species, obtaining curves that relate the useful potential habitat with the flow in the river sections selected.

These sections were selected by prioritising water bodies with a higher environmental importance or that were located downstream from large dams or important diversions and that may condition the allocations and reserves of resources of the RBMP.

© Claudia Baeta

Brook trout. *Salmo trutta*. Linnaeus, 1758

© Claudia Baeta

Chub. *Squalius pyrenaicus*. Günther, 1868

© Claudia Baeta

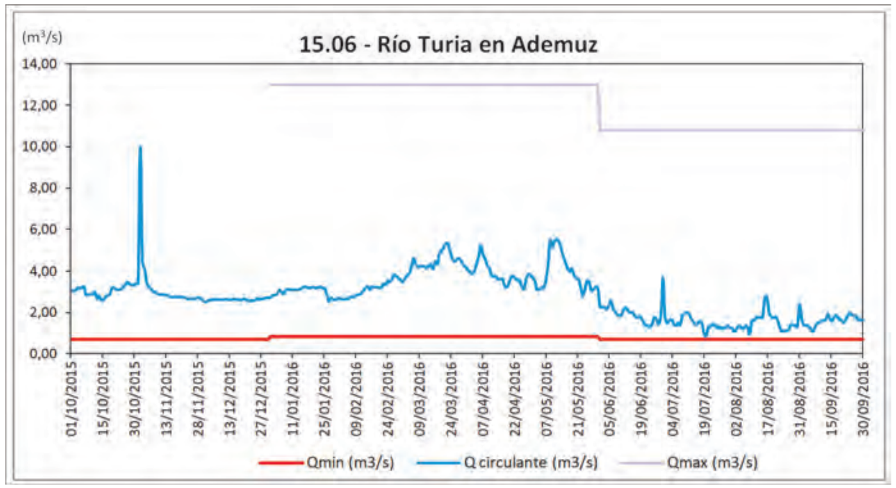
Mediterranean barbel. *Luciobarbus guiraonis.* Steindachner, 1866

Follow-up and compliance with the ecological flow regime

The Hydrological Plan establishes that the follow-up of the flow regime will be conducted by the River Basin Organisation. This follow-up will be conducted, at the very least, at the gauging stations that belong to the Official Gauging Stations Network and to the Automated Hydrological Information System Network. The follow up may also be conducted in the bodies located downstream of a reservoir with the drainage structures of the dam. Additionally, the River Basin Organisation may assess the compliance of the ecological flow regimes by means of specific gauging campaigns or other procedures. In order to be able to conduct the follow-up at the sites that currently lack a gauging station, some specific measures have been included in the Programme of Measures.

In general terms, minimum tides exceeding the natural existing regime at each time should not be enforceable. In addition, water release flows shall ensure the compliance with minimum flow regime at the monitoring sites located downstream from the reservoirs, and minimum water release flows that exceed the contributions to the reservoir in natural regime should not be enforceable.

The chart below shows and example of the follow up of the ecological flow regime in Turia River.



Monitoring and follow-up chart of the ecological flow regime in Turia River in Ademuz

Sections with minimum flow defined and active monitoring sites

Image: Los Frailes gauging station in the Júcar River in Albacete

Nowadays there are 51 monitoring sites of the minimum flow regime, which are located at gauging stations that belong to the Official Gauging Stations Network (OGSN) and to the Automated Hydrological Information System Network (AHIS) or at the drainage structures of the dams.

8. WATER RESOURCES ALLOCATION AND RESERVE

Introduction

The allocations and reserves are one of the most important contents of the River Basin Management Plan as they are the final result of the balance between resources and demands considering, in addition, environmental restrictions.

Overall, the allocations of the Plan for the first planning cycle 2009-2015 and the water rights included in the Public Water Record and the Private Water Catalogue of this River Basin Authority have been considered when establishing such allocations. With regards to reserves, and despite its temporary nature, endeavours were also made to maintain the existing reserves in the Plan for the first planning cycle.

Even though this section includes basic data of the allocation and reserve globally, the information may be referred with greater detail in the report or in the regulations of the River Basin Management Plan, available in the website www.chj.es.

Conventional resources

Approximately 2,180 hm³/year of conventional resources have been allocated in the regulatory content of the River Basin Management Plan, of which the main recipients will be the irrigated lands of Eastern La Mancha, of the area of Vinalopó-Alacantí and of the coastal plains of the Valencia Region, as well as the supply of València and its metropolitan area. The Júcar River system concentrates more than half of all allocations.

In addition, a total reserve volume of approximately 350 hm³/year, has been planned. The total reserve volume is lower than that of allocations, concentrating again the main reserves in the Júcar River water resources system. It should be noted that approximately 200 hm³/year of these reserves are conditioned mostly by the conduct of modernisation actions in the traditional irrigated lands.

Unconventional resources

With regards to reuse, a study of the grants of water rights to irrigated lands or other uses whose resource origin is regenerated water, has been conducted; besides, an analysis of the technical characteristics, volumes cleaned and, when applicable, the reusable volumes in the different waste water cleaning stations of the District has been conducted. From this information, a total allocation of 89 hm³/year and a reserve of 115 hm³/year of resources generated has been allocated.

As regards sea water desalination, due to the very recent construction of these facilities, the allocations and reserves have been established based both on the information provided by the Acuamed state corporation, sponsor of the projects, and on the needs of possible users. In addition, the need of the potential collaboration of these infrastructures in the achievement of the environmental objectives in some water bodies, was assessed. The total allocation volume is 18 hm³/year, all of it from the desalination plant of Mutxamel. With regards to the reserves, the volume stated is much larger, as the start-up of the other facilities built in the northern coast of the District, Oropesa, Moncofa and Sagunto, with a total volume of 33 hm³/year, mainly focused on the substitution of pumping of water bodies in poor quantitative status and the support of future urban developments.

Image: Alarcon Dam in the Júcar River

The dam of Alarcon, built in the 1950's and with a maximum capacity of approximately 1,100 hm^3, constitutes the biggest dam of the Júcar River Basin District.

9. REGISTRY OF PROTECTED AREAS

The protected areas are subject to special protection by virtue of a specific regulation on surface or groundwater protection, or on the preservation of habitats and species directly dependent on water.

The international conventions signed by Spain, the European guidelines and the national and autonomy regulations establish different categories of protected areas, each of which with their specific protection objectives, their legal basis and the corresponding requirements in terms of appointment, delimitation, follow-up and provision of information.

The following types of protected areas are differentiated:

a) Water catchment areas for current and future supply

b) Areas of economically significant aquatic species

c) Water bodies of recreational use

d) Vulnerable areas

e) Sensitive areas

f) Areas of habitat or species protection

g) Mineral and thermal water protection perimeters

h) Natural river reserves

i) Special protection areas

j) Humid areas appointed under Ramsar Convention

Most water bodies of the District are associated with some protected area. Over 73% of the bodies in the case of rivers, 89% in lakes, 98% in groundwater bodies and 100% in coastal and transitional water.

In the Information System of the JRB Water (SIA-Júcar), which may be accessed through the website www.chj.es, all the protected areas and their information associated may be referred to through the geographical viewer.

River-type surface water bodies with protected area associated

Image: Natural river reserve in Guadalaviar River in Albarracin.

The declaration of natural river reserves aims to preserve, with no alterations, those river sections with scarce or no human intervention.

In such sections it will not be possible to grant or modify authorisations or concessions in the public hydraulic domain that put at risk the maintenance of the naturalness status and the hydromorphological characteristics that motivated the declaration.

In the District there are currently 10 open natural river reserves, most of which are located at the heads of the main rivers or their tributaries (Mijares, Turia and Júcar).

Monitoring programmes

Article 8 of the Water Framework Directive establishes that the Member States of the European Union should design the follow-up and monitoring programmes that provide enough information to assess the status of water bodies. These programmes should include, for surface waters, measurement of volume and flow level, ecological status/potential, and chemical status. With regards to groundwater, the programmes should allow to assess the chemical status and quantitative status.

The establishment of monitoring and follow-up programmes has involved an adaptation of the monitoring networks already existing in the District. Depending on the purposes of each programme and on the parameters on which the follow-up may be conducted, there are surveillance programmes, operation, protected areas programmes and quantitative programmes.

