The Ebro Water Management Plan

Symbolises the spirit of unity, a common desire of the nine Autonomous Communities of the Ebro to achieve ethical, efficient and sustainable water management.

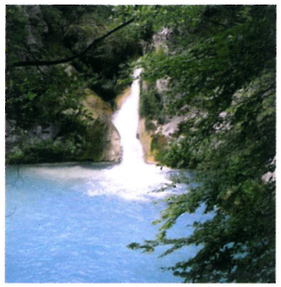
GOBIERNO DE ESPAÑA
MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE
CONFEDERACIÓN HIDROGRÁFICA DEL EBRO

1. The Ebro water resources

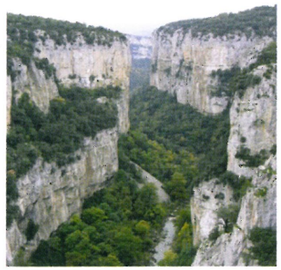
The great depression of the Ebro, flanked by the Cantabrian-Pyrenees Mountain Range and the Iberian Mountain Range, is a mosaic of contrasts, climate, orography, landscape, fauna, flora, culture, etc

Ebro in Fontibre

Nela in Puentedey



Source of the Urederra river



Foz de Arbayún in El Salazar

Gállego in Riglos

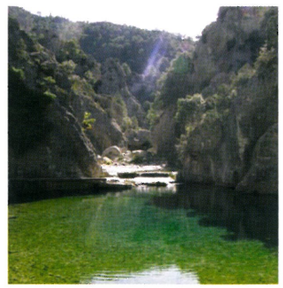
Arazas in the N.P. Ordesa

Lake Sant Maurici

Pozo Azul in El Rudrón

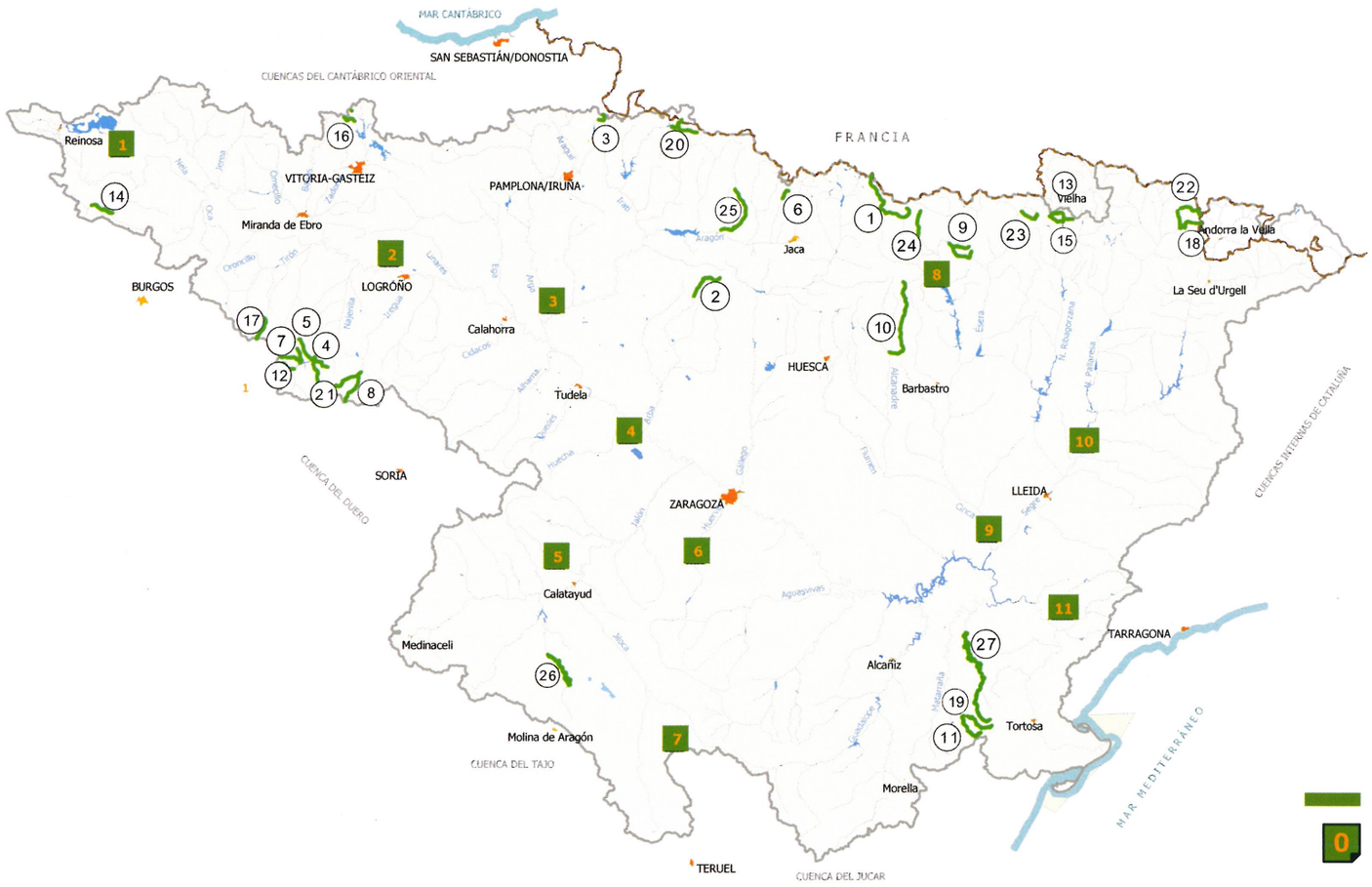
Piedra river

Source of the Pitarque river



Matarraña in El Parrizal

Delta del Ebro.
Laguna de la Encañizada



From the spectacular glaciers and tarns or Pyrenean lakes, to the endhoreic lakes in the centre of the valley, the area has many valuable water resources. River canyons, waterfalls, pools, meanders, galachos, wetlands and an impressive delta are environmental assets that are increasingly appreciated by society.

The Water Framework Directive considers that water is not a commercial asset like any other; rather it is a heritage resource that must be protected, defended, and treated as such.

The Ebro water resources are quite valuable. The Pyrenean rivers and the Iberian System rivers have not been altered by man, due to depopulation, and they are an environmental treasure within the context of the European Union. As occurred with the so-called «Alpine diamond», the Pyrenees are on their way to becoming a very high quality area within populated Europe, where the spectacularity of the landscape is combined with recreational and scientific activities, similar to the Swiss Alps.

In the rest of the basin, where a dry climate and the steppe are predominant, water is of great environmental value and is part of the heritage.

The previous page shows a sampling of natural areas of extraordinary beauty and environmental value. The Plan to defend the water resources proposes a wide range of initiatives, among which we highlight:

River Ebro at outlet

Benasque Valley

Environmental projects contained in the water resource management plan

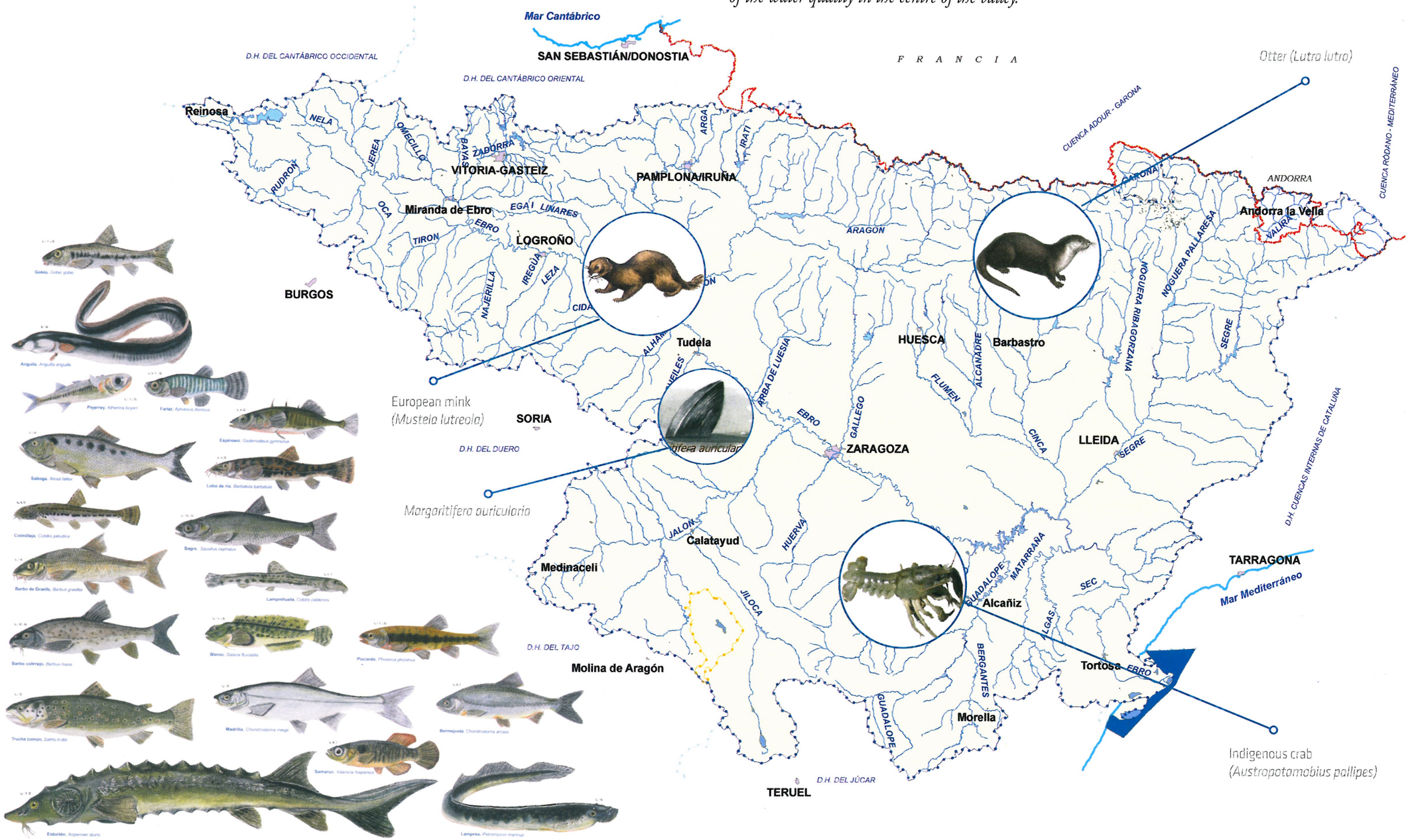
1. **Híjar-Ebro River Park. Refurbishment of the River Híjar basin**
2. **Comprehensive works on the Ebro in Logroño**
3. **Work at the confluence of the Rivers Arga and Aragon.**
4. **Trail GR-99 from Reinosa to the Ebro Delta**
5. **Environmental project at the Monteagudo de las Vicarias reservoir.**
6. **Restoration of the River Huerva downstream from Muel.**
7. **Recovery of the old El Cañizar lake in Villarquemado.**
8. **Recovery of the environs of Janovas.**
9. **Work at the Bajo Cinca in Fraga.**
10. **Work at the River Segre in Balaguer.**
11. **Environmental recovery of the Flix Meander.**

The Water Management Plan proposes the **natural river reserves** marked in green on the map. These river reserves are bodies of water that are in very good condition (physical-chemical and biological) that serve as reference conditions. These are rivers that are in an ideal condition:

1. Ara from its source to the River Arazas.
2. Arba from Luesia at its headwaters.
3. Arga at its headwaters.
4. Calamantio from its source to its outlet in the Najerilla.
5. Cambrones from its source to its inlet into the Mansilla Reservoir.
6. Estarrun at its headwaters.
7. Gatón from its source to its inlet into the Mansilla Reservoir.
8. Iregua from its source to the irrigation dam of the transfer channel to the Ortigosa Reservoir (includes River Mayor).
9. Irues and tributary Garona at its headwaters.
10. Isuala from its source to its outlet to the River Alcanadre.
11. Matarraña from its source to the River Uldemo and the elevation channel to the Pena Reservoir.
12. Najerilla from its source to the River Neila.
13. Noguera Ribagorzana from its source to the tailwater of the Baserca Reservoir (including Bizberri).
14. Rudron and San Anton to their confluence.
15. Salenca from its source to the tailwater of the Baserca Reservoir.
16. Santa Engracia at its headwaters.
17. Tirón from its source to the town of Fresneda de la Sierra.
18. Tor from its source to its outlet to the River Vallfarrera.
19. Ulldemo at its headwaters.
20. Urbelcha from its source to the tailwater of the Irabia Reservoir.
21. Urbion from its source to its outlet to the River Najerilla.
22. Valfarrera from its source to the River Tor.
23. Vallibierna from its source to its outlet to the River Esera.
24. Bellos from its source to the River Aso.
25. Veral to the River Majones.
26. Piedra from the limit with Castilla-La Mancha to Cimballa.
27. Algars, from its source to the limit with Catalonia.

2. Biodiversity and indicators

The object of the Ebro Water Management Plan is to preserve the great biological resources of the headwaters of the Pyrenees and Iberian systems and to fight against invasive species and deterioration of the water quality in the centre of the valley.



Fish indigenous to the Ebro

Indicators are used to assess the biological richness and the condition of the water. When drafting the Plan these indicators were used to measure the environmental condition: phytoplankton, macrophytes, macroinvertebrates, diatomae, physical-chemical indicators, hydromorphological indicators and chemical indicators.

The most compared indicators of macroinvertebrates (IBMWP), diatomae (IPS) and the chemical condition were used to define the condition of the water bodies on the next page.

Below are the results of the hydro-morphological indicators and of the fish that were included in the latest status of water bodies (CEMAS).

The riverbank quality index (RQI) and the river habitat index (RHI) show the following results:

CONDITION QBR-2007		CONDITION IHF-2007	
Very good	21,4%	80-100	2,8%
Good	23,5%	60- 80	67,6%
Moderate	18,2%	40- 60	28,4%
Deficient	20,0%	20- 40	0,8%
Bad	16,8%	0- 20	0,4%

The indices of fish analysed, EFI, IBICAT2b, and IBICAT2010 showed these results:

	IBICAT 2010	IBICAT 2b	EFI
Very good	10 %	18 %	11 %
Good	8 %	16 %	35 %
Moderate	26 %	23 %	16 %
Deficient	21 %	17 %	8 %
Bad	31 %	7 %	4 %
Not analysed	4 %	19 %	27 %

The state of conservation of the Ebro water resources is twofold. In the peripheral rivers of the Cantabrian-Pyrenees and Iberian mountain ranges, biological richness is very important thanks to the indigenous species and the water quality. The introduction of exotic invasive species in the centre of the valley entails a high level of pressure: predation, hybridisation, introduction of diseases, alteration of the habitat, etc.

Invasive exotic species:

Fish: Zander, black-bass, pike, common bleak, gambusia, Wels catfish, etc.

Other species: Zebra mussel, Asian clam, red-rimmed melania, apple snail, red swamp crayfish, signal crayfish, yabby crayfish, coypu, American mink, red-eared terrapin, cormorant, etc.

Flora: Giant cane, black locust, ailanthus, water hyacinth, mosquito fern, certain types of macrophytes and diatomea.

Zebra mussel

Wels catfish

First of all the plan delves into the scientific-technical knowledge of the environmental aspects of the water medium and secondly it establishes a group of measures aimed at avoiding the proliferation of exotic invasive species, improving habitats, controlling the changes to the river banks and morphology and adopting an active stance in regeneration initiatives.

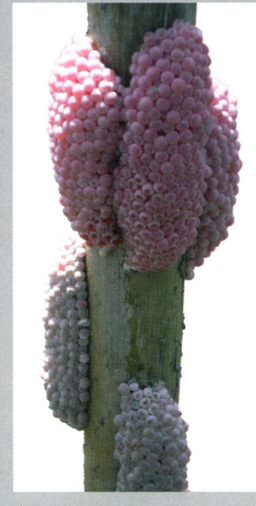
Among these initiatives are:

- Plan against the zebra mussel.
- Plans for prevention, control and eradication of exotic species from the Autonomous Communities such as the apple snail, propelled by the Generalitat de Cataluña.
- Control explosions of macrophytes.
- Plan to improve continuity of the rivers.
- Establish borders next to the rivers with indigenous species.
- Implementation of ecological flow regimes.
- Plans to restore rivers and lakes.