Taking into account all the programmes, the number of monitoring stations used to assess the status of river-type surface body water has been 325, whereas in the case of lakes, transitional waters and coastal waters, the number of monitoring stations used has been 19, 31 and 222, respectively, with respect to groundwater bodies, 615 monitoring stations have been used.

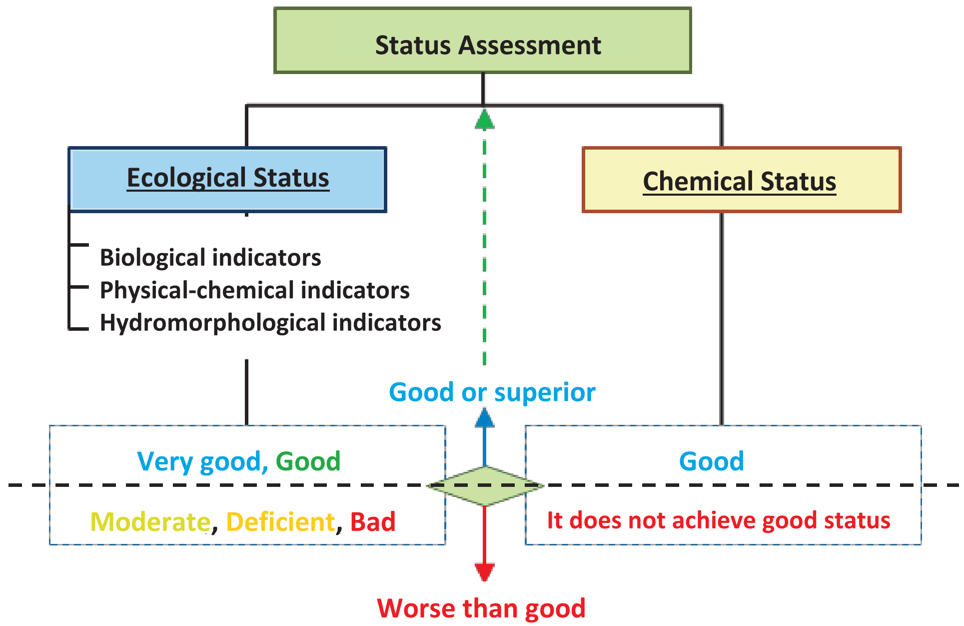
Assessment of the status

The assessment of water bodies' status is conducted both on surface and groundwater bodies with the purpose of assessing their status with regard to the reference status, which is the ideal status corresponding to zero or very low pressure levels.

In the case of surface water bodies, and in compliance with the guidelines of Royal Decree 17/2015 dated September 11, establishing the follow-up criteria and the assessment of surface waters' status and the environmental quality standards, the status is determined as the worst value of the status or ecological potential and of the chemical status. In the first case, biological quality elements, physicochemical elements and hydro-morphological elements, are assessed whereas the second case includes the analysis of all substances collected in the environmental quality standards.

The status of groundwater bodies is assessed on the basis of the quantitative and chemical status. In order to assess the quantitative status, different aspects related to pressure caused by human activity and impact caused by the abstraction of groundwater are analysed from the information provided by the piezometry and quality network (nitrates, pesticides, chlorides, sulphates, heavy metals, etc.).

The criteria to assess the chemical status are defined by Directive 2006/118/EC and Royal Decree 1514/2009, which transposes national legislation; therefore, they are considered environmental quality standards –nitrates and pesticides– and threshold values of pollutants and pollution indicators that have been identified as elements that contribute to water bodies not achieving good status.



Scheme of the status assessment of surface water bodies

Image: Júcar River in Cuenca

The direct benefits of having water bodies in good qualitative and qualitative status will result in a better assurance of meeting demands and in a recovery of the conditions of the aquatic and terrestrial ecosystems associated, and of the flora and fauna present in these ecosystems.

In addition, there are also other indirect benefits such as increased opportunities of recreational uses such as swimming, fishing or kayaking.

10. MONITORING PROGRAMMES AND WATER BODIES' STATUS

Results of the status assessment: Surface water bodies

The percentage of surface water bodies achieving good status is 35%. In the case of water bodies of river category, water bodies in poor status are concentrated mainly in middle and low sections of rivers and, to a greater extent, in the southernmost part of the District.

In addition, all water bodies have been assessed in this planning cycle, including bodies called Without Water at Sampling (WWS), which due to their seasonal and ephemeral character do not carry water permanently. This assessment has been conducted based on an analysis of their hydrological, morphological and point-source pressures (resulting from urban, industrial and/or hazardous substance discharges).

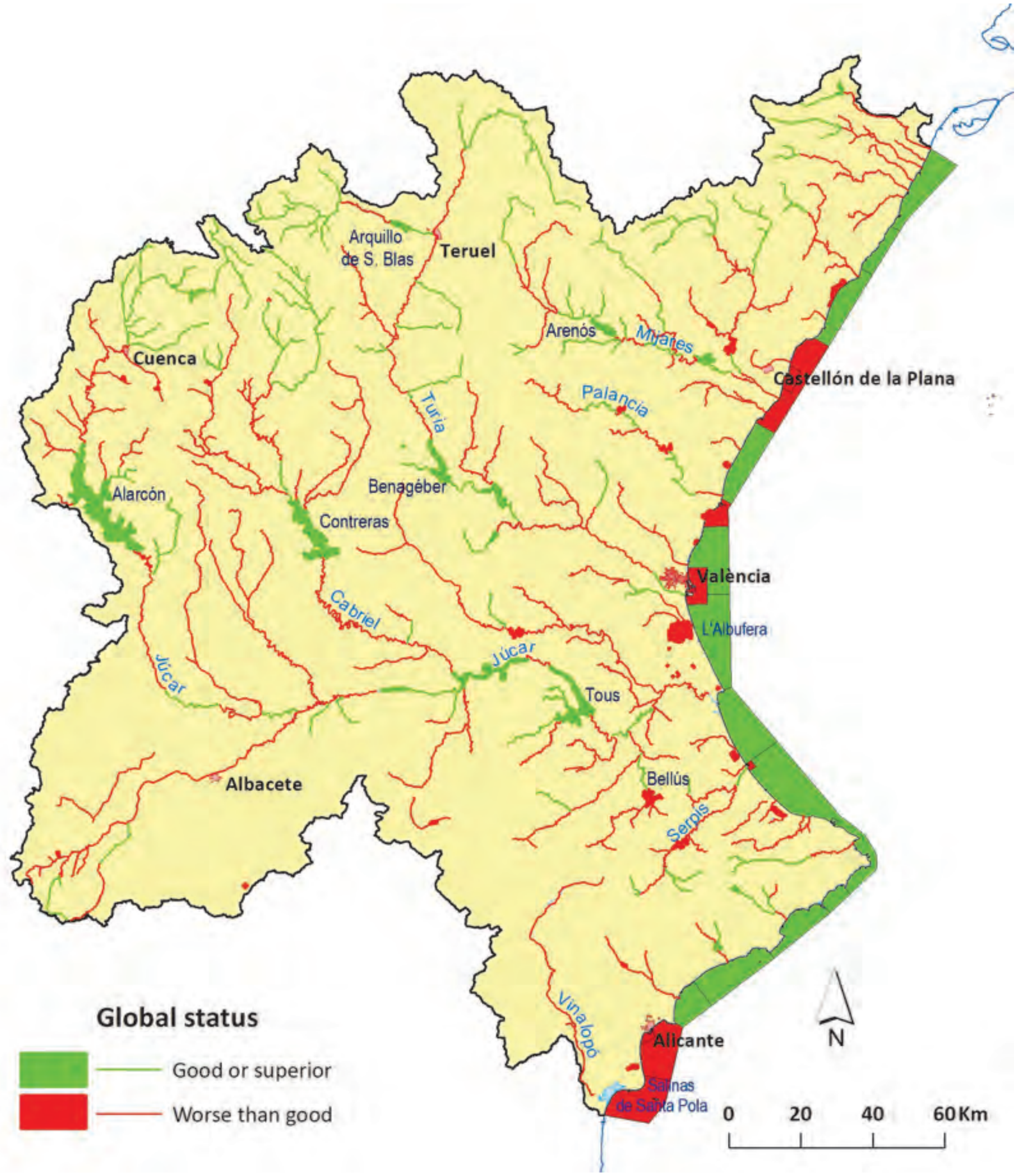
With respect to reservoirs, the majority of them achieve the objectives set for good status, which does not occur in lakes as only two lakes are in good status.

Finally, with respect to coastal water bodies, the majority of natural water bodies achieve the conditions for good status, unlike ports, where only one achieved good status. With regards to transitional water bodies, two out of the three water bodies have good status.

The primary reasons why good status is not achieved derive from point-source urban and industrial pollution, diffuse pollution mainly due to agricultural use, and from the modification of the natural morphological conditions of the river basin.

Surface water category	River Basin Management Plan, 2016-2021			
	Good or superior		Worse than good	
	Number	%	Number	%
River	104	34	200	66
Lake	2	11	17	89
Transition	2	50	2	50
Coastal	14	64	8	36
Total	**122**	**35**	**227**	**65**

Status of surface water bodies: Summary per number and percentage in each water body category



Status on surface water bodies

Image: Servol River in Vallibona

The JRBA participates with other Administrations and Universities, in the LIFE TRIVERS project (2014-2018), related to the analysis and study of temporary and ephemeral water bodies.

Its primary task is to determine the methodology to define environmental objectives and to assess the status for this type of temporary rivers.

The results of this LIFE project should indicate progress on this subject and help the European Commission and the Member States in the inter calibration of this type of water bodies, typical of arid and semi-arid environments.

Results of the status assessment: Groundwater bodies

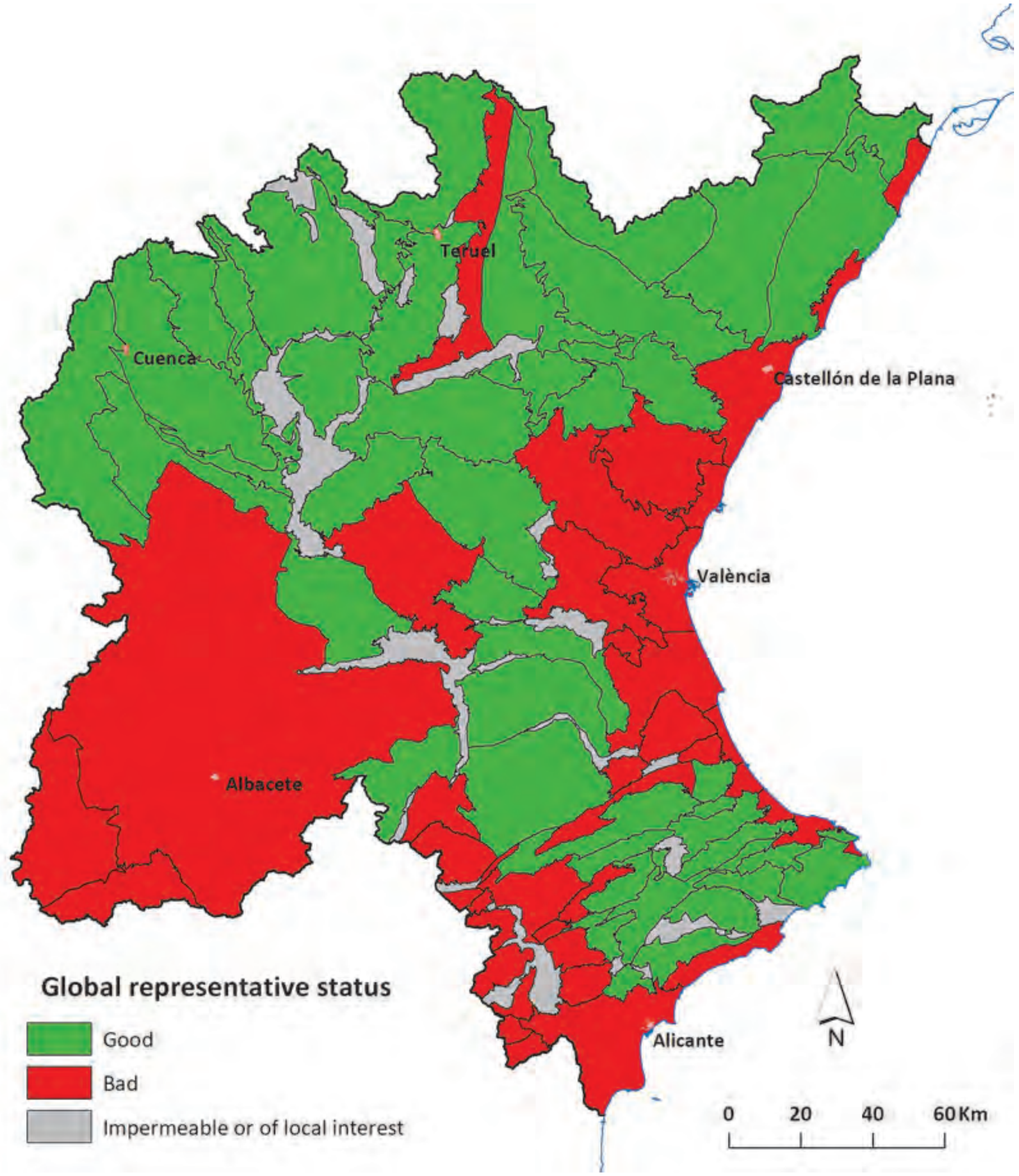
Out of the 90 groundwater bodies, 60 have a good quantitative status and 67 have a good chemical status, although when assessing global status, combining previous status, the result is that 49 bodies, which represent 54% of the total, achieve good status.

The majority of groundwater bodies in the coastal area, where the population is primarily concentrated and which therefore have a higher pressure, have an overall poor status due to non-compliance with the quantitative status, chemical status, or both. Many of the bodies of the Vinalopó-Alacantí system are also in poor status, primarily due to overexploitation, except for coastal areas, which are non-compliant due to nitrates, and the bodies of the area of Eastern La Mancha, which are non-compliant both in terms of quantitative and chemical status.

The primary reasons why the good status is not achieved derive from the intensive exploitation of groundwater bodies and from diffuse pollution due to agricultural use which causes the presence of pesticides and nitrates in some water bodies, with nitrates being the primary cause of the poor chemical status in the Júcar River Basin District. The bodies with problems due to high content of nitrates are located primarily along the coastal strip. Twenty-three of these groundwater bodies have a poor chemical status due to nitrates, which represents 25% of the total bodies.

Rating	River Basin Management Plan2016-2021	
	Number of water bodies	%
Good	49	54
Poor	41	46
Total	**90**	-

Status on groundwater bodies



Assessment of the status of groundwater bodies

Image: Pool and pumping station of the Júcar-Vinalopó pipeline at Llanera de Ranes

In the Vinalopó-Alacantí system, there are some water bodies with a significant imbalance between resources and abstractions.

The programme of measures of the River Basin Management Plan includes a series of actions aimed at providing enough resources to replace groundwater abstractions in this area, balancing groundwater bodies and ensuring the sustainability of the system exploitations.

One of the primary actions in this respect is the provision of surface resources from the Júcar river system through the Júcar-Vinalopó pipeline.

11. ENVIRONMENTAL OBJECTIVES OF WATER BODIES

Environmental objectives of water bodies

In order to achieve a proper water protection, the Water Framework Directive and the consolidated text of the Water Law establish that certain environmental objectives should be achieved to prevent, protect and recover the good status of water bodies for the year 2015. The regulation admits the possibility of establishing term exemptions (extensions) or objective exemptions (less rigorous objectives), either due to disproportionate costs, to not being technically feasible or to natural conditions. No exemptions have been applied in the Júcar River Basin Management Plan, but extensions have been considered.

In the case of water bodies that do not achieve good status, the pressures associated to non-compliance with the indicators have been analysed and actions have been put forward in order to reduce these pressures. Thus, overall, the outlook of good status compliance will depend on the outlook of implementation of the actions associated and of the outlook in which the action is expected to affect the water body.

Status objectives on surface water bodies

In the case of surface water bodies, the objectives for compliance of good status or ecological potential and for good chemical status have been defined, setting a global objective from the most restrictive one of the two.