Etc.

Macrophytes

Arundo donax (Giant cane)



Apple snail eggs

3. Status of water bodies

The commitment of the Kingdom of Spain with the European Union to achieve a good status of water bodies requires a shared sacrifice between all of the administrations (national, autonomous communities and local) as well as society in general.

The **Framework Directive** demands an improvement in the status of water bodies.

Currently **70%** of the bodies of water are **in good condition** (surface+ groundwater+lakes+reservoirs+coastal). The average in the European Union is 54%, therefore, in the general scheme the Ebro is already at a vantage point.

The map of objectives shows the duality between the periphery of the basin with the rivers in good status and the centre of the Ebro Valley, where the population and economic activities are concentrated and where the rivers, in spite of the efforts in waste treatment, are still in bad status.

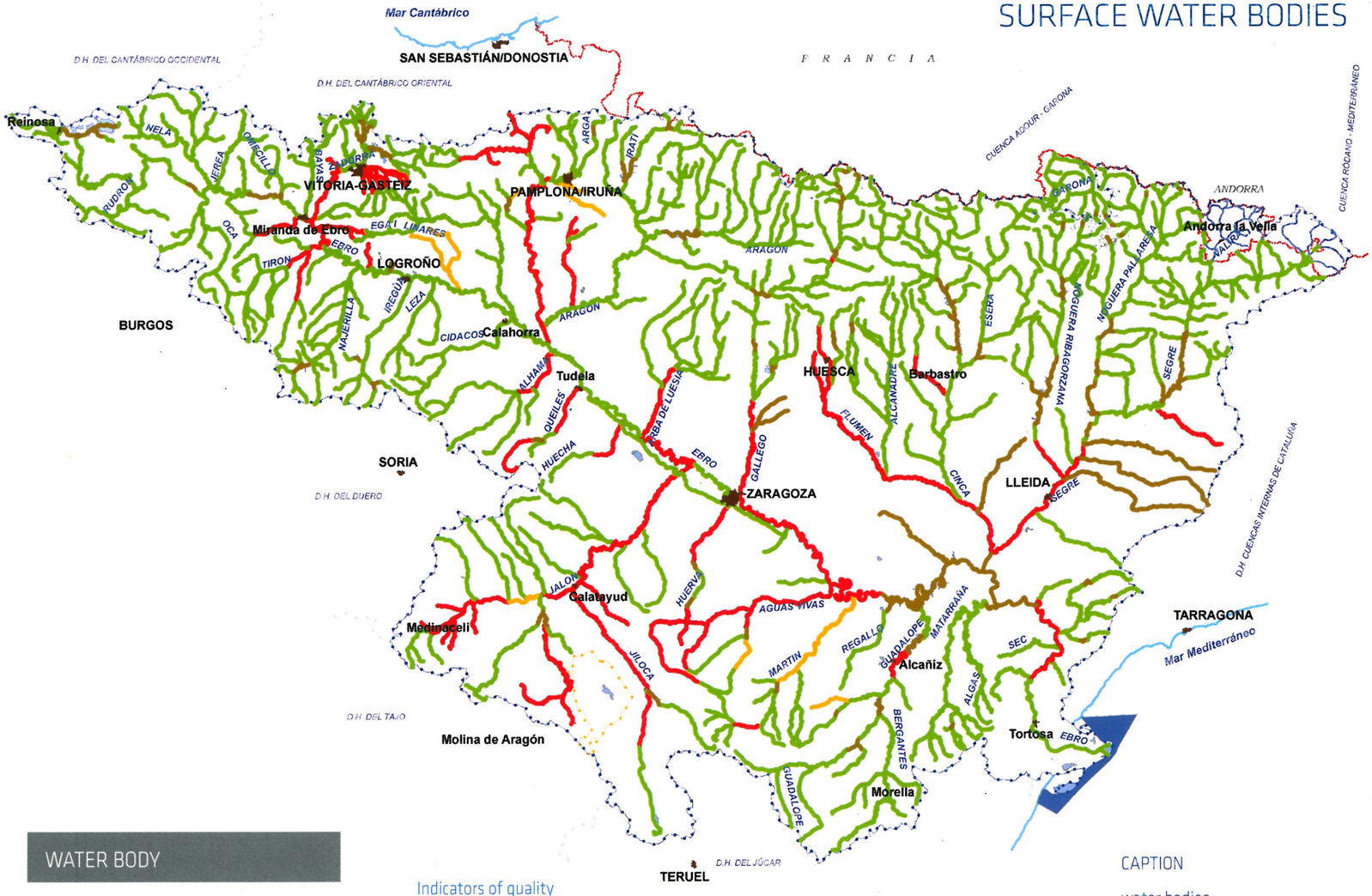
The Plan's objective is for 85% of the global water bodies to be in good status.

▶ SURFACE WATER BODIES: RIVERS

		Nº OF WATER BODIES	
		Nº	%
IN GOOD STATUS		478	74,2
DOES NOT MEET ENVIRONMENTAL OBJECTIVE	Not in good status Less strict objective Heavily modified bodies	164	25,5
	Artificial	2	0,3
Total rivers		**644**	**100**

In order for the water bodies to achieve a good status, the Competent Authorities must implement measures. Central Government, Autonomous Communities and Town Halls, as well as water users. Investment during the period from 2010 to 2015 is estimated at €1,744 million.

SURFACE WATER BODIES



WATER BODY

is a differentiated and significant part of surface water or groundwater where analysis is performed on its status. This page shows the status of the water bodies.

Indicators of quality

Hydrometridae

Austropotamobius pallipes (Indigenous crab)

Gammarid

CAPTION

water bodies

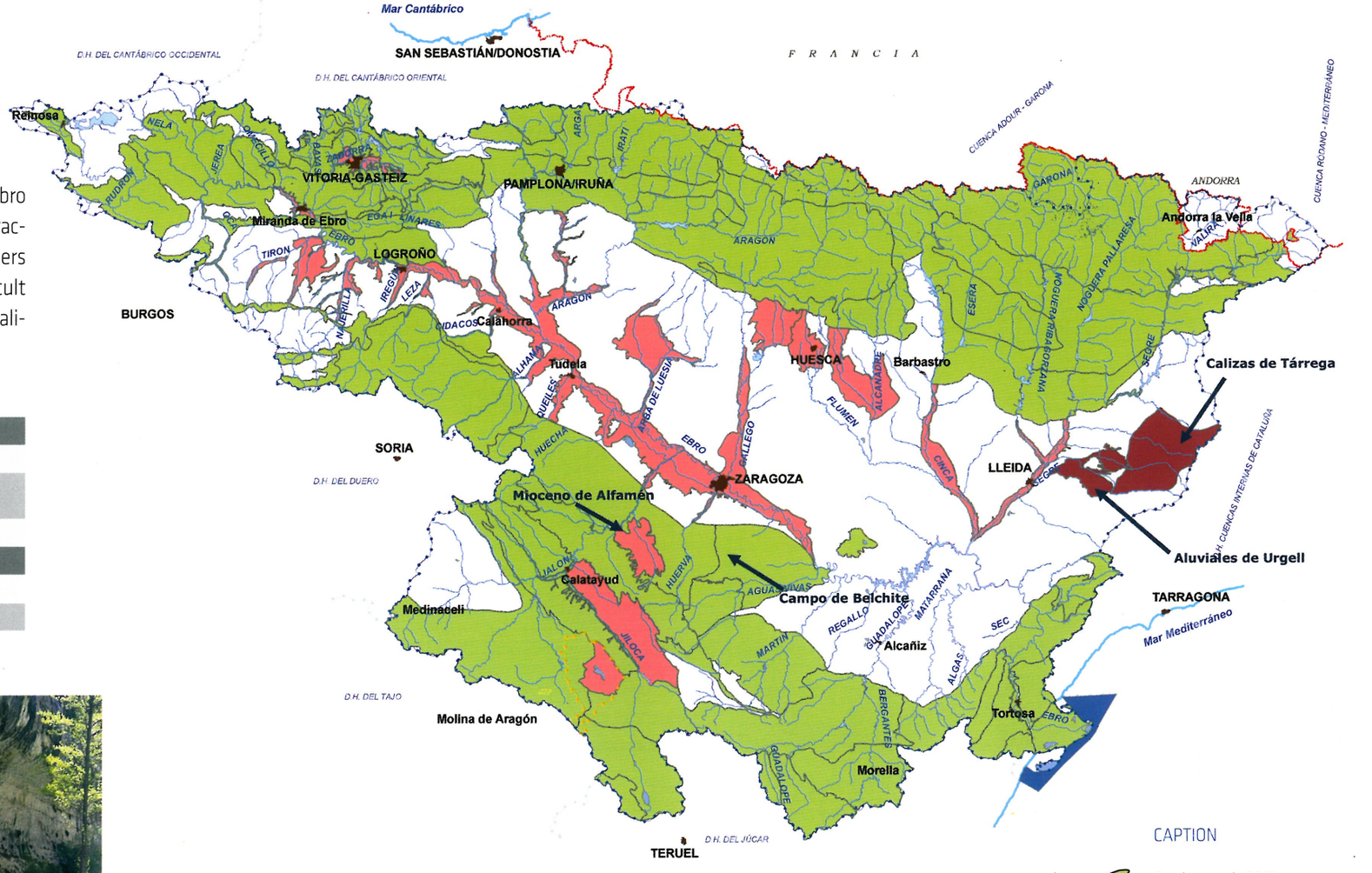
- Meets Good status objectives as of 2015
- Extension of deadline to 2021-2027
- Exception (less stringent objectives)
- Very modified water bodies
- Not assigned

Groundwater is usually in good status in the Ebro territory but there are areas with excess abstraction, such as Alfamen and Belchite, and others with important nitrate contamination and difficult to improve such as «aluviales de Urgell» and «calizas de Tárrega».

▶ GROUNDWATER BODIES

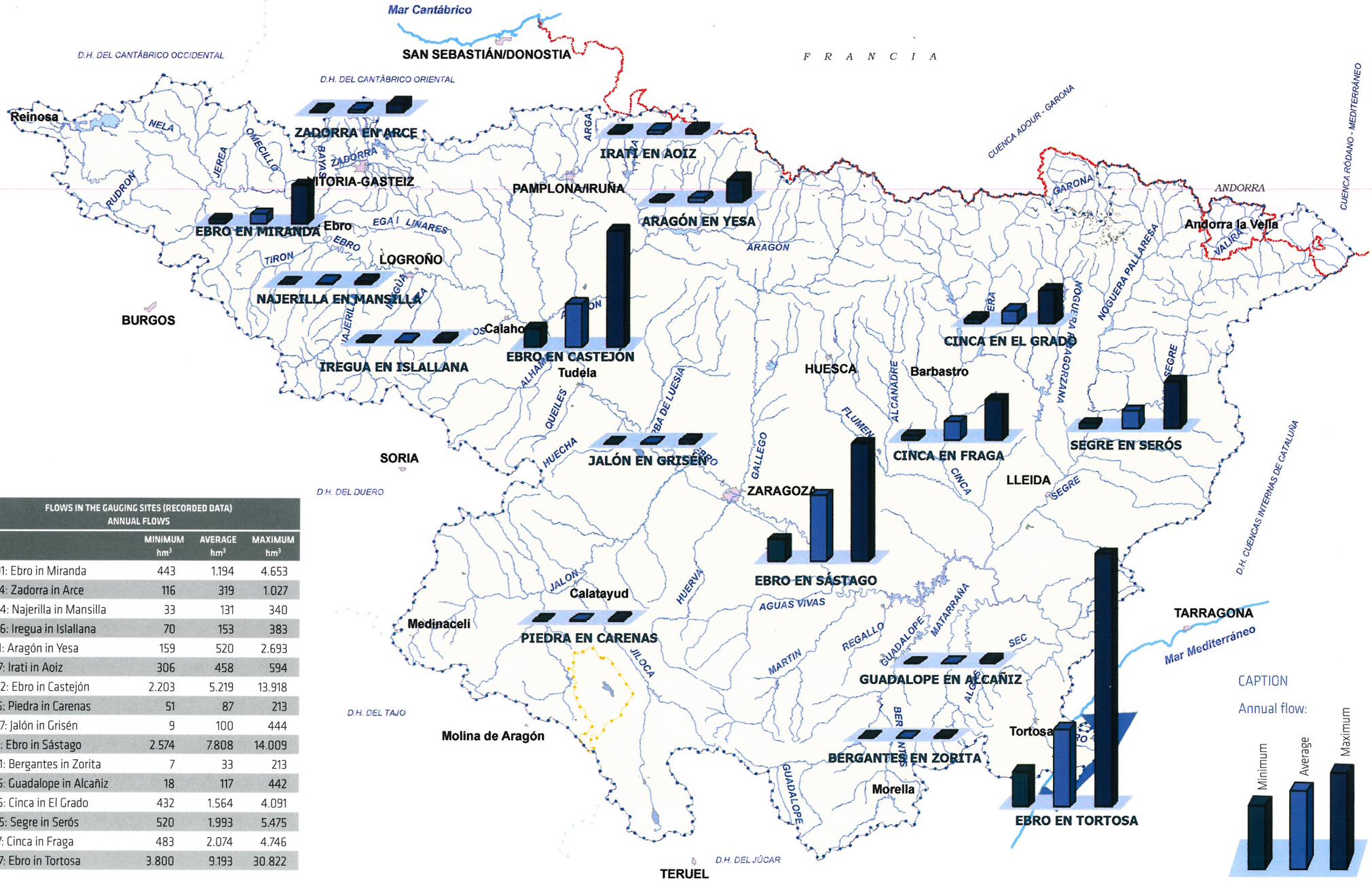
QUANTITATIVE STATUS	Nº	%
Good status	94	89
Good status with significant exploitation	10	10
Bad status	1	1
QUALITATIVE STATUS		
Good status	83	79
Bad status	22	21

Source of the River Pitarque (groundwater upwelling)



4. Flows-input

The Water Management Plan evaluates the available water and allocates it to the various uses and environmental flows of the basin

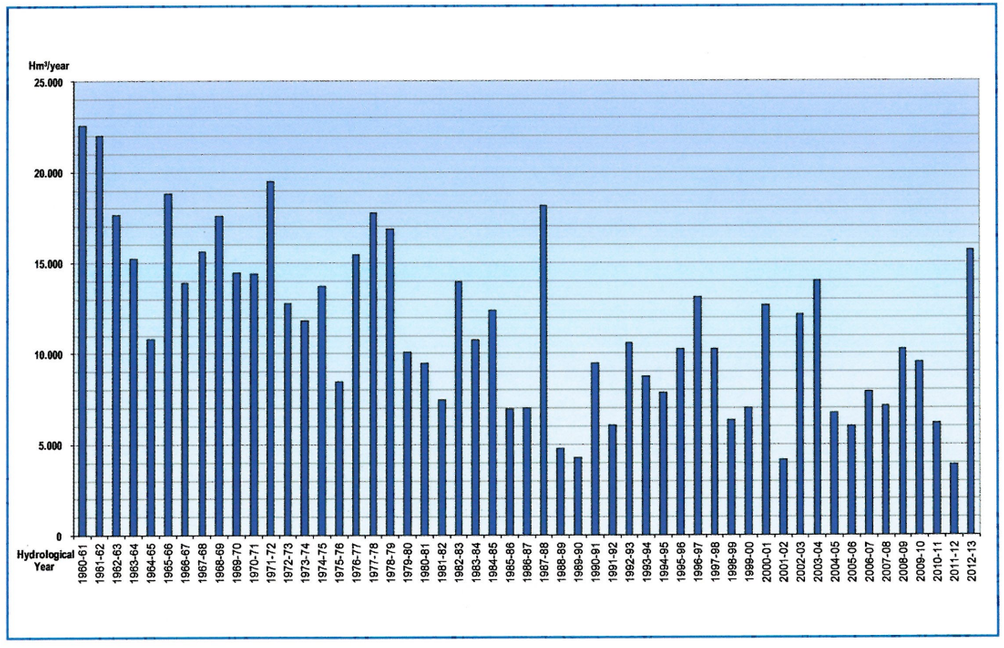


FLOWS IN THE GAUGING SITES (RECORDED DATA) ANNUAL FLOWS			
	MINIMUM hm^3	AVERAGE hm^3	MAXIMUM hm^3
9001: Ebro in Miranda	443	1.194	4.653
9074: Zadorra in Arce	116	319	1.027
9034: Najerilla in Mansilla	33	131	340
9036: Iregua in Islallana	70	153	383
9101: Aragón in Yesa	159	520	2.693
9277: Irati in Aoiz	306	458	594
9002: Ebro in Castejón	2.203	5.219	13.918
9125: Piedra in Carenas	51	87	213
9087: Jalón in Grisén	9	100	444
9112: Ebro in Sástago	2.574	7.808	14.009
9031: Bergantes in Zorita	7	33	213
9015: Guadalope in Alcañiz	18	117	442
9016: Cinca in El Grado	432	1.564	4.091
9025: Segre in Serós	520	1.993	5.475
9017: Cinca in Fraga	483	2.074	4.746
9027: Ebro in Tortosa	3.800	9.193	30.822

The map shows the annual volume of water that went through the gauging sites (annual flow) in hm^3/year.