Category of water body	Good status 2012	Good status 2015	Good status 2021	Good status 2027
Natural rivers	80	80	105	257
Rivers. Heavily modified and artificial, assimilable as a	5	5	6	19
Heavily modified and artificial water bodies due to the presence of dams (reservoirs)	19	19	21	28
Natural lakes	1	1	1	16
Heavily modified lakes	1	1	1	3
Transitional water bodies	2	2	2	4
Natural coastal water bodies	13	13	13	16
Coastal water bodies heavily modified by ports	1	1	1	6
Total surface water bodies	**122**	**122**	**150**	**349**

Summary of environmental objectives on surface water bodies

Final outlook of compliance with environmental objectives to achieve good global status in surface water bodies

Image: Cabriel River in Enguidanos

Compliance of these environmental objectives defined for water bodies of river categories does no longer depend only on the implementation of urban wastewater sanitation and cleansing actions, which is a subject that has already experienced great progress with the subsequent improvement in physicochemical quality of the bodies.

Current quality problems of these bodies are more related to the non-compliance of biological indicators such as macroinvertebrates or ichthyofauna, therefore the actions to achieve the objectives defined should aim to improve these indicators.

In this respect, the Planning involves the implementation of ecological flows in all water bodies, hydromorphological restoration measures and the recovery of their longitudinal and transversal connectivity.

Status objectives on surface water bodies

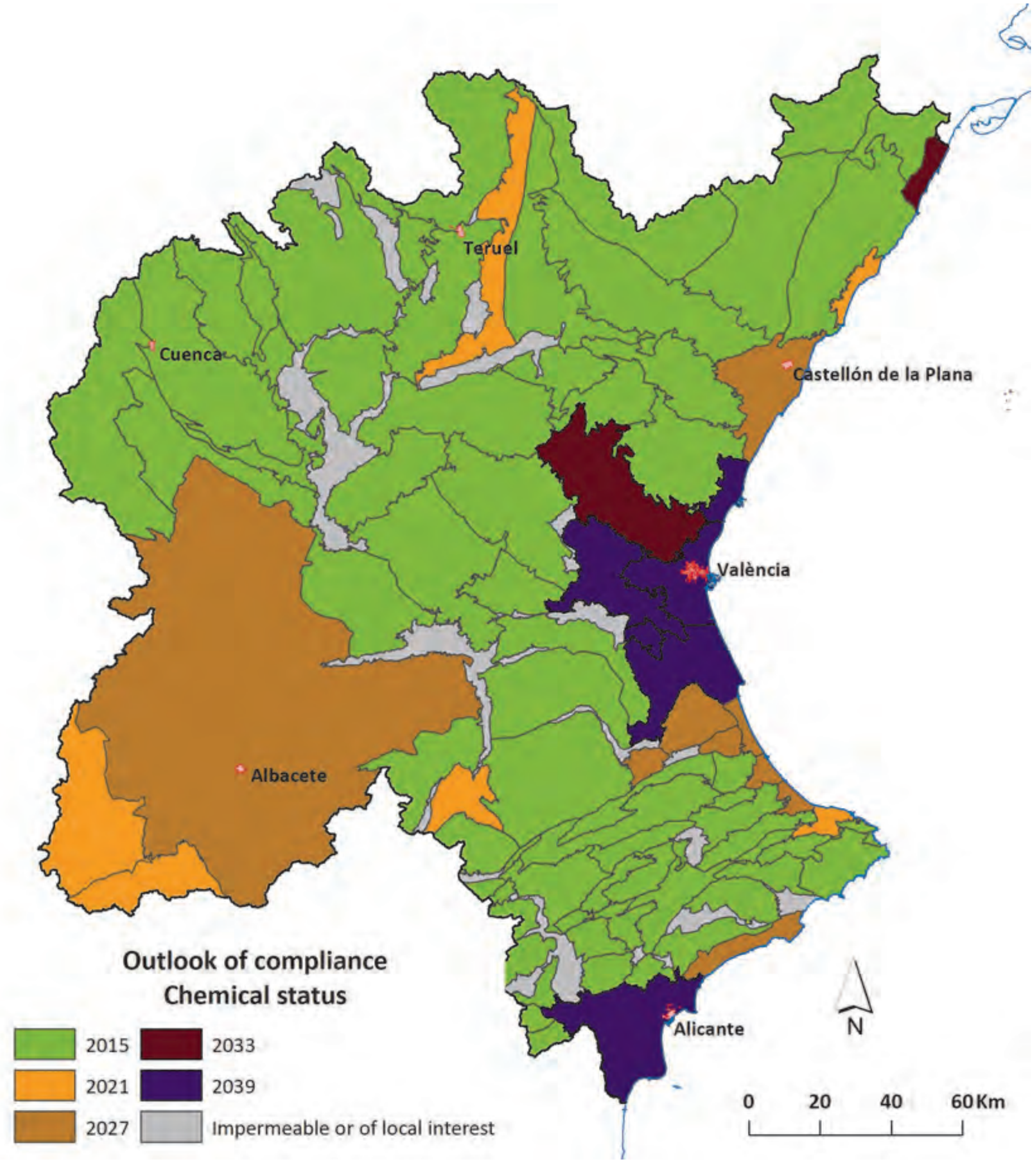
In order to establish the outlook of compliance with the good quantitative status objective, the effect of the measures has been assessed, identifying the measures that affect the quantitative status of groundwater bodies by allowing a reduction of abstractions.

In the case of the outlook of compliance of the good chemical status objective, a detailed analysis of the nitrates parameters has been performed, as nitrates are the most relevant pollutant. For this purpose, a methodology common to all Spanish territory has been used, based on the application of a simulation model of water quality (PATRICAL). The future evolution of nitrate concentration of groundwater bodies has been analysed, depending on the different scenarios of fertiliser application. In the case of the other parameters that cause non-compliance, taking into account the uncertainty about the temporal evolution of the parameters, they have been planned to achieve good status in the year 2027.

After establishing the outlooks of achievement of environmental objectives for each status (chemical and quantitative) of groundwater bodies, an outlook of global compliance has been assigned to each water body, taking into account the most unfavourable situation in case the body has different outlooks.

Category of water body	Good status Plan	Good status 2015	Good status 2021	Good status 2027	Good status 2033	Good status 2039
Good quantitative status	60	60	61	90	90	90
Good chemical status	67	67	73	82	84	90
Good global status	**49**	**49**	**53**	**82**	**84**	**90**

Outlooks of compliance of good quantitative, chemical and global status in groundwater bodies



Outlooks of compliance of good chemical status in groundwater bodies

Image: Tancat de la Pipa

Technical studies conducted at l'Albufera lake of València indicate that it is unlikely that a good ecological potential may be achieved in the short term, especially due to the eutrophication problems caused by the excess phosphorus and by the existing sediments on the lake bed.

It has been established in the specific objective Plan (in two phases) to achieve 90 µg/L of a-chlorophyll in the year 2021 and 30 µg/l in 2027 (as a trophic status indicator).

Tancat de la Pipa is an ecological restoration work made to act as a green filter and to reduce the pollutant load that reaches the lake, to recover the different typical habitat of the original humid area, and to generate spaces intended for public use that allow to approximate the results of the project, and the environmental and cultural values of l'Albufera of València to society.

12. COST RECOVERY

Cost recovery

The Water Framework Directive (WFD) defines water services as all services for the benefit of homes, public institutions or any economic activity, entailing:

a) The abstraction, storing, deposit, treatment and distribution of surface or groundwater.

b) The collection and cleansing of waste water, which is then discharged to surface water.

These services are subject to recovery by means of fees and charges on water, or as self-service payment.

The analysis of water service cost recovery is carried out in the Planning by calculating the costs, revenue and the level of water services' cost recovery, for the entire District and for each water resources system, from the data of the budgets of public Administrations, and, only when such information is not available, data from surveys or estimates are used.

Environmental costs

An important progress in relation to the previous planning has been the estimate of environmental costs, conducted through the actions included in the investment programmes implemented by the Administrations, with the purpose of minimising the pressure and impact generated by the provision of water services on water ecosystems.

Environmental costs are understood as a "penalty for the damage to water body status" connected to the provision of water services.

Cost recovery rates

The following table summarises the costs of all water services supplied by the Júcar River Basin District, including the so-called self-services that include the services where the agent that conducts the abstraction and the beneficiary is the same person. The same table also indicates the level of cost recovery by the users.

Water service	Financial costs (million €/year)	Revenue per cost recovery tools (million €/year)	Recovery level of total financial costs (%)
Provision of wholesale surface water	14.3	6.4	45%
Provision of wholesale groundwater	60.3	60.3	100%
Distribution of retail irrigation water	190.6	123.1	65%
Urban retail provision	320.1	295.6	92%
Self-services	288.4	288.4	100%
Reuse	17.6	0.0	0%
Desalination	25.6	0.0	0%
Collection and cleansing in public networks	258.1	215.1	83%
Total	**1,174.9**	**989.0**	**84%**

Total cost recovery index for water services during the period 2004-2013

The average annual cost of water services in the District in the period 2004-2013 (at constant prices of 2012) amounts to 1,175 million euro, 288 million of which correspond to self-services. To address these costs, the organisations that provide these services have billed approximately 989 million euro, therefore the global recovery rate is 84% of total costs. If environmental costs are considered in this calculation, which are approximately 93 million euro, the global recovery rate decreases up to 78%.

The table of the following page presents a global analysis of the cost recovery analysis per service and use, indicating also the contribution of these costs to the volume supplied.

Water services		Water use	Volume of water (hm^3)		Financial costs (M€)			Non-financial costs (M€)		Total costs (M€)	Revenue per fees and charges on water (M€)	Total cost recovery rate (%)	Financial cost recovery rate (%)	Ratio €/m^3	Ratio €/m^3
			Water supplied	Water consumed	Operation and Maintenance	CAE investment *	Total financial cost	CAE environmental cost*	Cost of the resource						
			A	B	C	D	E = C + D	F	G	H = E + F	I	J= I/H*100	K = I/E*100	L=H/A	M=E/A
Abstraction, storage, treatment and distribution of surface and groundwater.	Wholesale surface water services	Urban	240.1	12.0	0.9	1.8	2.7	1.0		3.7	1.20	32%	45%	0.02	0.01
		Agriculture/livestock	1,457.9	72.9	3.7	7.9	11.6	4.4		16.1	5.22	32%	45%	0.01	0.01
		Industry/energy	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
	Wholesale groundwater services	Urban	242.9	0.0	10.9	49.4	60.3	0.0		60.3	60.25	100%	100%	0.25	0.25
		Agriculture/livestock	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
		Industry/energy	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
	Distribution of retail irrigation water	Agriculture	1,462.3	691.5	125.1	65.5	190.6	1.9		192.5	123.1	64%	65%	0.13	0.13
	Urban supply	Homes	181.9	27.3	228.8	18.8	247.7	0.0		247.7	228.74	92%	92%	1.36	1.36
		Agriculture/livestock	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
		Industry/energy	49.8	7.5	66.9	5.5	72.4	0.0		72.4	66.90	92%	92%	1.46	1.46
	Self-services	Domestic	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
		Agriculture/livestock	1,095.6	752.4	160.3	110.2	270.5	50.0		320.5	270.51	84%	100%	0.29	0.25
		Industry/energy	136.8	20.5	14.7	3.2	17.9	6.2		24.2	17.93	74%	100%	0.18	0.13
	Reuse	Urban (garden irrigation)	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
		Agriculture/livestock	77.3	42.9	1.4	16.1	17.5	0.0		17.5	0.00	0%	0%	0.23	0.23
		Industry (golf)/energy	0.5	0.1	0.0	0.1	0.1	0.0		0.1	0.00	0%	0%	0.23	0.23
	Desalination	Urban supply	2.6	0.4	3.3	15.6	18.9	0.0		18.9	0.00	0%	0%	7.23	7.23
		Agriculture/livestock	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.00	sd	sd	sd	sd
		Industry/energy	0.9	0.1	1.2	5.5	6.7	0.0		6.7	0.00	0%	0%	7.28	7.28
Collection and treatment of discharges to surface waters	Collection and cleansing outside of public networks	Homes	0.0				sd			Sd	0.00	sd	sd	sd	sd
		Agriculture/livestock/ aquaculture	0.0				sd			Sd	0.00	sd	sd	sd	sd
		Industry/energy	0.0				sd			Sd	0.00	sd	sd	sd	sd
	Collection and cleansing in public networks	Urban supply	361.0		167.0	32.7	199.7	22.5		222.1	166.46	75%	83%	0.62	0.55
		Industry/energy	105.6		48.8	9.6	58.4	6.6		65.0	48.69	75%	83%	0.62	0.55
		TOTAL	**3,254.6**	**1,499.1**	**833.0**	**341.9**	**1,174.9**	**92.6**		**1,267.6**	**989.01**	**78%**	**84%**	**0.39**	**0.36**

Summary of the cost recovery analysis per water use and service in the scope of the Júcar River Basin District in the period 2004-2013 (constant prices of 2012)

Introduction

In the last decades, a slight decrease of the precipitations and of the average provisions has been observed in the Júcar River Basin District. This decrease has not been homogeneous in all settings, but it has been concentrated in the headwaters and interior areas, increasing even the average precipitation in the coastal areas with the recent series. This slight increase of precipitation in coastal areas causes a greater surface run-off and generates resources that are less usable from the hydrological planning point of view, increasing, in addition, flood risk.

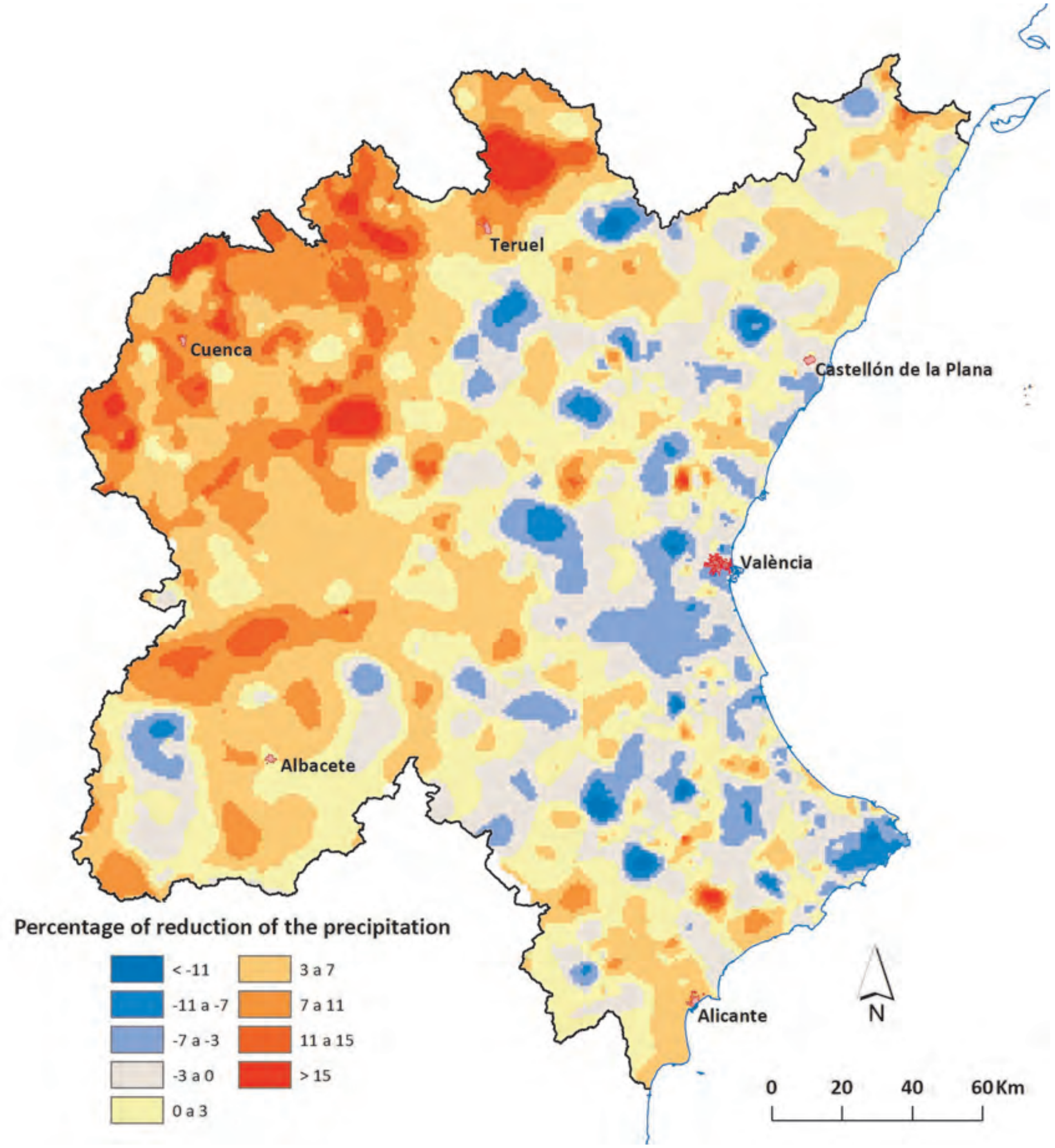
Hydrological planning implications

The reduction of water resources in natural regime in the medium and long term involves one of the aspects to take into account in the review of the hydrological plan.