As we can see the flows from the Ebro rivers vary substantially between the minimum flows of a dry year and the maximum flows of a wet year.

▶ ANNUAL FLOWS OF THE RIVER EBRO IN TORTOSA (E. A. 27) HM^3 1960-61 / 2012 -13



Observation: The hydrological year begins in October and ends the following September.

The flows vary greatly every year in the Ebro in Tortosa. The maximum flow was close to 25,000 hm^3 in 1960-1961 and the driest year was 3,800 hm^3 in 2011-2012. We must bear in mind that the water circulating in the gauging sites is affected by the consumption upstream and by the variation in the volume of the reservoirs.

The Water Management Plan has performed an evaluation of the water existing in each of the rivers of the Ebro Demarcation. This water is called «natural flowing».

- **Precipitation:** Average precipitation is 622 mm/year. Statistical studies do not lead us to conclude that in the last century there was any decrease in rain.
- **Natural flow:** The water circulating in the rivers does show a clear trend towards reduction due to what is known as land uses, with an increase in vegetation in the last half-century; but there are other reasons that are unknown or that can not be suitably evaluated.

The Planning Instruction OARM/2656/2008 establishes two periods to take into consideration in order to evaluate water in its natural flow: 1940/41 to 2005/06 and 1980/81 to 2005/06.

In the Ebro territory the natural flows are as follows:

- 1940/41 to 2005/06 - 16.488 hm^3/year on average.
- 1980/81 to 2005/06 - 14.623 hm^3/year on average.

The resources are allocated with the data of the latter period.

The Water Management Plan distributes the 14,623 hm^3/year in first place to the environmental flow regimens as priority restriction on the rest of uses and then it allocates the rest of the water to current and future uses, with the following priority order:

a) Supply to the population

b) Agricultural and livestock uses

c) Industrial and energy uses

d) Recreational uses

e) Aquaculture and others

Water is allocated for each tributary with simulation models in such a manner that at each area of the Ebro territory we can see the water in natural flow, its uses and the guarantees for supply.

Climate change in the Ebro Demarcation and its effects on water availability poses uncertainty regarding its irregularity. The Water Management Plan establishes the content of the OARM/2656/2008 Planning Instruction. For the whole Ebro area, a 5% reduction is estimated in natural flow water from the rivers as of 2027.

Study of the environmental flows in the River Aragon Subordan

5. Regulated water: current and future reservoirs. Interbasin water transfers

The Plan assumes the regulations undertaken in the previous Water Management Plan of 1998 and it reclassifies 34 reservoirs as not feasible.

Pineta reservoir and valley

CURRENT WATER TRANSFERS	AVERAGE VOLUME TRANSFERRED
1. Ebro – Besaya, for the region of Torrelavega, Santander and coastal towns.	reversible transfer
2. Cerneja – Ordunte, to supply Bilbao.	13 hm^3/year
3. Zadorra – Arratia, from the headwaters of Zadorra to supply Greater Bilbao and hydroelectricity generation.	200 hm^3/year
4. Alzania – Oria, from the headwaters of the Alzania for various uses.	1 hm^3/year
5. Carol – Ariége, in French territory, for hydroelectric use, with return.	zero net balance
6. Ciurana – Ruidecañas, from the River Ciurana for the Reus region.	5 hm^3/year
7. Ebro – Campo Tarragona, for urban and industrial supply.	70 hm^3/year

CAPTION

Current reservoirs

- Reservoirs between 5 and 25 hm^3
- Reservoirs between 25 and 400 hm^3
- Reservoirs exceeding 400 hm^3

Future reservoirs

- Reservoirs between 5 and 25 hm^3
- Reservoirs between 25 and 400 hm^3
- Reservoirs exceeding 400 hm^3
- WATER TRANSFERS

The current reservoir capacity is 7,580 hm^3 (60% is mainly used for energy purposes and 40% for consumptive use: supply, irrigation and industry.

The reservoir volume for consumptive uses represents 21% of the average natural flow of the basin. Within the context of the so-called Dry Spain, the Ebro is one of the basins with the lowest reservoir capacity in relation to the average natural flow.

This lack of reservoir capacity has led to the current irrigation deficit of 900 hm^3 (875 hm^3/year according to simulation models).

The building of the infrastructures contemplated in the 1998 Plan and assumed in this Water Management Plan requires a reservoir volume of 2,078 hm^3 thus bringing the reservoir capacity for consumptive use from 21% to 35% of the average flow from the Ebro basin.

The Plan contemplates reports on the financial, social and environmental feasibility of each reservoir, as well as the water bodies involved. This documentation is drafted notwithstanding the specific studies performed for the projects and the environmental impact studies.

▶ CURRENT RESERVOIRS WITH CAPACITY EXCEEDING 5 hm^3

	NAME	hm^3		NAME	hm^3		NAME	hm^3
1	EBRO	540	24	VADIELLO	16	47	PENA	18
2	URRÚNAGA	72	25	OLIANA	84	48	MALVECINO	7
3	IRABIA	14	26	BARASONA	85	49	SANTOLEA	48
4	EUGUI	22	27	GONZÁLEZ LACASA	33	50	RIALB	403
5	ULLÍVARRI-GAMBOA	147	28	CANELLES	678	51	MONTEAGUDO	10
6	ITOIZ	418	29	TERRADETS	33	52	S. LORENZO	10
7	RESPOMUSO	18	30	MANSILLA	68	53	EL FERIAL	8
8	LANUZA	17	31	LA SOTONERA	189	54	MONEVA	8
9	CERTESCANS	16	32	LAVERNÉ	44	55	ESTANCA DE ALCAÑIZ	7
10	SOBRÓN	20	33	PAJARES	35	56	BACHIMAÑA ALTO	7
11	BÚBAL	63	34	CAMARASA	163	57	LAS TORCAS	7
12	ALLOZ	65	35	STA. ANA	237	58	ESTANY NEGRO	7
13	CAVALLERS	16	36	EL VAL	25	59	SALLENTE	6
14	BASERCA	22	37	MAIDEVERA	18	60	ALBIÑA	6
15	LLAUSET	17	38	MEQUINENZA	1534	61	URDALUR	5
16	YESA	447	39	RIBARROJA	210	62	IP	5
17	ESTANY MAR	14	40	CIURANA	12	63	ESCARRA	5
18	MEDIANO	435	41	FLIX	11	64	ARDISA	5
19	ESCALES	152	42	LA TRANQUERA	84	65	LASESA	10
20	LA PEÑA	15	43	CASPE	82	66	LAS FITAS	8
21	STA. MARÍA BELSUÉ	13	44	GUIAMETS	11	67	ULLIVARRI-ARRAZUA	7
22	EL GRADO I	400	45	CUEVA FORADADA	22	68	VILLAVETA	5
23	TALARN	205	46	CALANDA	54	69	PUENTE DE SANTOLEA	18

▶ RESERVOIRS CONTEMPLATED IN THE PLAN WITH CAPACITY EXCEEDING 5 hm^3

	UNDER CONSTRUCTION	hm^3		UNDER CONSTRUCTION	hm^3
4	ALBAGÉS	80	31	SOTO-TERROBA	7
16	LAS PARRAS	6	34	YESA (REC.) COTA 510	623
21	VALDEPATAO	5	35	ENCISO	46
23	LECHAGO	18	37	MONTEARAGÓN	43
24	SANTOLEA (REC)	64	38	LA LOTETA	105
26	MULARROYA	103	39	SAN SALVADOR	100
	PROJECT OR STUDY STAGE	**hm^3**		**PROJECT OR STUDY STAGE**	**hm^3**
1	ROBRES DEL CASTILLO	6,9	20	VALCUERNA	240,0
2	LUNA	9,9	22	MALVECINO (REC 418)	43,3
3	CIGUDOSA-VALDEPRADO	41,8	25	TRASOBARES	2,8
5	LAS TORCAS (REC.)	7,5	27	BIOTA	12,0
6	LA TRANQUERA (REC.)	11,8	28	REGULAC. EJE DEL EBRO	100,0
7	VALLADAR	22,2	29	ALCANADRE	95,0
8	BISCARRUÉS	35,4	30	ALMUDEVAR (alt. A)	169,7
11	AGUAVIVA	0*	32	VAL DE BELTRAN	4,0
14	CORPORALES	3,5	33	VAL DE FIGUERA	3,1
15	REGULAC. RÍO OMECILLO	1,0	40	SAN LORENZO	8,5
17	MANZANARES	7,0	41	REGULAC. ZONA ÁLAVA	**
18	RÍO MAYOR	33,4	42	EMBALSE EN EL GLERA	5,0
19	TORREHERMOSA	2,0			

* For flood abatement. ** Not defined.

▶ OTHER RESERVOIRS CONTEMPLATED IN THE PLAN

	hm^3
Basins in the River Algars (Planserrats, Val de Bot and Val de San Joan)	6
Comellares reservoir, Monroyo and Peñarroya basins in the River Tastavins	3,3
Irrigation dam and basin in Dévanos in the River Añamaza	1,2
San Pedro Manrique reservoir in the River Linares	0,6
Alchozasa reservoir in the River Alchozasa	0,3
Peña Cervera reservoir, Arba basin	0,2
Tailwater reservoir at the La Tranquera reservoir: Nuevalos dam	
Adaptation of the Escuriza dam in the River Escuriza	0
Substituting regulation for the doubtful feasibility Water Agreement reservoirs (Reservoirs del Vero, Las Umbrías, Morós/Carabán, Espeso, Valcodo, levee of the Moneva reservoir, Síscar-La Condoñera, El Pontet, Batán and Molí de las Rocas)	not defined
Reservoir in basin of the River Tirón	not defined
Tailwater dike, protection and environmental adaptation of the tailwater of the Rialb reservoir	not defined
Dam heightening in the Margalef reservoir	not defined
Consruction of tailwater dams in the Itoiz reservoir in the Rivers Urrobi and Irati (floodable dikes Nagore and Oroz-Betelú)	not defined
Tailwater reservoir Barasona	not defined
Works on the Valdegutur reservoir in the River Añamaza	not defined
Reservoir in the basin of the Linares	not defined

6. Environmental flows

The Ebro Water Management Plan establishes minimum environmental flows, enforceable and verifiable, in order to improve and guarantee the good status of the water bodies.

ENVIRONMENTAL FLOW

is the flow that maintains, at least, fish life and vegetation along the river banks.

PREVENTIVE FLOW

is the flow that is recommended for quality reasons.

Mequinenza reservoir, that guarantees the environmental flow in the lower section of the Ebro.

CAPTION

Gauging sites, where the environmental flow regime under ordinary conditions is defined

The map shows the 41 gauging sites where the environmental flow regime is defined.

The bar charts show the comparison between the environmental flow in Tortosa and other sites such as Segre in its outlet (Serós), Ebro in Zaragoza, Cinca in Fraga and Ebro in Miranda.

We can see that the environmental flow in Tortosa is much higher than in the rest of the basin, due to regulation of the Mequinenza reservoir.

- The European Union Framework Directive on Water has not established any specific regulations on the environmental flow regimes.
- The Spanish Law on Water (TRLA) considers environmental flows as a restriction on usage, and it affects current usage (irrigation, hydroelectricity, industry, etc.).

Fieldwork to study the environmental flows in the River Segre in Isóbol

Fieldwork to study the environmental flows in the River Ara

GAUGING STATION		MINIMUM ENVIRONMENTAL FLOW REGIME (m^3/s)												hm^3/year
CODE	NAME	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	
1	Ebro in Miranda de Ebro (Preventive flow)	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	316
1	Ebro in Miranda de Ebro (Environmental flow)	3,77	4,43	4,49	5,40	5,56	5,17	5,61	4,92	4,40	3,72	3,35	3,15	142
3	Ega in Andosilla	1,41	1,72	1,87	1,88	1,91	1,71	1,86	1,61	1,36	1,05	0,85	0,98	48
5	Aragón in Caparroso	4,63	4,89	5,07	5,00	4,78	4,69	5,13	4,63	4,22	3,67	3,40	3,91	142
10	Jiloca in Daroca	0,13	0,12	0,12	0,13	0,13	0,12	0,16	0,19	0,18	0,14	0,13	0,13	4
11	Ebro in Zaragoza (preventive flow)	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	30,00	947
11	Ebro in Zaragoza (Environmental flow)	20,00	20,00	35,00	35,00	35,00	15,58	17,08	15,32	13,56	11,37	13,56	13,56	642
14	Martín in Híjar	0,14	0,14	0,14	0,15	0,14	0,14	0,16	0,17	0,16	0,14	0,14	0,14	5
15	Guadalope in Alcañiz	0,51	0,46	0,45	0,47	0,46	0,45	0,48	0,51	0,50	0,45	0,42	0,42	15
17	Cinca in Fraga	6,23	5,79	5,74	5,85	5,00	5,12	5,55	5,92	6,40	5,45	5,09	5,62	179
18	Aragón in Jaca	1,00	0,99	0,92	0,85	0,74	0,82	0,91	0,99	0,95	0,83	0,74	0,86	28
25	Segre in Serós	6,00	5,40	5,00	5,10	5,20	5,70	6,70	9,10	8,80	6,10	6,00	6,00	198
26	Ebro in Arroyo	0,5	0,62	0,65	0,71	0,66	0,72	0,8	0,76	0,63	0,57	0,51	0,48	20
27	Ebro in Tortosa[1]	80	80	91	95	150	150	91	91	81	80	80	80	3.010
	Environmental flow Ebro Delta	*The ecological flows for the whole Ebro Delta are set by minimum flows measured at the Tortosa gauging station, generator flood flows (in order to naturalise flow regime), and environmental flows feeding into the delta from canals on the right and left bank, subject to the primacy of the water rights that have these canals, and the natural groundwater discharges. At the Ebro mouth (as it is defined in the Basin Plan of 1998) the following values are estimated:*												
	Ebro at the mouth area	80	100	100	120	150	155	100	100	100	100	100	80	*3.370*
34	Najerilla in Mansilla	0,37	0,40	0,42	0,40	0,36	0,38	0,40	0,38	0,30	0,25	0,22	0,26	11
35	Iregua in Villoslada	0,16	0,26	0,33	0,37	0,37	0,36	0,34	0,34	0,30	0,23	0,17	0,16	9
38	Najerilla in Torremontalvo	2,13	2,29	2,44	2,34	2,13	2,14	2,35	2,26	1,77	1,42	1,28	1,45	63
39	Albercos in Ortigosa	0,06	0,07	0,08	0,07	0,07	0,07	0,07	0,07	0,06	0,05	0,04	0,05	2
55	Jiloca in Morata de Jiloca	0,13	0,12	0,12	0,13	0,13	0,12	0,16	0,19	0,18	0,14	0,13	0,13	4
59	Gállego in Santa Eulalia	5,00	4,89	4,77	4,65	4,16	4,26	4,60	4,66	4,60	4,03	3,80	4,21	141
65	Irati in Liédena	2,36	2,61	2,75	2,75	2,75	2,66	2,84	2,45	2,24	1,99	1,85	1,97	77
69	Arga in Echauri	4,49	5,30	5,71	5,58	5,64	5,08	5,54	4,73	4,19	3,56	3,20	3,55	149
74	Zadorra in Arce	1,66	2,07	2,60	3,02	3,04	2,77	2,59	2,32	1,66	1,18	0,55	1,18	65
80	Veral in Zuriza	0,23	0,23	0,22	0,21	0,18	0,20	0,23	0,22	0,19	0,16	0,15	0,19	6
84	Salado in Alloz	0,20	0,23	0,26	0,26	0,26	0,24	0,25	0,22	0,19	0,16	0,13	0,15	7
87	Jalón in Grisén	0,59	0,57	0,59	0,63	0,62	0,60	0,68	0,68	0,68	0,60	0,56	0,57	19
89	Gállego in Zaragoza	1,50	1,47	1,44	1,44	1,27	1,28	1,39	1,39	1,37	1,18	1,11	1,26	42
94	Flumin in Albalatillo	0,59	0,58	0,63	0,65	0,54	0,53	0,57	0,54	0,52	0,44	0,40	0,49	17
95	Vero in Barbastro	0,23	0,23	0,26	0,26	0,22	0,21	0,22	0,21	0,22	0,18	0,17	0,20	7
97	N. Ribagorzana in La Piñana	1,54	1,47	1,39	1,40	1,26	1,27	1,45	1,58	1,74	1,42	1,39	1,41	46
99	Guadalope in Caspe	0,40	0,36	0,35	0,37	0,36	0,36	0,38	0,40	0,39	0,35	0,33	0,33	12
101	Aragón in Yesa-PP	2,77	3,19	4,36	4,47	4,33	4,79	5,50	5,50	5,00	4,50	4,00	4,00	138
106	Guadalope in Santolea-PP	0,20	0,19	0,18	0,19	0,19	0,19	0,21	0,25	0,24	0,20	0,17	0,17	6
112	Ebro in Sástago	20,00	20,00	35,00	35,00	35,00	15,58	17,08	15,32	13,56	11,37	13,56	13,56	642
115	N. Ribagorzana in Puente Montañana	1,23	1,16	1,08	1,06	0,95	0,99	1,14	1,26	1,39	1,13	1,12	1,13	36
118	Martín in Oliete	0,10	0,09	0,09	0,10	0,09	0,09	0,11	0,13	0,12	0,09	0,09	0,09	3
120	Ebro in Mendavia	8,70	9,84	10,83	11,28	11,14	10,60	11,55	10,53	9,08	7,54	6,75	6,72	301
124	Huerva in Las Torcas	0,07	0,07	0,07	0,08	0,07	0,07	0,08	0,09	0,08	0,07	0,06	0,07	2
125	Piedra in Carenas	0,27	0,27	0,28	0,29	0,29	0,28	0,30	0,30	0,31	0,28	0,28	0,28	9
142	Lumbreras in Lumbreras	0,13	0,13	0,25	0,26	0,23	0,22	0,25	0,24	0,21	0,16	0,13	0,13	6
145	Ésera in Eriste (Villanova)	0,57	0,50	0,49	0,44	0,41	0,43	0,48	0,63	0,83	0,66	0,61	0,61	18
147	Nájima in Monreal de Ariza	0,02	0,01	0,02	0,03	0,02	0,02	0,03	0,03	0,02	0,01	0,00	0,01	1
153	Algas in Horta de San Juan	0,00	0,01	0,02	0,07	0,05	0,05	0,04	0,03	0,02	0,00	0,00	0,00	1
159	Arga in Huarte	0,37	0,44	0,45	0,45	0,66	0,62	0,65	0,39	0,36	0,32	0,29	0,32	14
172	Cinca in Lafortunada	2,80	2,52	2,33	2,33	2,03	2,17	2,32	2,68	2,88	2,65	2,54	2,65	79
174	Queiles in Los Fayos	0,11	0,11	0,12	0,13	0,13	0,11	0,14	0,14	0,13	0,11	0,09	0,09	4
190	Flumin in Quicena	0,12	0,12	0,13	0,13	0,11	0,11	0,11	0,11	0,10	0,09	0,08	0,10	3
192	Guatizalema in Siétamo	0,16	0,15	0,17	0,16	0,14	0,14	0,15	0,14	0,14	0,12	0,11	0,13	5
238	Aranda in Maidevera-PP	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,03	1
250	Gállego in Búbal	0,40	0,38	0,33	0,31	0,27	0,31	0,35	0,38	0,39	0,34	0,32	0,35	11
253	Cidacos in Arnedillo	0,00	0,00	0,05	0,10	0,15	0,15	0,15	0.10	0,05	0,00	0,00	0,00	2
277	Irati in Aoiz	0,90	1,93	2,07	3,10	3,01	2,80	2,81	2,86	1,29	0,90	0,90	0,90	61
876	Rialp dam	3,76	3,74	3,70	3,59	3,30	3,39	3,78	4,43	4,14	3,35	3,26	3,38	115

6.1. Environmental flow in the Tortosa gauging site

The Ebro Water Management Plan guarantees a large environmental flow in Tortosa thanks to the solidarity of the nine autonomous communities within the integrated management of the Ebro.

The Ebro Plan has established flows between 80 m^3/s and 150 m^3/s depending on the month, which works out to 3,009 hm^3/year guaranteed.

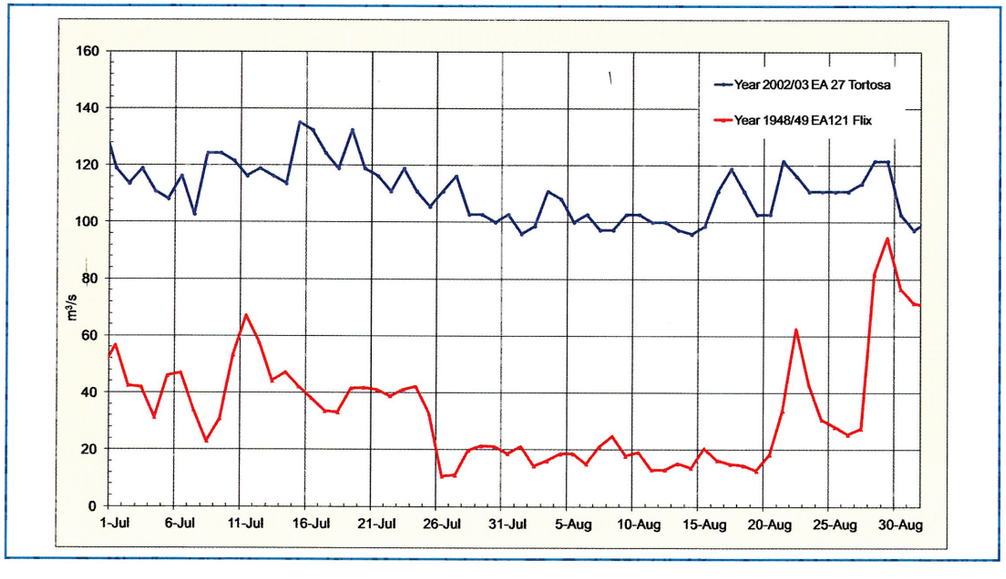
This regime of environmental flows is much higher than the rest of the rivers in the demarcation, and much higher than the rest of rivers of the Spanish Mediterranean area.

Such a large flow can be guaranteed in Tortosa thanks to the solidarity of the Autonomous Communities upstream, and especially to the water regulated in the Mequinenza reservoir, located in Aragon.

Ever since the Mequinenza reservoir was built, the Ebro's minimum flow has increased. Between 1953 and 1966, before the Mequinenza became operational, the average flow in the months of July, August and September was 56,4 m^3/s. Between 1993 and 2006, with Mequinenza operating, the average flow in the months of July, August and September was 94,3 m^3/s.

The red line in Graph 1 shows the flow in a dry year before Mequinenza was built; we can see that on many days it does not even exceed 20 m^3/s. The blue line shows that after Mequinenza was built, almost 100 m^3/s are guaranteed.

▶ GRAPH 1



Proposal by the Committee for Sustainability of the Land of the Ebro (C.S.T.E.)

In the annual calculations, the environmental flow requested by the C.S.T.E. is:

Wet year: 12,783 hm^3/year

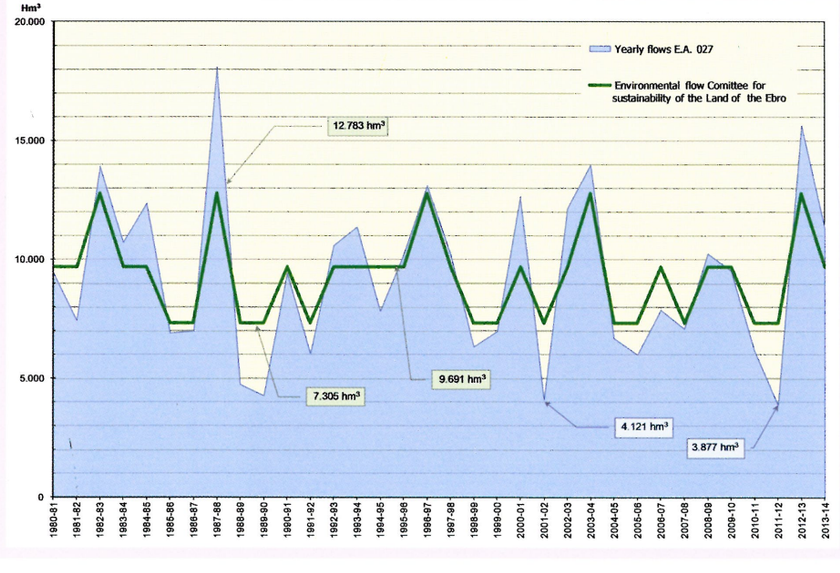
Average year: 9,691 hm^3/year

Dry year: 7,305 hm^3/year

Graph 2 shows the annual water volume that circulated through the Tortosa gauging site and in green what the C.S.T.E. demanded.

As we can see, the environmental flows proposed by the C.S.T.E. seem to iron-clad the Ebro against new usage and in the years of drought the environmental flows demanded are much higher than the flows available in the river, therefore they would make the current usage of the basin non-feasible.

▶ GRAPH 2. RIVER EBRO FLOWS IN THE G S. 27 (TORTOSA) - ENVIRONMENTAL F. R. (hm^3)

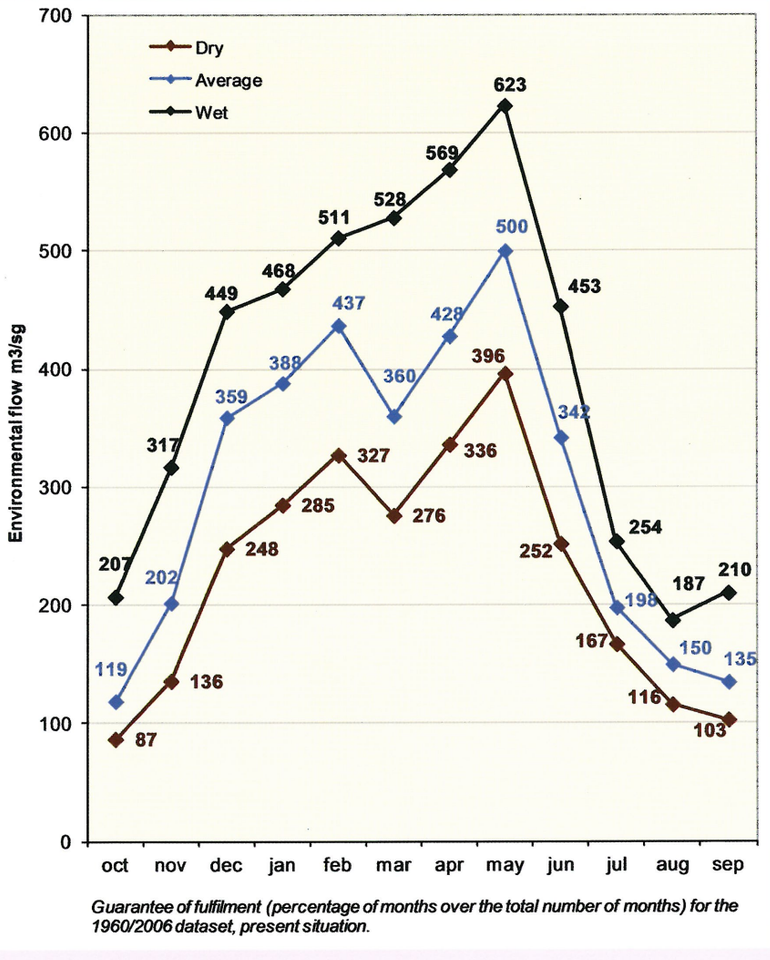


If we consider the flow regimens month by month, as established by the Planning Instruction, the flows in m^3/s set by the C.S.T.E. have a negligible, if not zero, percentage of being met, as shown in black on the graph.

In conclusion, the flow proposed by the C.S.T.E. and assumed by the Parliament of Catalonia is unrealistic and not feasible for the hydrological features of the Ebro.

The minimum flows in m^3/s established by the C.S.T.E. are disproportionate and unattainable, even in the event that all of the Autonomous Communities of the basin, including Catalonia, should renounce continuing with any current and future development. These are flows that are enormously higher than what the Ebro has historically ever had.

▶ PROPOSAL FOR ENVIRONMENTAL FLOWS IN THE LOWER EBRO



Guarantee of fulfilment (percentage of months over the total number of months) for the 1960/2006 dataset, present situation.