In accordance with the studies carried out by the CEDEX Hydrographic Studies Centre on the evaluation of the effects of Climate Change on the water resources using the climate scenarios generated by the State Meteorological Agency, the global reduction rate of the provisions to be used in the District would be 12%.

In accordance with CEDEX works, future surface run-off trends of the rivers of the Júcar River Basin District show a decrease with regards to the reference period 1961-1990, whose magnitude varies depending on the emissions scenarios and the regional climate models used. By averaging the values obtained with the different models for each emission scenario, an average between -5% and -12% is obtained for the period 2011-2040, between-18% and -13% for the period 2041-2070, and between -32% and -24% for the period 2071-2100.

Notwithstanding the above, there is a lot of uncertainty about the effect of climate change on water resources as well as on demands and ecosystems. For this purpose, it is necessary to continue working on the study of the impacts of the climate change as well as on the measures required to mitigate its effects.



Percentage of reduction of the precipitation of the recent series (1980/81-2011/12) with regards to the complete series (1940/41-2011/12)

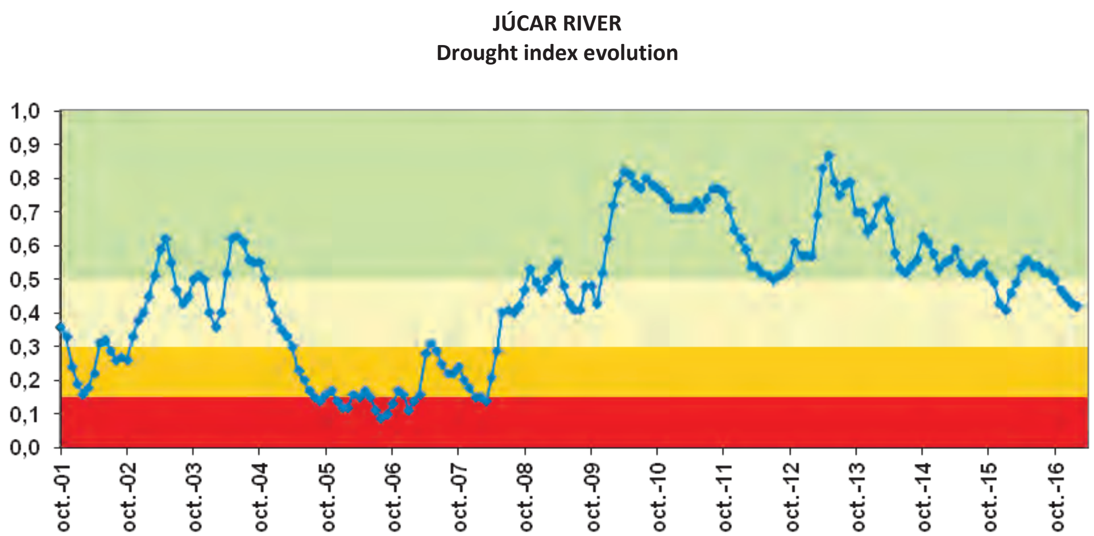
Image: Talayuelas Lagoon

Most aquatic ecosystems may be affected by the effects of climate change. A specific measure has been included in the programme of measures of the River Basin Management Plan: “Study of the effects of Climate Change in the Júcar River Basin District and their impact on the status of water bodies and supply guarantee”.

Indicator system of the Special Drought Plan

The Júcar River Basin Authority developed the Special Action Plan against alert and potential Drought situations, known as the Special Drought Plan (SDP), approved in 2007 by the Order MAM/698/2007, dated March 21, in accordance with article 27 of the Law 10/2001, dated July 5, of the Spanish National Hydrological Plan.

The SDP establishes an indicators system that allows to predict drought situations and assess the severity these situations present, as well as to serve as a general reference of the formal declaration of drought situations and for the hydrological status assessment of the water resources systems. This prediction and alert system allows to activate in time the management measures that must contribute to minimise the effects of the drought. The indicators may take normal, pre-alert, alert or emergency values. The following figure shows, by way of illustration, the time evolution of the hydrological status indicator of the Júcar water resources system, where the red colour indicates values below the emergency threshold.



Evolution in the Júcar system status indicator

The Follow-Up Reports of Drought Indicators in the territorial scope of the Júcar River Basin Authority, which may be found in the drought section of the Water Information System of JRB (SIA_Júcar), are published monthly and can be accessed through the URL http://aps.chj.es/ideJúcar/.

Drought impact prevention and mitigation measures

Mitigation measures defined in the SDP that are activated have a different nature and impact depending on the status of the water resources system and the severity of the drought period. At a pre-alert situation, monitoring and information measures. At an alert situation, resource conservation measures. At an emergency situation, restriction measures. Once the most severe phase of the drought has been overcome, the necessary measures will be taken, as soon as possible, to return water bodies to their previous status before the drought situation. The following table shows the most relevant measures planned in the SDP.

Pre-alert measures	Alert measures
To promote voluntary water-saving campaigns in the supply. To promote voluntary water-saving campaigns among the irrigators. To speed up the development of new drought infrastructures already planned.	Increase of groundwater abstractions. Non-conventional resources: Sustainable reuse. Non-conventional resources: Maximum summertime desalination. Reduction of the volume of surface water supplied for irrigation. Savings in the volume of surface water supplied. Environmental measures: Monitoring plan.

Emergency measures
Groundwater abstractions: To increase abstractions. Non-conventional resources: Maximum reuse. Non-conventional resources: Maximum potential desalination. Alternative supplies being provided. Restriction of the volume of surface water supplied for irrigation. Restriction of the volume of surface water supplied. Activation of the rights Exchange Centre to ensure the supply and to preserve the water environment. Environmental measures: Police plan and monitoring of the public hydraulic domain.

Measures of prevention and reduction of drought impact per scenario

Review of the Special Drought Plan

The review of the Special Drought Plan has been scheduled for 2018 as established in the first final provision of the Royal Decree 1/2016, of January 8, approving the review of Hydrological Plans.

Image: Marina Baja desalination plant in Mutxamel

The Special Drought Plan foresees an increase in non-conventional resources (by means of reuse or desalination) in alert or emergency drought situations.