River Ebro in Miravet

River Ebro in Tortosa

The scientific-technical studies of the Plan for the Ebro basin regarding environmental flows can be found at:

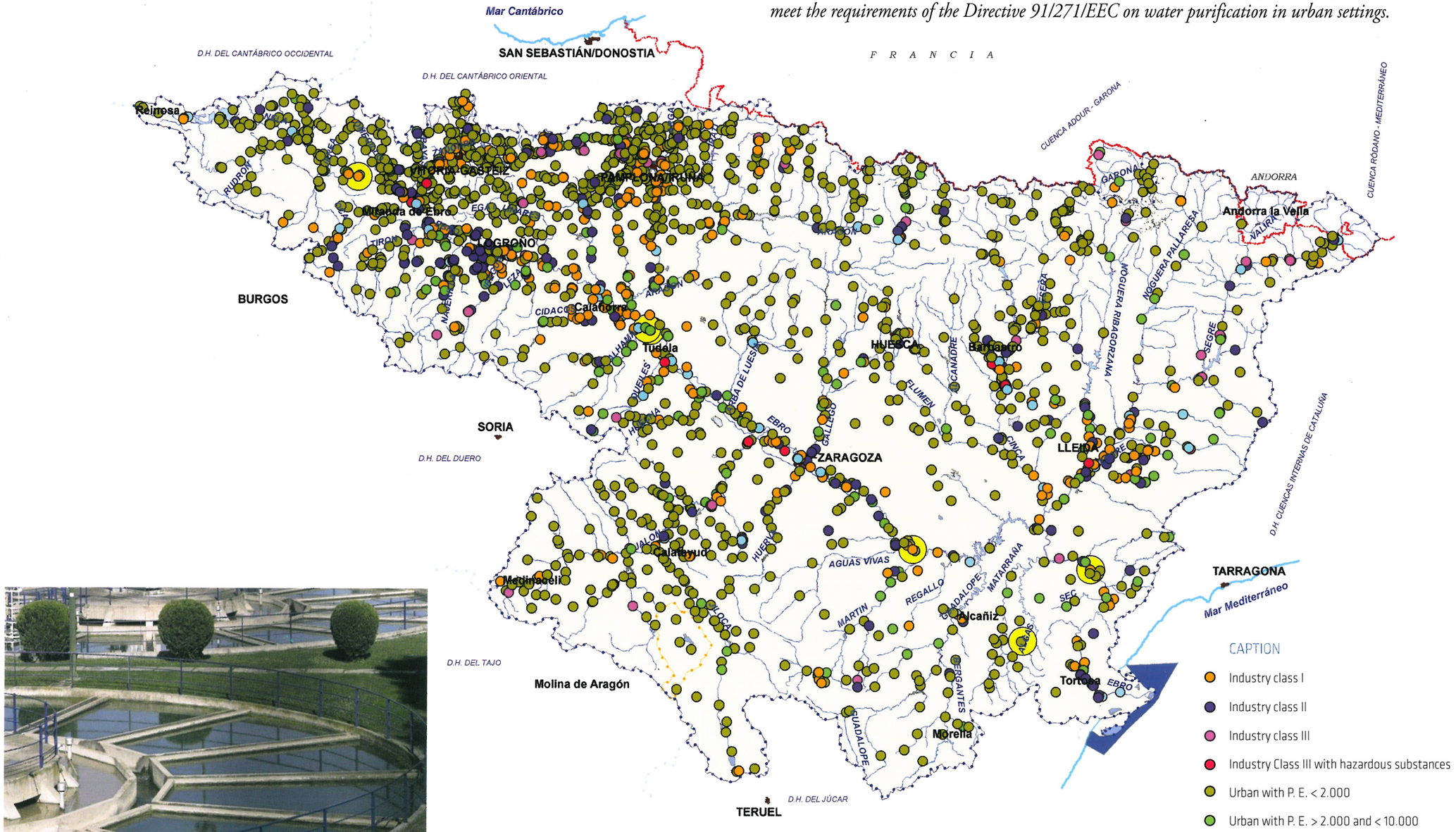
www.chebro.es/contenido.visualizar.do?idContenido=14093&idMenu=3048

Included is a critical analysis of the scientific studies not contrasted with reality, which try to justify the flows proposed by the C.S.T.E. and are beyond and disproportionate with the physical reality of the Ebro.

River Ebro in Ascó

7. Supplies and industrial usages. Point source pollution-contaminated sediments

Priorities established by the Ebro Water Management Plan are to supply good quality water and to meet the requirements of the Directive 91/271/EEC on water purification in urban settings.



Drinkable water treatment plant in Zaragoza

The map shows the discharge control points that the Ebro Confederation has set up throughout the Demarcation and the waste treatment plants of existing towns.

Guaranteed supply

- The Ebro supplies 3.1 million inhabitants in the basin itself and close to 2 million by transfers to other basins. Demand is 494 hm^3/year.
- There are no deficits in demand for supply and industrial usages, except for the Zadorra system that supplies water to Bilbao and Vitoria, which has cyclic crises. The small towns in the Pyrenees and Iberian system in Aragón, Valencian Community and Catalonia have deficit in years of extreme drought.

Quality of supply

- In 2005 (an especially dry year), 16% of the population that was supplied in/or from the basin received their supply from waters that were A-3 quality or below A-3, the object of the Plan is to reduce this percentage to less than 3% (although this classification A-1, A-2, A-3 has been abolished, it represents the quality of the water supplied). In 2012 we achieved this objective.
- This aim to improve water quality for the population in the Ebro Valley is being achieved thanks to the large joint provisions that capture top quality water in the Pyrenees and the Iberian System, such as the water supply to Zaragoza and 53 towns in the surrounding area, supply of the lower sections of the sub-basins of the Rivers Oja and Alhama, Lower Ebro in Aragon, Lleida-Segria, etc.
- There are still some joint supplies pending completion, such as the extension of the Lleida-Segria, Garrigas, Huesca, Bajo Jiloca, Bajo Ebro, Iregua-Leza, Cidacos, etc.
- With these objectives of the plan, over 50% of the population will have improved the quality of their water supply.
- The Plan also protects all of the groundwater catchment for supplies.

WWTP (Waste Water Treatment Plant)

- In 2000, 50% of the population had secondary water treatment, pursuant to Directive 91/271/EEC on Water Treatment. Currently 83% has secondary treatment.
- The object of the Plan is to complete waste water treatment for towns of over 2,000 population equivalent.
- Actions to regenerate sensitive areas: elimination of nutrients by tertiary treatment (phosphorus removal). In the case of Mequinenza-Ribarroja it affects among others the WWTP Almozara-La Cartuja in Zaragoza, Ejea de los Caballeros, River Huerva, Lleida, etc.
- Criteria are established for wastewater treatment in small towns.

Treatment Plant in Flix

Industrial usages

- The industrial sector comprises 28% of the total Gross Added Value of the Demarcation and 25% of the active population.
- Industrial demand is 249 hm^3/year (includes the demand connected to the transfer network to Bilbao and Campo de Tarragona).
- The objectives of the Plan are to improve the 409 biodegradable industrial discharges and to become stricter with the 551 non-biodegradable discharges. The points of special interest are the Zadorra in Vitoria, the Arga in Puente la Reina, the Huerva in Zaragoza, etc.
- Perform research on the new emerging contaminants, drugs, endocrine disruptors, fireproofing treatments, cosmetics, etc.

Contaminated sediments

- The main actions are focused on the Ebro in Flix and the Gallego in Sabiñanigo.

Work to remove sludge at the Flix reservoir

8. The agri-food complex

The Ebro Water Management Plan assumes the strategic nature of the agri-food complex of the Ebro (agriculture + livestock + food industry) for the whole of Spain and it is committed to highly technical irrigation to reduce diffuse pollution and improve international competitiveness.

Esplus irrigation canal (Canal of Aragon and Catalonia)

CAPTION

New irrigation proposed by the Autonomous Communities to be included in the W.M.P.E.

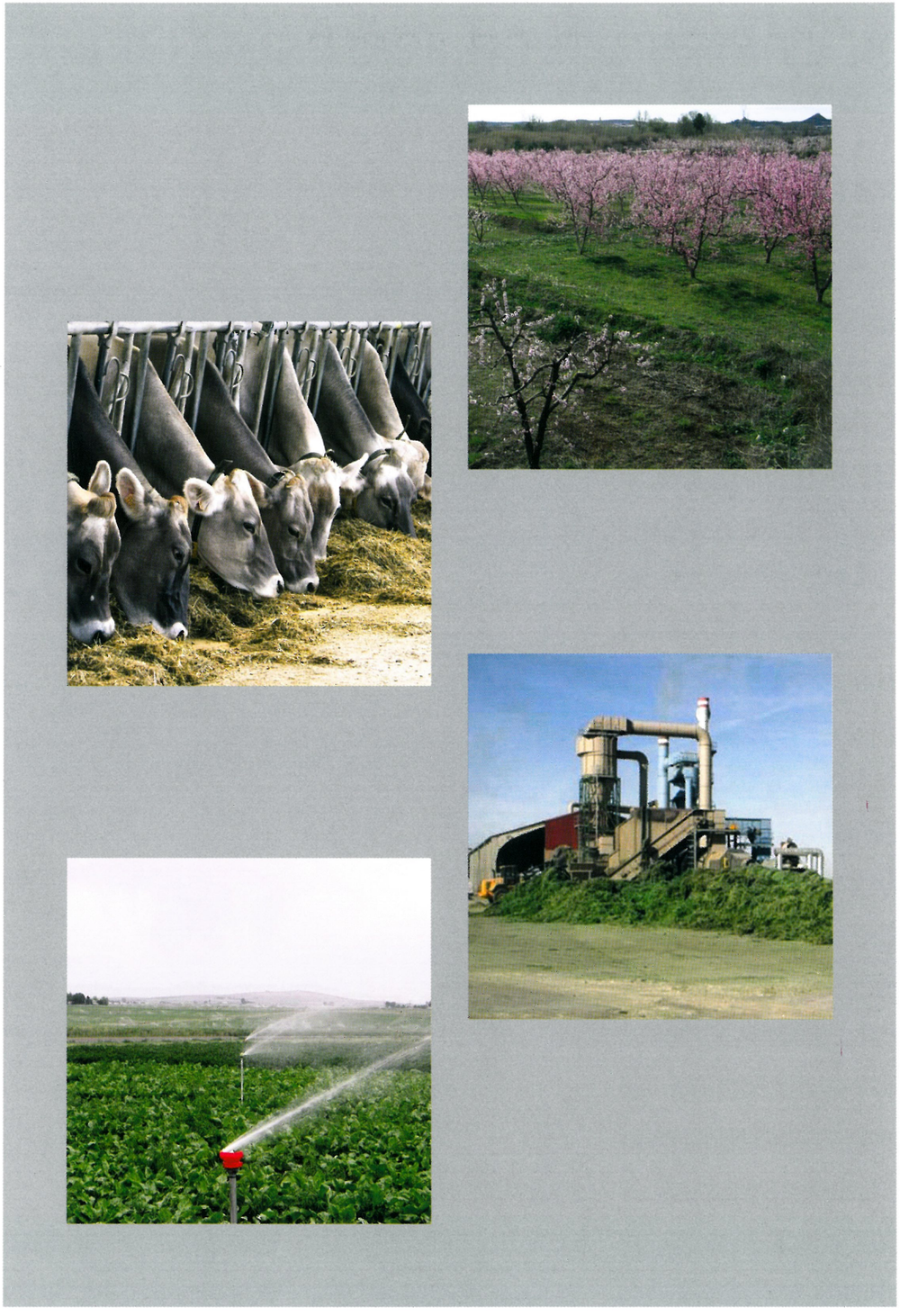
Current irrigation

The Ebro Agri-food Complex (agriculture + livestock + food industry) is the second pillar of the productive economy of the Ebro Valley, after the metallurgy and transport complex. Meat production, which comprises a third of the entire Spanish production and sweet fruit being 60%, are the singularities of the basin. The Ebro area contributes 35% of Spain's agri-food exports.

- The basis of the Ebro area agri-food complex is irrigated land, the concession area of which is estimated at 965;698 hectares and demand is 7,623 hm^3/year. This demand (water that would be necessary, and part of which would return to the river) has an estimated deficit of 875 hm^3/year.
- There is a duality in the irrigated land in the Ebro area. On the periphery they are narrow strips of irrigated land, frequently lacking resources due to lack of regulating reservoirs and with a low level of production. In the centre of the valley they are large irrigated areas with regulating reservoirs, where there is currently a trend towards turning them into highly technified and modernised irrigated areas. These are the irrigated crops that can compete internationally.
- The nitrogen mass exported from the Ebro area is estimated at 25,907 MT/year. This is a moderate contaminant mass compared to other European rivers, where the application of nutrients for crops, especially in dryland farming, is higher. Modernisation of irrigated land entails a significant improvement of the contaminant mass exported through returns in irrigation, and in some cases it can be evaluated at 30% reduction in nutrients and around 8% in salts and pesticides.
- In groundwater, of the 157 points measured, 30 areas were found affected by nitrates above 50 or 25 mg/l. Regarding pesticides, of 284 samples 10 had levels exceeding the limits.

Proposals in the Plan

- The Ebro Plan is committed to achieving at least 800,000 hectares of highly technified irrigation land, focusing on modernisation and on the new irrigation crops in execution such as the Canal de Navarra, Segarra-Garrigas, Monegros II and higher areas of the Ebro.
- The fight against diffuse pollution, environmental checks on the irrigation systems, slurry management, vulnerable areas, good agriculture practises, etc. are essential to reduce the pressure on the water resources.
- The new irrigation areas are adapted to the regulations so as not to affect the environmental flows. The groundwaters are adapted to the hydrological cycle of the outlet basins.
- The new irrigation areas will strictly comply with environmental restrictions.
- The Plan assumes the strategies that each Autonomous Community has over the long term on new irrigation areas to purposes of water availability.
- The maximum consumption of diverted water, if the total forecasts of the Autonomous Communities are met, would be 1,800 hm^3/year, equivalent to 12% of the natural flow regime of the Ebro. The maximum limit of the water consumed in the basin is established at half (49%).

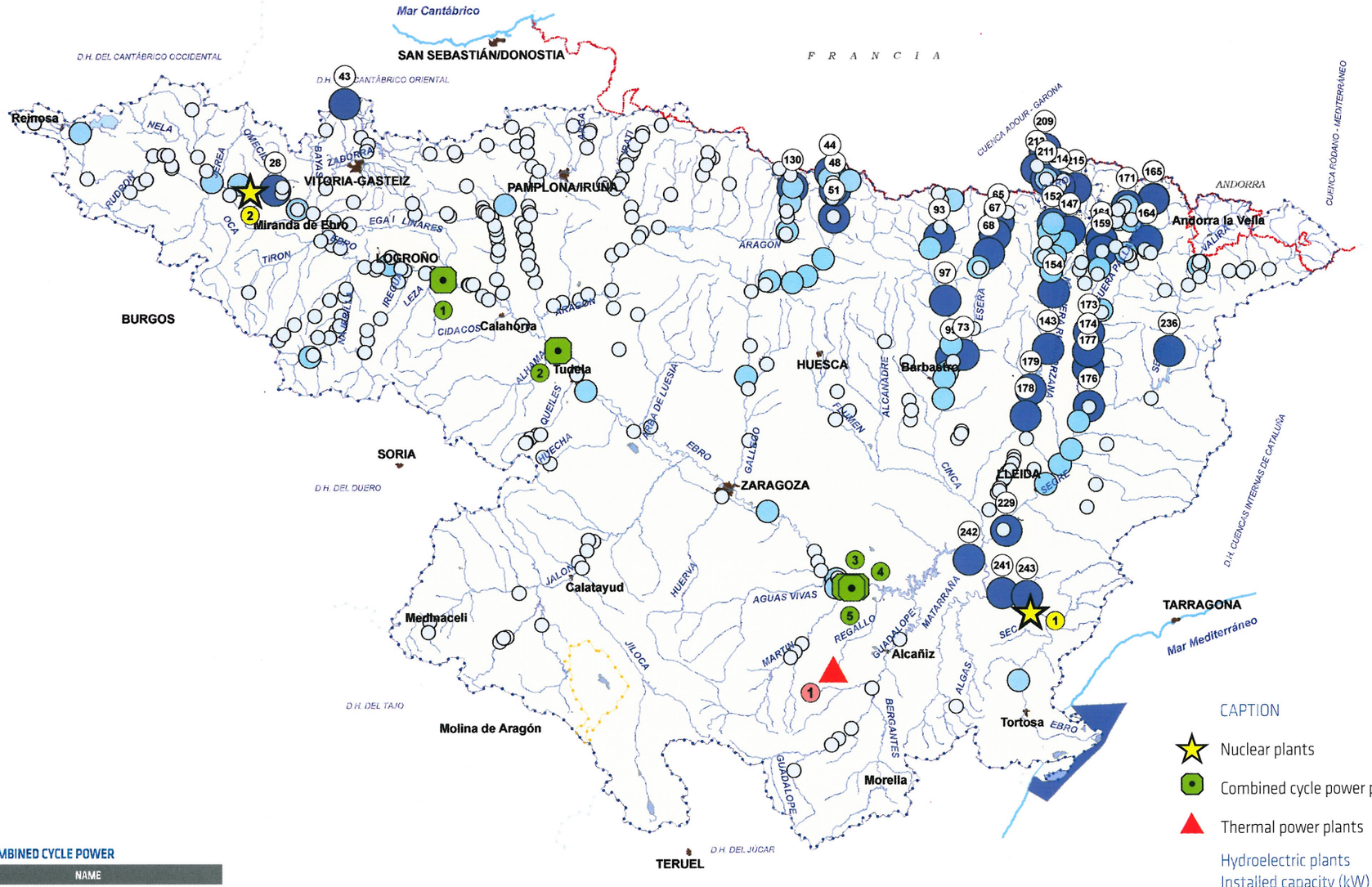


9. Energy usage, recreational and other uses

Given an electric scenario based on intermittent renewable energy, the use of the Ebro for hydroelectric production is becoming a factor that enables offer and demand to be compatible in Spain.

▶ **HYDROELECTRIC PLANTS > 20,000 kW**

Nº	NAME	POWER (kW)
28	SOBRON	28.800
43	BARAZAR	84.050
44	LASARRA	24.000
48	LANUZA	52.000
51	BIESCAS II	62.000
65	ERISTE	80.000
67	SESUE	36.000
68	SEIRA	22.700
73	SAN JOSE	26.000
93	LAFORTUNADA CINCA	42.000
94	LAFORTUNADA CINQUETA	41.400
97	MEDIANO	66.400
99	EL GRADO II	27.200
130	IP	82.440
143	PUENTE MONTAÑANA	44.800
147	CALDAS	32.640
152	MORALETS	221.400
154	ESCALES	36.000
159	CABDELLA	26.000
161	ESTANY GENTO SALLENTE	450.000
164	LLAVORSI	52.800
165	TABESCAN SUPERIOR	120.440
166	MONTAMARA	88.000
167	TABESCAN INFERIOR	32.040
171	ESTERRI	26.640
173	TALARN	35.200
174	GABET	23.000
176	CAMARASA	60.000
177	TERRADETS	32.500
178	SANTA ANA	30.400
179	CANELLES	108.000
209	PONT DE REY	46.400
211	JUEU	20.400
213	BOSSOST	21.600
214	VIELLA	22.000
215	AIGUAMOIX	32.000
216	ARTIES	68.000
229	SEROS	44.600
236	OLIANA	37.890
241	RIBARROJA	262.800
242	MEQUINENZA	324.000
243	FLIX	42.500



▶ **COMBINED CYCLE POWER**

Nº	NAME
1	CASTEJÓN
2	ARRÚBAL
3	Generación Eléctrica C.C-PEAKER
4	CASTELNOU-ESCATRÓN

▶ **NUCLEAR PLANTS**

Nº	NAME
1	ASCÓ (UNIDAD 1 Y UNIDAD 2)
2	SANTA MARIA DE GAROÑA

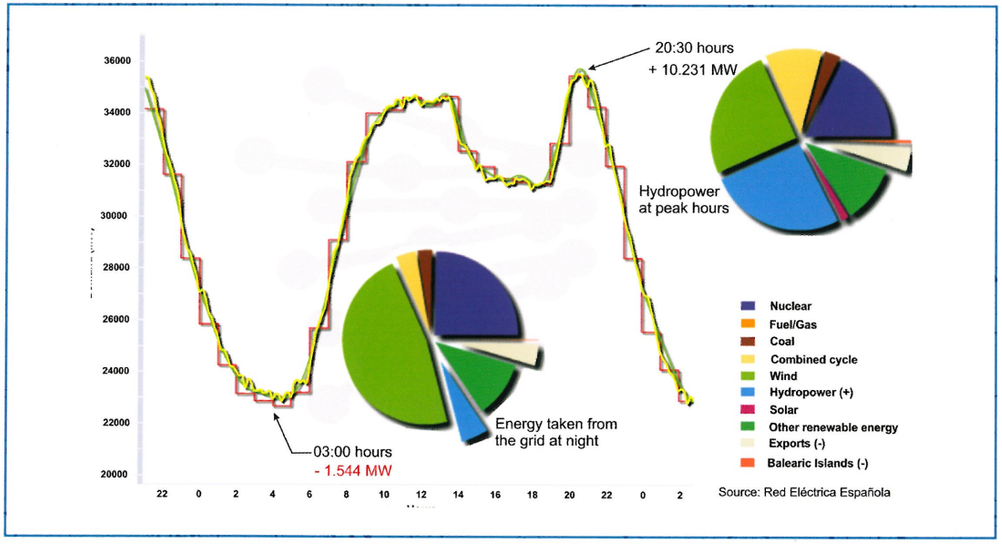
▶ **THERMAL POWER PLANTS**

Nº	NAME
1	C. T. TERUEL

The Ebro produces around 21% of the total hydroelectric power in Spain; 11% of the conventional thermal production and 32% of nuclear energy.

More than 3.100 hm^3/year are used to cool the thermal and nuclear power plants. Hydroelectric generation uses around 38,000 hm^3/year, producing an average of 9,400 GWh/year. Every m^3 of water from the Ebro produces over 0.5 kWh/year.

▶ REAL-TIME ELECTRICITY DEMAND 26-March-2014



The graph shows in light blue how hydroelectric energy quickly adapts to demand and it also makes the Spanish electricity system dispatchable, taking energy from the network at night and providing it during peak hours.

Recreational uses

There is not much tourism in the Ebro demarcation and therefore it is not a significant pressure factor.

The main recreational use of the water is artificial snow making and practically all of the ski resorts have cannons. To a lesser extent the 21 golf complexes also consume water.

La Loteta reservoir

The trend is towards sustainable growth of snow sports and of the number of affiliate golf licenses. Growth exceeding two digits in water adventure sports such as canyoning, rafting, windsurf, etc.

The number of affiliate licenses for fishing and sailing tends to remain stable.

The Plan includes a large number of recreational initiatives (2,000) that are demanded by society, among which are: tailwater dikes at Itoiz and Rialp, environs of La Loteta, Ebro in Logroño, recreational initiatives in the Delta (PIPDE), Cañizar lake and especially scientific tourism around the water resources.

Aquaculture

Aquaculture requires over 1,000 hm^3/year in the 50 facilities dedicated mainly to rainbow trout and to a lesser degree sturgeon.

In the bays of the Delta there are over a dozen facilities that mainly work with molluscs that require fresh water from the irrigation channels.

Vozmediano fish farm

Forecast of the plan:

- The forecasts for the future contained in the Plan, product of the participation process between industry companies, Red Electrica Española and the departments of Industry, are that water will become a factor that enables the offer of intermittent energy such as wind, nuclear or solar power to be compatible with demand.
  There are plans to increase the power in pumped-storage around 2,000 MW in order to achieve a valley that is energetically sustainable.
- Preservation of the hydroelectric reservoirs as sensitive areas (Sobron, Mequinenza, Ribarroja, Ullivarri-Urrunaga) requires measures to eliminate nutrients upstream in all of the towns with over 10,000 population equivalent.
- Monitoring of the water quality in the Ebro in Ascó.
- Recovery for public interest of the reserved energy and the extinct concessions.

Biescas II

Aggregate extraction

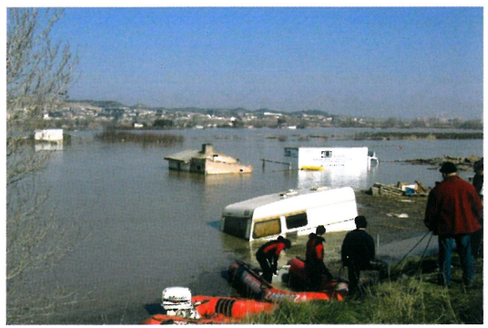
The volume of aggregate extractions from water resources has decreased due to environmental reasons. The Plan contemplates complementing the extraction of aggregate in certain river sections as a suitable measure in some cases to reduce the effects of floods.

Forest planting

The Plan contemplates creating strips of indigenous vegetation in the public domain water resource areas and in certain waterway police areas.

10. Floods and droughts

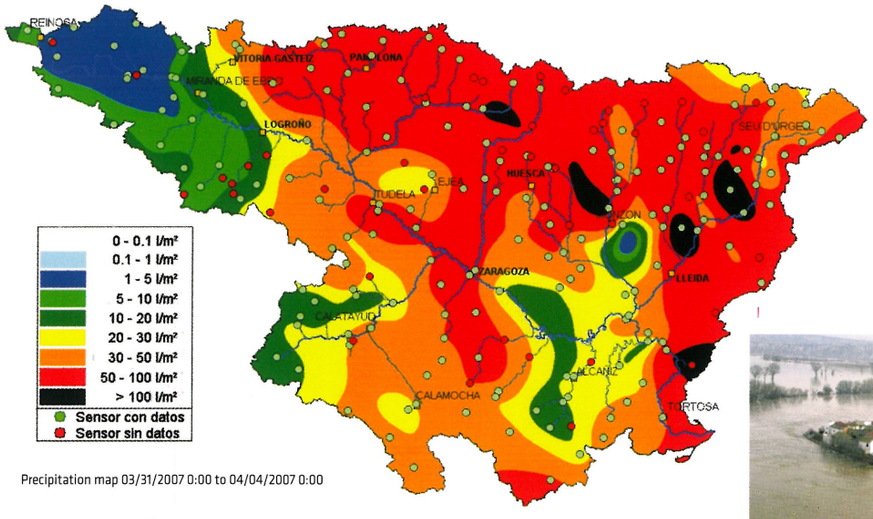
The Ebro water management plan includes the specific plans for droughts and floods.



Floods in the Ebro valley

Dryland farming land next to La Loteta reservoir

▶ ACCUMULATED RAINFALL IN THE EBRO BASIN BETWEEN MARCH 31 AND APRIL 4, 2007



Precipitation map 03/31/2007 0:00 to 04/04/2007 0:00

Floods in the Ebro valley – Cabañas de Ebro

Floods

The large floods in the Ebro demarcation are due to persistent rain in wide areas, compounded by fast ice thawing from the Pyrenees. On the other hand, there are flash floods due to convective and localised rainfall.

The Hydrological Information system SAIH, with 724 remote flow stations, snow gauges, rainfall gauges, etc., and the Decision Support System, allow for proper management, especially during large floods of the Ebro.

The Plan contemplates including in the next revision the plan developing Directive 2007/60/CE on evaluation and management of the flooding risk.

The Plan proposes as measures avant-garde initiatives to recover the river area, abatement basins, controlled flooding areas, plans for layout and guidance on crops, technical delimitation of the floods for different return periods, environmental studies compatible with the abatement sections, etc.

Pursuant to the Planning Instruction, the effects of climate change will reduce flows by 5% in the medium term (year 2027). We will wait for further worldwide scientific knowledge regarding the exacerbation of droughts and floods.

The rise of the water level in the Mediterranean as consequence of climate change is the main threat to the Ebro Delta.

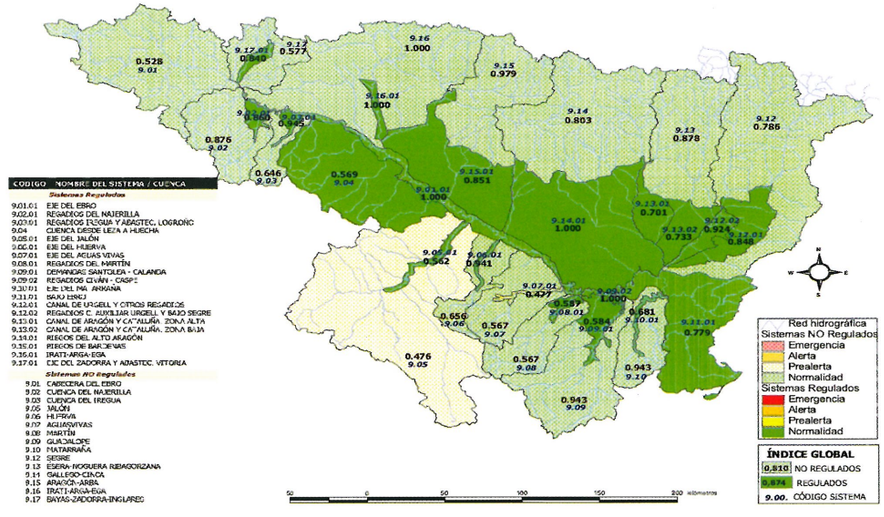
Droughts

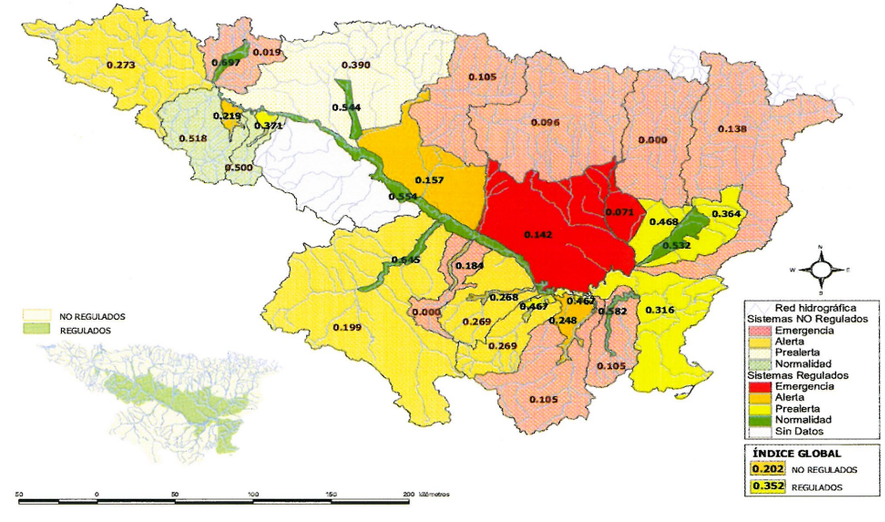
Globally, the Ebro Basin does not have supply problems in the larger towns, because their networks are connected to large irrigation systems and in the event of drought priority of usage is implemented. The transfer to Gran Bilbao has episodes of vulnerability.

Financial losses in irrigation and energy usage due to drought are significant, and in the 2004-2005 drought they were estimated at €540+98 million.

The Special Plan for Droughts, with its indicators and measures, has been included in the Water Management Plan.

▶ DROUGHT INDEX MAPS, SHOWING TWO VERY DIFFERENT SITUATIONS





11. Water balance

The Ebro Water Management Plan guarantees the water reserve aspirations of the nine autonomous communities of the basin and a large amount of regulated water in the final section of the Ebro.

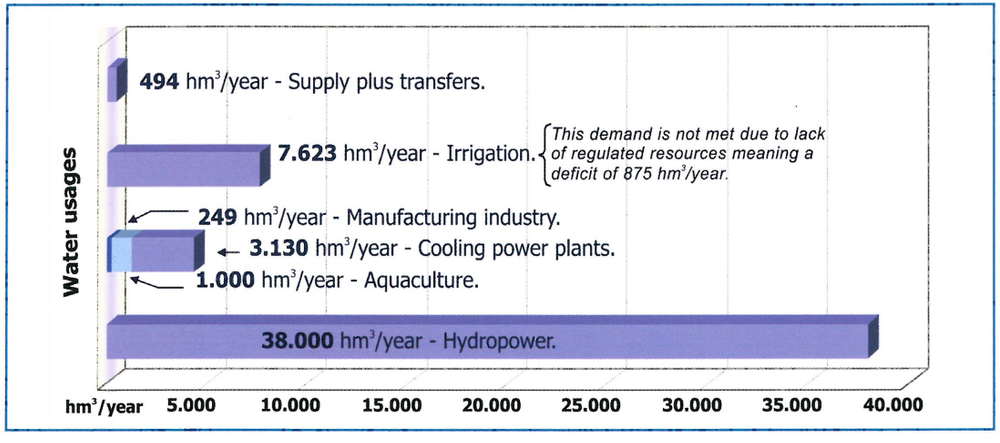
Existing water (Natural flow regime)

The Planning Instruction establishes that to purposes of the Plan the series used to allocate resources will be the period from 1980-81 to 2005-06, according to the models at 14,623 hm^3/year.

To purposes of balances for 2027 a 5% reduction is established due to climate change.