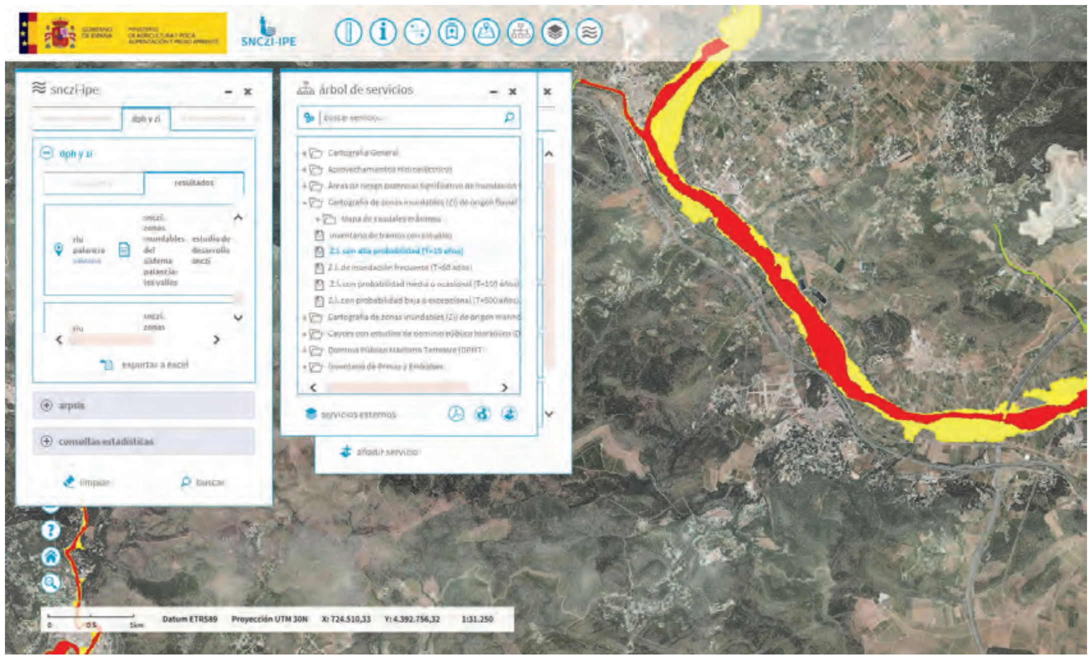
The Marina Baja desalination plant, located in Mutxamel, started to operate in the summer of 2015 with the objective of solving the supply problems caused by the drought in Marina Baja.

Introduction

Article 62 of the Hydrological Planning Regulations establishes that hydrological plans will take into consideration the plans conducted under the territorial scope of the District related to the protection against floods, and a summary of these plans will be attached, including the risk assessment and the measures taken. This summary has been included in the report of the plan. The planning and management of floods is conducted through the Royal Decree 903/2010, of July 9, which transposed into the Spanish law the Directive 2007/60/CE and establishes that flood risk management plans should be conducted in three phases.

Hazard and risk mapping

After a preliminary flood risk assessment phase, where an identification of the significant potential risk areas is conducted, flood hazard and risk maps of river origin are prepared, which may be accessed in the Water Information Systems of the JRB (SIA-Júcar) and are part of the National Flood-Prone Areas Mapping System (NFPAMS), which may be viewed in the website of the Ministry of Agriculture, Fisheries, Food and Environment, in the section: http://sig.magrama.es/snczi/



Example of flood-prone areas map. Palancia River. Image from the SNCZI viewer

Flood risk management plans

The third and last phase consists in the preparation of the Flood Risk Management Plan (FRMP). The FRMP of the Júcar River Basin District was approved by the Royal Decree 18/2016.

The core content of the FRMP is the programme of measures and it adheres to the provisions of Royal Decree 903/2010, i.e., it covers all flood risk management issues, focusing on prevention, protection and preparation including flood forecasting and the early warning systems, and taking into account the characteristics of the river basin or sub basin being considered. The table below shows the different types of measure considered as per the classification established by the European Commission.

Risk management aspects	Type of measure
No action	No action
Prevention	Territorial planning
	Transfer and relocation of incompatible land uses
	Adaptation of land uses to the flood risk
	Other actions
Protection	Measures to decrease flows, improve infiltration, recover river space, etc.
	Construction, optimisation and/or removal of works regulating flows, to be studied in each case
	Construction, optimisation and/or removal of longitudinal works in the course and/or flood plain, to be studied in each case
	Improvement of the reduction of flooded surfaces, e.g., through the Sustainable Urban Drainage Systems
	Other actions
Preparation	Prediction and alert systems
	Emergency action plans
	Population awareness and preparation
	Other actions
Recovery and assessment	Recovery of human and material damage, victim support system, insurance policies, etc.
	Recovery of environmental damages, decontamination, etc.
	Assessment of lessons learned

Types of flood measures according to the European Commission

Image: Palancia River in Sagunt

Torrential rain episodes, as those occurred in March 2015, are frequent in the Júcar River Basin District.

The measures included in the Flood Risk Management Plan should serve, primarily, to increase flood risk perception, improve administrative coordination and predictive capacity against flood events, contribute to improve the territorial planning, achieve risk reduction, improve resilience and decrease the vulnerability of the elements located in flood-prone areas, and to contribute to improve or maintain a good water body status by improving its hydromorphology.

15. PROGRAMME OF MEASURES

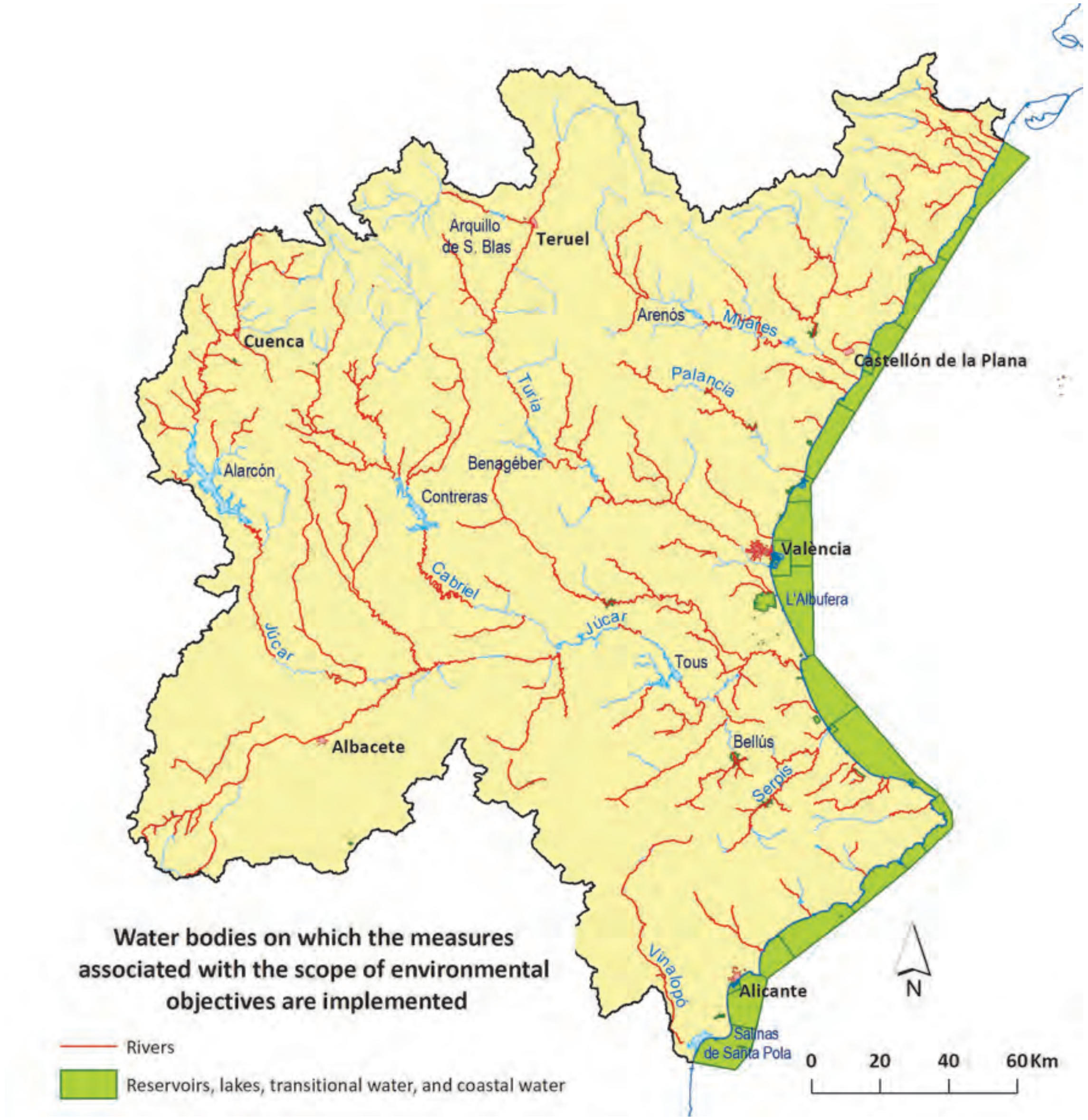
Description of the Programme of Measures

The purpose of the programme of measures is to achieve the environmental objectives based on the economic rationality and sustainability criteria. Therefore, to achieve good status in all water bodies, the most adequate measures have been combined taking into consideration economic, social and environmental aspects, taking into account the cost and efficiency of the measures. The river basin Organisation is responsible for the process of integration and coordination of the programmes conducted by the different competent administrations, while it is the task of the Competent Authorities Committee to enable the conduct of this process.