Current balance (Includes ongoing risk provisions)

A) water usage



B) water consumption

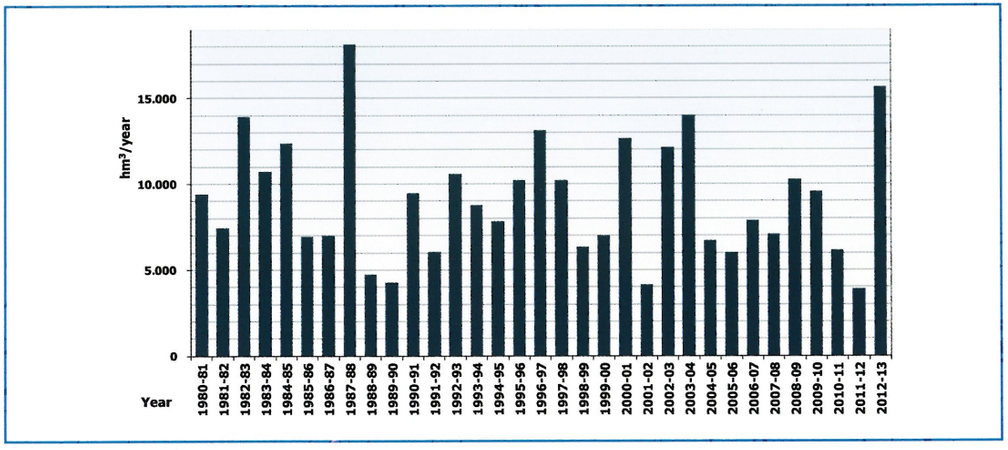
The water that is used and not returned to the river is the water consumed. Supply, industrial usage and hydroelectricity consumption comprise less than 10% of the whole amount of water used.

In irrigation, the percentage of water consumed regarding water used varies considerably. In the large irrigation systems, Urgell, Aragon and Catalonia, Bardenas and Riegos del Alto Aragon, the data obtained from specific studies shows that the water from return flow is around 15% of the water supplied by the irrigation canal. In older irrigation systems this percentage may increase considerably and in drip irrigation it is considerably reduced.

As a whole, the water consumed in the basin according to the models is 5,096 hm^3/year.

This graph shows the water not consumed in the basin upstream from the Tortosa gauging site. As we can see, the volume of water varies greatly depending on the hydrological year.

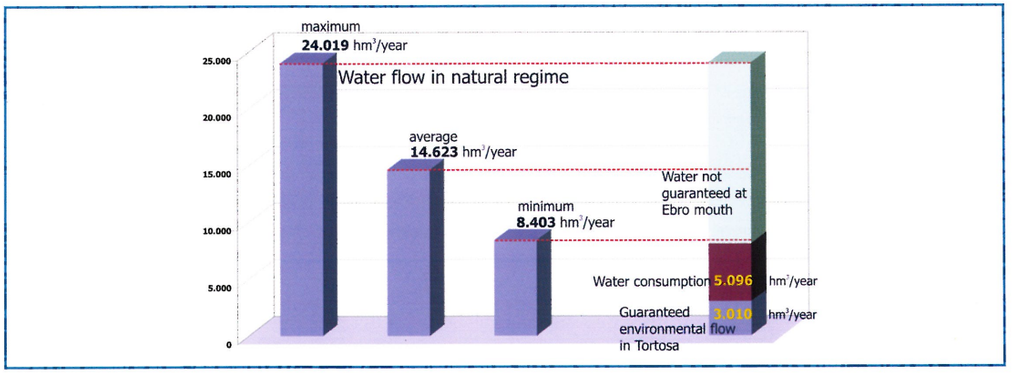
▶ GAUGING IN THE RIVER EBRO IN TORTOSA (G. S. 27) HM^3. WATER NOT CONSUMED IN THE BASIN



Gauging at the Tortosa site discounts existing consumption.

Current balance for the entire basin

The graph shows on the one hand the maximum, average and minimum available water and on the other hand the water's purpose, guaranteed environmental flows in Tortosa + water consumed. As we can see, except in years of minimum flow, there is enough water that fulfils environmental functions and which is not guaranteed at the outlet.



Series 1988/81 to 2005/06.

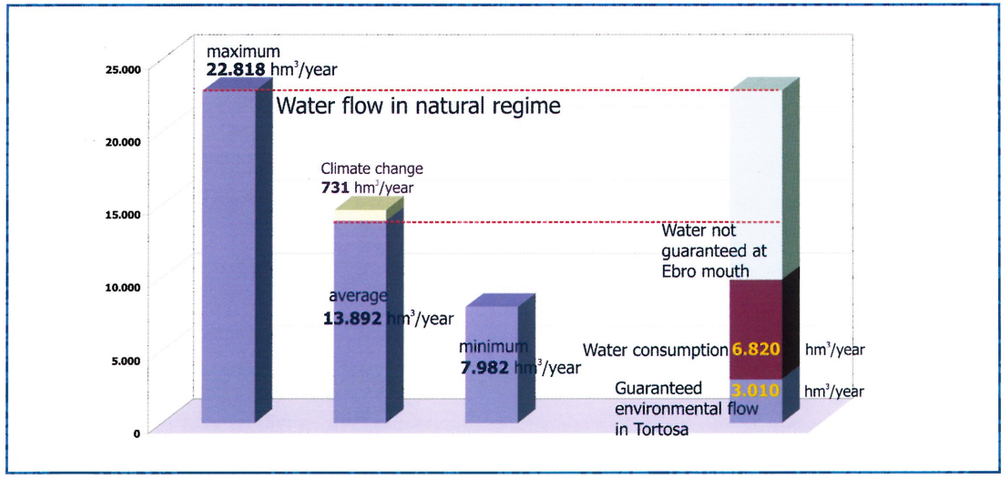
Observation: In years of minimum flow, drought in the basin leads to a reduction in consumption and the water held in reservoirs from rainy years is used.

Long-term balance (2027 onwards)

- Average flow in natural regime is reduced by 5% due to climate change (Planning Instruction). 13,892 hm^3/year.
- Uncertainties surrounding the future of the agri-food complex and fossil energies in the worldwide context have led each Autonomous Community, within the framework of their competences, to adopt a long-term strategy.
- The Water Management Plan contains these strategies to purposes of water availability and effects on water resources without assuming feasibility (financial, social or environmental).

AUT. COMM.	NAME		RESERVE
Cantabria	Development irrigation land low allocation	–	
País Vasco (Cdad. Foral de Álava)	Irrigation Alava valleys		22 hm^3/year
Castilla y León	Manchas regadíos		40 hm^3/year
La Rioja	Modernisation and possible change of crops		149 hm^3/year
Navarra	Canal de Navarra - Terra Estella		32 hm^3/year
Aragón	Strategic reserve:	850 hm^3/year	
	Developments linked to the Plan:	1.440 hm^3/year	
	Current consolidated usages:	4.260 hm^3/year	
		Total...	6.550 hm^3/year
Castilla-La Mancha	Supply- Irrigation		1 hm^3/year
Cataluña	Segarra-Garrigas, Cenia - Aldea Camarles, etc.		445 hm^3/year
Valencia	Supply and other usage		10 hm^3/year

Modernisation of the irrigation systems and new irrigation have led to more efficient management and lower diffuse pollution. The new scenario of maximum water use will increase the water consumed to 49% of the entire volume of natural flow water.



Is the end section of the Ebro threatened by the Water Management Plan?

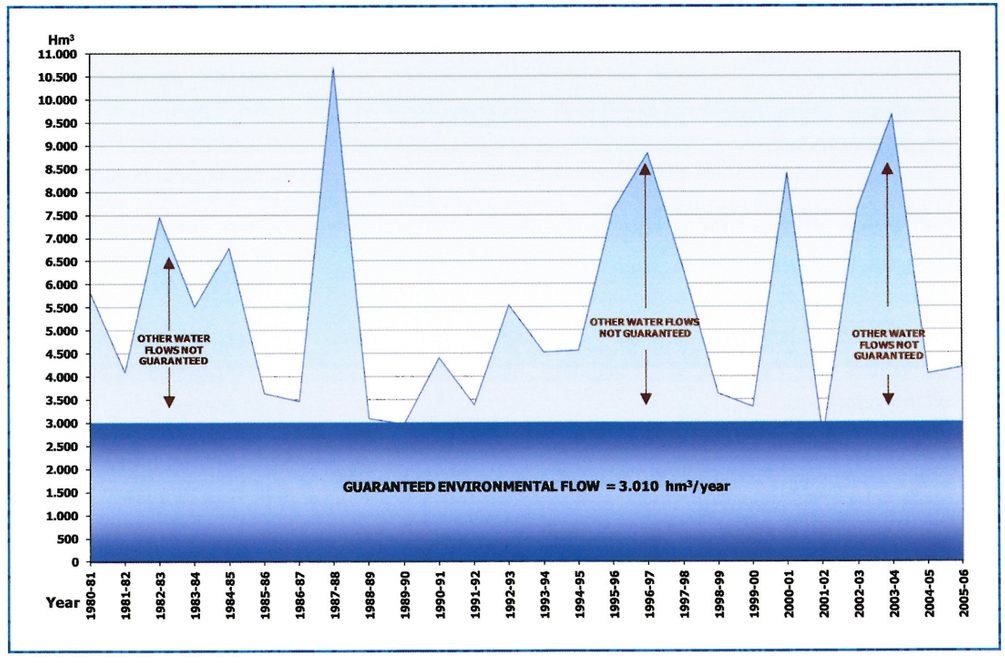
Thanks to the high level of solidarity between the Autonomous Communities of the Ebro and mainly to the Mequinenza reservoir in Aragon, the end section of the Ebro enjoys a privileged situation regarding the whole of Spain.

The Tortosa gauging site guarantees 3,010 hm^3/year and on average there are intermittent flows equivalent to 51% of all of the resources of the Ebro Basin.

The graph shows the distribution of flows that would have existed between 1980 and 2006, with all of the water consumption foreseen in the Plan.

Therefore, there is no risk of lack of flow in the lower section of the Ebro.

FLOWS OF THE RIVER EBRO IN TORTOSA - F.R. ENVIRONMENTAL (hm^3/year)
HORIZON 2027



The technical analyses can be found at:

www.chebro.es/contenido.visualizar.do?idContenido=14093&idMenu=3048

12. Financial, social and environmental sustainability of the Ebro plan

The Ebro Water Management Plan greatly contributes to agri-food sustainability for Spaniards and to enabling a sustainable electrical scenario within Spain, with the guarantee of environmental sustainability of the Ebro water resources.

The Comprehensive Management of Water Resources (GIRH-WIRM) is based on the principle that water ecosystems management is compatible with the socio-economic requirements of water usage. In the case of Spain, the Law on Water establishes the objectives of the plan:

> (TRLA-Art. 40) establishes comprehensive sustainability under these terms: Water management planning will have these general objectives: a) achieve a good status and protection of the hydraulic public domain of the water and b) meet demands and contribute to development of the region increasing availability, protecting its quality, cutting down on its use and in harmony with the environment.

COMPREHENSIVE SUSTAINABILITY = SPAIN'S AGRI-FOOD SUSTAINABILITY + ENERGY SUSTAINABILITY + EBRO WATER RESOURCES SUSTAINABILITY.

Agri-food sustainability:

Is it sustainable to feed the world population? 9.6 billion by the year 2030

FAO reports create uncertainty and warn of the environmental impact on water: over-exploitation of aquifers, biotechnology, increased irrigation, etc.

It is recommended that countries like Spain contribute towards their own sustainability and to world sustainability with their agri-food production.

Meat production for consumption requires a large amount of water.

The water required to produce the food we consume every day exceeds 1,300 litres per person (water footprint).

Is Spain's food production sustainable?

The water required for agri-food consumption for Spaniards (water footprint) affects third-party countries. Spain's food balance sheet, in terms of water, produces a deficit of 12,000 hm^3/year, mainly due to the mass import of feed - grain.

As Spain is not sustainable regarding agri-food, it is important for it to increase the sustainable use of water for food production.

The Ebro Water Management Plan, pursuant to its participation process, assumes the challenge to contribute to Spain's agri-food sustainability by developing the current irrigation areas and especially by making them more sustainable by modernising them. Current water consumption in the Ebro Demarcation is 34% of the natural flow water, while the maximum established by the Plan is (49%).

Energy sustainability:

Spain is not energetically sustainable, as it depends on third countries for over 85% of its consumption, especially due to its lack of fossil energy.

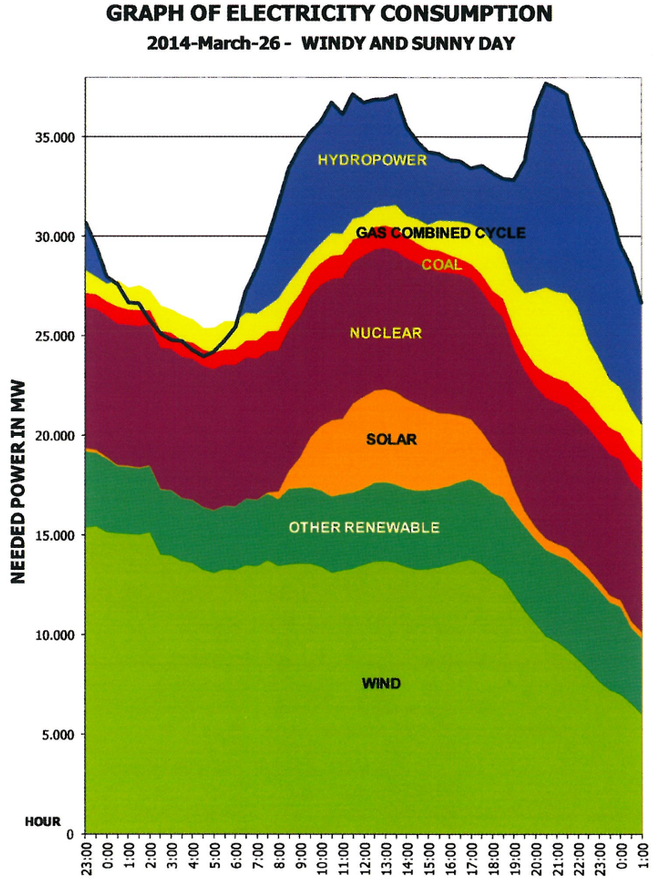
Hydroelectric production, especially production from reservoirs, is high quality energy that enables production to be adapted to demand, thus making intermittent renewable energy feasible.

The graph shows how hydroelectric energy adapts to demand by the time of day. At night the non-usable excess energy is used to carry the water back up to the higher reservoirs in pumped-storage stations. Water in Spain is the «great basin» of energy storage that enables provision of a quality supply.

Spain demands hydroelectric development and management, especially with pumped-storage stations and upgrades in a sustainable energy scenario. The Ebro Water Management Plan contributes to Spain's energy sustainability with a forecast of 2,000 MW in pumped-storage stations and improvements to efficiency in current systems.

Given a scenario based on wind and solar renewable energies, water becomes the essential factor to making them feasible.

▶ **CURVE WITH ELECTRICITY CONSUMPTION DAY WITH WIND AND SUN 26 MARCH 2014**



Silos for storing grains. Mass import of feed-grain in Spain

Sustainability of the water resources of the Ebro:

In the global balance of the Demarcation, consumption pressure is currently 34% of the total natural flow water. This percentage is sustainable.

Long-term forecasts of the Plan situate consumption pressure at 49%, which is also assumable given that it is a Mediterranean river.

Water consumption pressure in the sub-basins reaches higher percentages, which led the Water Management Plan to establish very strict rules for new water demands:

- No new concessions will be granted if there is no regulation (basins or reservoirs).
- Uptake from groundwater will be subject to the hydrological cycle.
- Strict compliance with environmental restrictions.

The mandatory environmental flow in the whole of the Ebro area (Delta) is established between 23% and 30% of the natural regime flow, as restriction to usage.

This is a much higher percentage than the rest of Spain's Mediterranean rivers and it is feasible thanks to the Mequinenza Reservoir and to the high level of solidarity of the 9 Autonomous Communities of the Demarcation, within the framework of the IWRM.