The total planned investment of the programme of measures in the period between 2016 and 2027 amounts to approximately 2,240 million euro.

Typology of measures	Investment 2016-2021 millions of euro	Investment 2022-2027 millions of euro
01. Point-source pollution reduction	357.58	163.97
02. Diffuse pollution reduction	8.87	5.10
03. Pressure reduction by water abstraction	258.05	268.87
04. Morphological	68.33	67.39
05. Hydrological	6.20	0.10
06. Conservation and improvement measures for the structure and function of aquatic ecosystems	4.09	2.54
07. Other measures: Measures associated with impacts	267.80	93.66
09. Other measures (not directly associated with pressure or impacts): Specific measures of protection of drinking water	135.12	128.83
10. Other measures (not directly associated with pressure or impacts): Specific measures for priority substances	1.55	0.39
11. Other measures (not directly associated with pressure or impacts): Governance	43.62	30.91
12. Increase in available resources	78.64	231.23
19. Measures to fulfil other uses associated with water	0.49	16.85
TOTAL	**1,230.36**	**1,009.83**

Implementation outlooks of the programme of measures in million euro (at constant prices of 2012).



Water bodies on which the measures are implemented

Image: Waste-water treatment plant of La Vall d'Uixo

The measures included within the "Reduction of point-source pollution" type involve an investment of approximately 520 million euro. It primarily involves waste water sanitation and treatment measures, although point-source pollution reduction measures from unit system discharges are also included in this type.

Images: modernisation works of the Acequia Real del Júcar in Alzira

The modernisation of irrigated areas is considered key in the Júcar River Basin District. The agricultural sector in the District's scope has a significant economic, social and cultural weight, while it is also the primary water consumer in the District.

The modernisation of irrigated lands allows in many cases to save water consumption, which enables to improve the management and efficiency of water resources; therefore, such savings may help achieve the environmental objectives both in underground and in surface water bodies.

In addition, the modernisation of irrigated lands may involve a reduction of diffuse pollution (primarily nitrates), which arrive to water bodies either by infiltration or run-off.

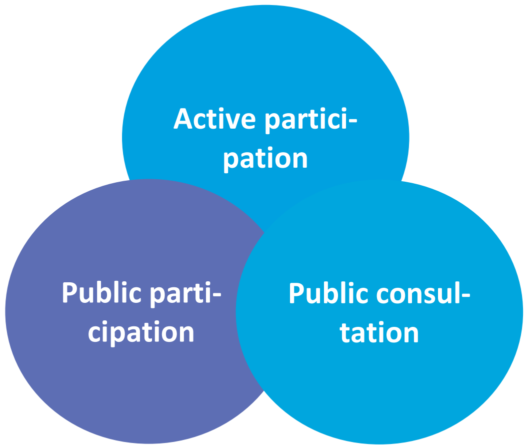
Image: Sellent River in Carcer, before and after an action

The Programme of Measures includes restoration and improvement measures for the riverbank vegetation with the objective of eliminating invasive plants or plants that are outside their natural habitat and that alter the hydromorphological conditions of rivers and of reintroducing native riverbank vegetation.

16. PUBLIC PARTICIPATION

Public participation process of the River Basin Management Plan

Public participation during the conduct of the River Basin Management Plan allows citizens to influence the planning and the work processes in relation to the management of river basin districts and ensures the presence of the interested and affected parties in the planning process. Three levels of social and administrative involvement are defined for this purpose.



Levels of public participation

The process of hydrological planning is, therefore, a process open to the participation of all the population both at an individual level and through the different interested agents: economic, social and environmental administrations, users and organisations. After the establishment of the Water Council of the District, the Hydrological Planning and Citizen Participation Commission was formed, which has validated the participation model set by the river basin Organisation, in compliance with the three levels of public participation mentioned above.

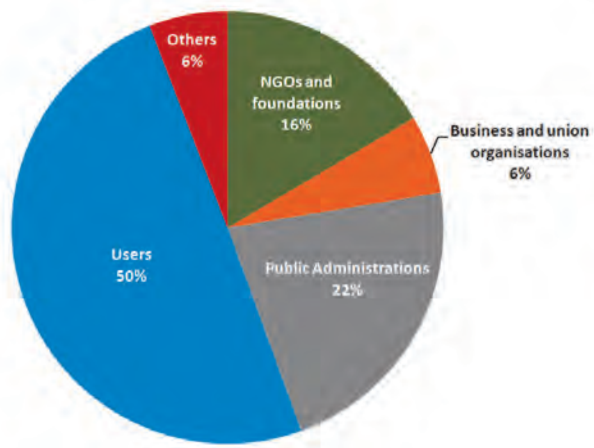
The actions undertaken to promote public participation in the different milestones of the planning conducted up to this date are different. Therefore, the Júcar River Basin Authority made the documents generated in each of the three phases of the planning process: Initial Documents, Provisional Overview of Significant Water Management Issues (OSWMI) and the review project of the River Basin Management Plan (RBMP), available for the public for a period of 6 months.

Once the term is completed, all the proposals, remarks and suggestions in each of the three phases were collected and analysed in specific reports prepared for that purpose.

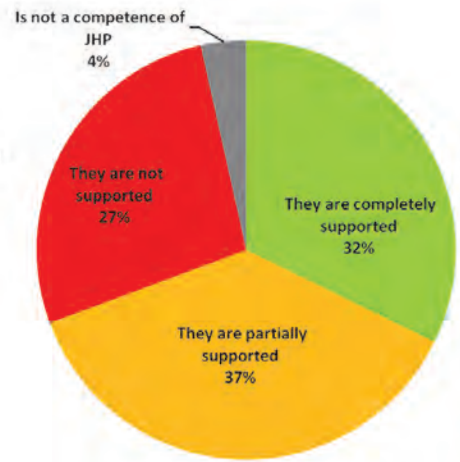
During the public consultation of the OSWMI, approximately 400 topics were collected and 66% of them were included totally or partially in the document. In addition to the regulated participation process, different actions have been conducted during this public consultation phase with the objective of promoting active participation. Thus, territorial meetings were held per water resources system in Teruel, Castellon de la Plana, Albacete, Alzira and Alicante, in addition to a presentation session in València for which an informative document of the OSWMI was made.

During the public consultation phase of the River Basin Management Plan, approximately 900 topics were collected and 69% of them were included totally or partially in the document. As in OSWMI public consultation, over 20 territorial meetings were held during the public consultation period in different locations of the District (Oropesa del Mar, Castellon de la Plana, Teruel, València, Albacete, Alzira, Benidorm, Alicante…) addressing specific topics such as the status of water bodies or measure proposals to be conducted with the purpose of promoting active participation, collecting the different opinions about the problems detected in the District.

All the improvements included in the Plan, as well as the treatment provided to each of the contributions received are collected in the Report of the proposals, remarks and suggestions to the review project Proposal of the River Basin Management Plan of the hydrological planning cycle: 2015–2021.



Percentage of contributions received per entity, during the public consultation of the Júcar RBMP



Treatment of the provisions received during the public consultation of the Júcar RBMP

Image: Territorial meetings in different locations of the District

In the meetings held during the public consultation process of the River Basin Management Plan, the existing issues associated with the status of surface and groundwater bodies and the possible measures to take to achieve the environmental objectives have been discussed for each of the different territories.

For this purpose, a dossier with cartographical material and information charts regarding the status of surface and groundwater bodies, detected non-compliance, existing pressure and a measure proposal was provided in every meeting.

All this material was explained by experts of the Hydrological Planning Office and the attendees were simultaneously encouraged to make the contributions and comments they deemed appropriate.

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A River Basin Management Plan for all

In a more and more demanding environment in terms of support and demand guarantee, and of respect to the environment, and where climate change raises uncertainties with regards to the future impact on the availability of water resources in the Júcar River Basin District, the River Basin Management Plan should allow the compatibility of the multiple uses of water (urban, agricultural, livestock, industrial, recreational, environmental, etc.), encouraging the cooperation among the different administrations involved in water management.

More information

For more information about the Júcar Hydrological Planning, please visit our website: **www.chj.es**

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