The environmental flows in the rest of the River Ebro and in its tributaries have much lower percentages, according to the Water Management Plan, although they meet the requirements set forth in the Planning Instruction.

Imposition of environmental flows for all water bodies will greatly affect current water usage.

In the current situation, 70% of the water bodies are in good status and the aim is to achieve 85% for the horizon 2015. Investments in wastewater treatment have yielded results and there has been considerable improvement of the water bodies.

The Water Management Plan undertakes to maintain investments in environmental improvements, establishing them at €1.74 billion between 2009-2015, which is 45% of the total investments of the Plan.

The peripheral strips of the Pyrenean and Iberian System rivers where there is no human pressure and where the water bodies are in good status or in very good status, become an environmental heritage for the whole of the European Union.

The centre of the valley requires important measures, especially regarding wastewater treatment and reuse, with an investment exceeding €10 billion to try to achieve that 100% of water bodies are in good condition.

We will achieve sustainability of the Ebro if people use the water responsibly, there is a good food balance sheet, energy savings and especially through a responsible attitude by the Government, the people and the productive industry that minimises pollution, with large investments in the coming years.

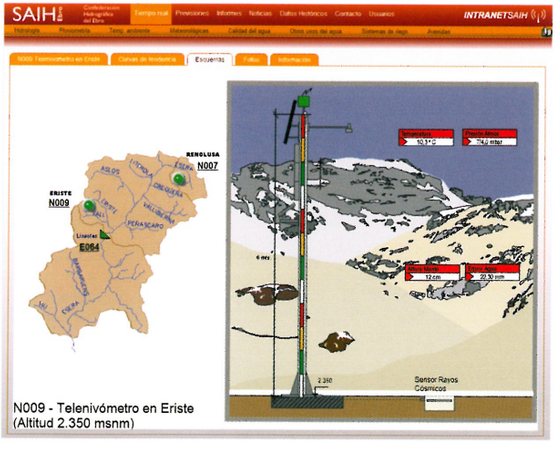
Traditional irrigation crops in the centre of the valley

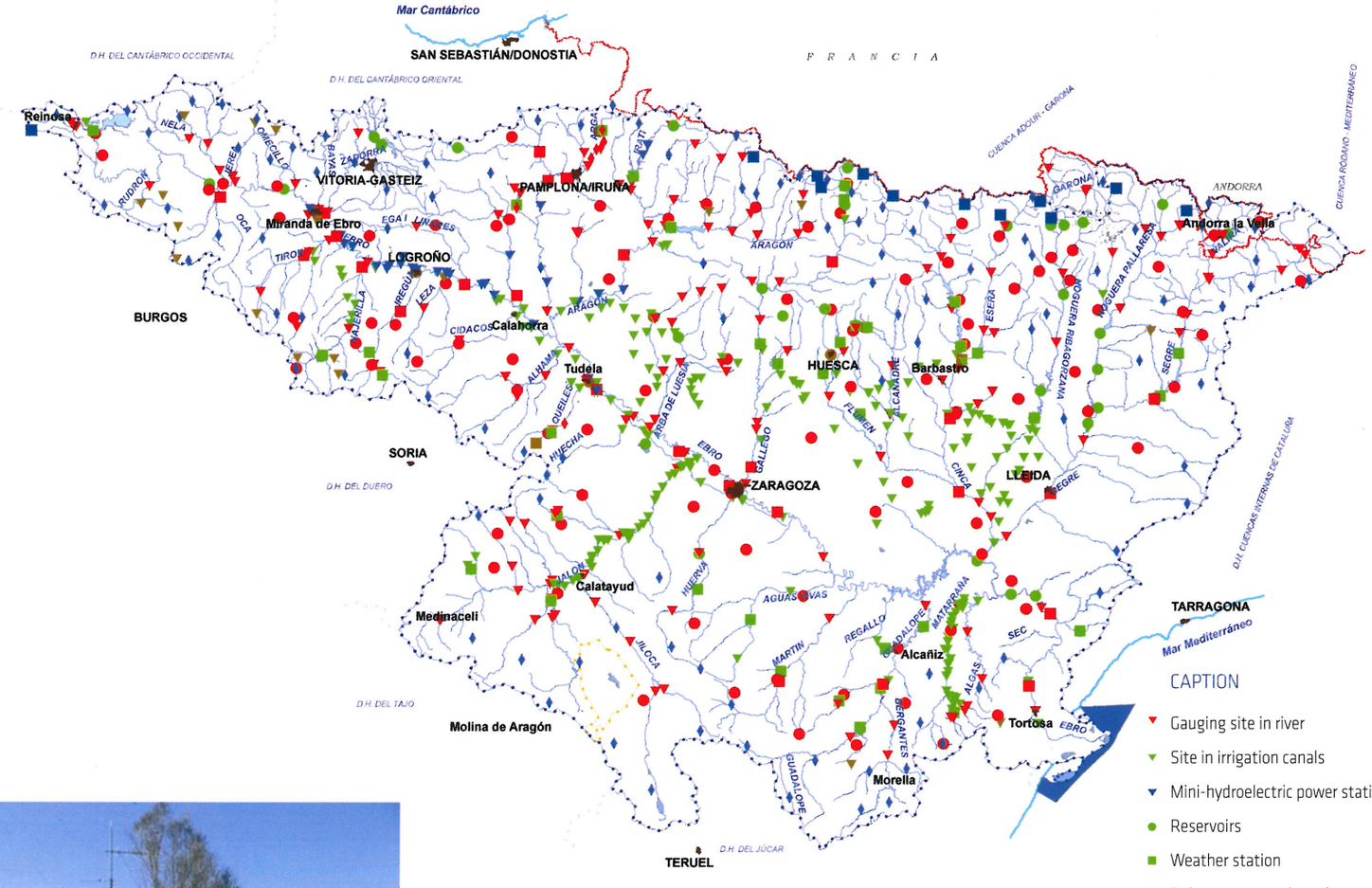
River Ebro as it passes by the Asco Nuclear Power Plant

Irrigation crops in the Ebro Delta

13. R+D+I in the Ebro plan

The Ebro Water Management Plan is committed to intensifying R+D+i in water management and water resources in order to face the challenges of the 21st Century from a modern perspective.





CAPTION

- Gauging site in river
- Site in irrigation canals
- Mini-hydroelectric power stations
- Reservoirs
- Weather station
- Rain gauges or rain and snow gauges
- Points of concentration
- Fish Farms
- Pressure gauges
- Quality gauging site
- Repeater stations in the network
- Siren
- Remote snow level gauges

Measuring networks:

HYDROLOGY AND HYDRO-GEOLOGY

ROEA (Official Network of Gauging Sites)	**322** points of control
Basic pressure gauge network	**317** observation points
ERHIN (Study of water resources for snow making)	**12** Remote snow level gauges (included in the SAIH) **115** measuring sticks

AUTOMATIC INFORMATION:

SAIH (Automatic Hydrological Information System)
225 gauging sites in rivers, **99** sites in reservoirs, **373** rainfall measures, **193** environment temperature gauge, **42** weather stations, **285** gauging sites in irrigation canals, **65** stations for other uses, **9** points of concentration.

SAICA (Automatic System for Water Quality Information)
27 water quality stations.

QUALITY:

CEMAS (Control of the Condition of Surface Water Bodies 2012)

Surface water.

• Surveillance monitoring	**274** sampling points
Operational control	**140** sampling points
Hazardous substance control	**24** sampling points
Pesticides control	**23** sampling points
Physical-chemical indicators	**274** sampling points
• Biological indicators	
Macroinvertebrates:	**107** sampling points
Diatomea:	**125** sampling points
Macrophytes:	**98** sampling points
• Hydromorphological indicators	**116** water bodies

Internal waters

• Surveillance monitoring:	**443** control points
• Operational control	
Nitrate network:	**318** control points
Network of tendencies:	**18** control points
Network of industrial contamination:	**26** affected areas

Protected areas

• Water for human consumption	
Surface:	**132** sampled points
Groundwater:	**343** sampled points
Fish farm areas:	**15** sampled points
• Sensitive and vulnerable areas. Nutrients:	**29** sensitive areas **26** vulnerable areas

Within the worldwide context, the Confederation's degree of technification regarding water management is a paradigm. The Ebro plan is committed to intensifying R+D+i in water management and water resources, to face the challenges of the 21st Century from a modern perspective.

The strongpoint of the efficient comprehensive management of water in the Ebro is the ability to take single and coordinated decisions from its source to the outlet and from the Pyrenees to the Iberian System.

This ability to take decisions within the natural framework of the river is what has enabled the achievement of technological successes such as the Hydrological Information System (SAIH), the Automatic System for Water Quality Information (SAICA), the Territorial Information System (SITEBRO), the Decision Support System (SAD), INTEGRA, Hidrogeoebro, RADE, control networks, remote snow gauges, gauging sites, pressure gauges, water quality, etc., throughout the entire basin.

- The Ebro Plan contains a wide range of R+D+i measures with specific aims such as:
  - Network of indicators of the Ebro Delta and in-depth study of the biology, subsidence, regression, hydro-geology, water quality, etc.
  - Improvements in the indicators on the good status of the water bodies.
  - Relationship between environmental flows and good status.
  - Financial aspects of floods and droughts.
  - Modelling of floods.
  - Early detection of droughts and climate change «Downscaling».
  - Balances of water, fertilisers and other diffuse pollution in the irrigation systems.
  - Automation of field databases in matters such as safety in dams.
  - Energy optimisation and strengthening of the hydroelectric sector, alternative energies applied to pumping, pumped-storage systems, etc.
  - Water footprint and water accounts.
  - Development of green infrastructures.
  - Water regeneration and reuse.
  - Remote detection, geothermal gradient, etc.
- R+D+i is the mark of identity of water management by basins GIRH-IWRM where technique, scientific knowledge, integration of objectives and solidarity on concession, competence and territorial interest are key.
- Investment in R+D+i in the Ebro basin enables job creation, higher added value with less amount of water, with less degradation, less energy and with environmental regeneration of the water resources.
- The specific R+D+i measures are set forth in the Water Management Plan and will be implemented in accordance with the available financing and human resources.

Point of control and measuring stations of the SAIH network.

Water quality laboratory of the CHE

14. Governance of water management of the Ebro

The Ebro Water Management Plan is included in the organisation of the comprehensive management of the Ebro from Reinosa to Amposta and from the Pyrenees to the Iberian System. The challenge is for the nine autonomous communities to take the responsibility and continue with the measures that Spain undertook with the European Union.

River Segre in Lleida

Spain has in the Ebro Confederation an organisational heritage that was handed down by our ancestors, which is both essential and vulnerable.

Management of the water from the Ebro is peaceful and efficient.

- Within the current context it would not be feasible to create an organisational heritage that is as integrating and supportive as the Ebro Confederation.
- In the Ebro basin it is considered evident that:
  - The control networks of the entire basin enable supply uses for the lower sections such as Zaragoza or the transfer to the Campo de Tarragona to be guaranteed.
  - Over 80% of the water from the Ebro belongs to rivers shared between two or more autonomous communities, and there are no conflicts in their management.
  - The regulating reservoirs are examples of intra-community support.
  - The Ebro reservoir, in Cantabria and Castilla y Leon, is the guarantee for supply to La Rioja, Navarra and Aragon. Life in the Ebro Delta in Catalonia exists largely thanks to the Mequinenza reservoir, located in the autonomous community of Aragon.
  - The Yesa reservoir is shared between Navarra and Aragon. The Canal in Aragon and Catalonia is the result of an excellent synergy between reservoirs of both autonomous communities, etc.
  - Supportive management of the Ebro is fundamental for all reservoirs to cooperate in the abatement of floods, saving the towns from flooding as happened in Tortosa in the flash flood in January 1997.
- The Ebro Plan's main objective is to maintain solidarity between the nine autonomous communities that are comprised therein.
- The Law on Water establishes that the Plan is informed by the Water Council of the Basin and is approved by the Council of Ministers. The Ebro Plan strictly follows the principles set forth in the Framework Directive on Water and in the Law on Water.
- Firstly, a wide participation process was followed, which legitimated the Plan: 2.758 representatives of 1,205 organisations and entities throughout the 13,000 km of river, who explained their criteria and proposals, which were then included in the report on the Ebro Plan. Therefore, the Ebro Plan is not the result of a few technical studies, rather it is the consequence of the aspirations of the whole of the inhabitants of a fifth part of Spain, belonging to nine autonomous communities.
- The Water Council of the Demarcation is the representative entity in charge of drafting the report on the Water Management Plan. The Law on Water (TRLA) establishes that its composition, in the case of the Ebro, is held by approximately a third (35%) of the nine autonomous communities, depending on the size of the territory and number of inhabitants in the Demarcation.

Meeting of the Water Council

A third (33%) of the members of the Water Council are the representatives of the users of the water supply to towns, industrial uses, irrigation, hydroelectricity, etc.

The last third (32%) of the members of the Water Council are the representatives of the central government, ecologist groups, financial and social agents.

- The Water Council, as chamber of representatives, has met 6 times and the Planning Commission 3 times throughout the process of drafting the Plan. Thus the Ebro Plan has had ample participation and it is a reflection of the aspirations of the inhabitants of the Demarcation.
- The Plan was informed favourably on June 4, 2013 by the Water Council, by a large majority. 9% voted against it: the direct representatives of the Government of Catalonia (Generalitat), the ecologist groups and Chunta Aragonesista (CHA). After the pertinent formalities by the Committee of Authorities and the National Water Council, it was approved by Royal Decree 129/2014, February 28.
- The Ebro Plan is a consensus project and no territory was affected.
- From the Autonomous Community of Catalonia, 7 vocals of the Water Council voted in favour and 6 against, among these the Government of the Generalitat because they wanted environmental flows that were impossible to guarantee in the lower section of the Ebro.
- The Ebro Plan is included in the organisational heritage that is the integrated management of the Ebro, in its entirety. Supportive, peaceful and efficient management that makes the Ebro a world reference point.
- The challenge of the Ebro Plan is that the nine autonomous communities, within the scope of their competences, assume the responsibility to proceed with the measures undertaken in the Plan.
- The Government, as guarantor before the European Union, must fulfil and ensure fulfilment of the commitments to improve the water resources that the kingdom of Spain acquired with its community partners.

Commitments in the Plan

Budget

A. Environmental	1.744,11
B. Fulfilment of demand	1.657,97
C. Extreme episodes	269,96
D. Management and government	243,30
Total	3.915,33

Million €

The commitment of the Kingdom of Spain with the European Union is to meet the investments of section A. Environmental Objectives; the 9 autonomous communities and the government acquire this commitment.

They also acquire the commitment towards a supportive management by demarcation and to improve the recovery of costs for the water services. The financial costs are recovered in percentages varying between 57% in supply and 85% in irrigation. Confederacion del Ebro finances itself by around 75%, therefore the water services performed do recover costs. The challenges of the Plan are to improve recovery of the financial costs and to influence environmental and resource costs.

Water Management Plan for the Ebro-Unity between the people of Spain

«The rough mountains that hold inside their humble rocks the cradle of the historical river that gives name to the whole peninsula and which, after greeting the iron borders of the Vasconia and kissing the triumphant and sacred wall of Zaragoza, pays tribute to the sea at the Tortosa banks, symbolising in its majestic course the supreme unity and the fertile diversity of the nation's history.»

Allegory of the Ebro at its source. - Marcelino Menéndez y Pelayo

The Greek Ibero, namesake of the Iberian Peninsula, the Roman Hiberus, the Muslim Wadi-Ibro, modern Ebro, has been a corridor for progress and culture throughout history.

The Ebro has been a path of peace and understanding between people, rather than an element of isolation and conflicts, although unfortunately in certain war episodes the Ebro played a role as a barrier.

Looking to the future the Plan is committed to an Ebro that brings together the rich cultural values of the people that are comprised within it, from Cantabria, Basque Country, Castilla, Rioja, Navarra, Aragon, Catalonia, Valencia, to an Ebro that projects its development axis onto the world and to an Ebro that is a reference point of living rivers.