



MINISTERIO
DE MEDIO AMBIENTE,
Y MEDIO RURAL Y MARINO

CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR



CLIMATE CHANGE

CHALLENGES TO WATER MANAGEMENT IN JUCAR RIVER BASIN AUTHORITY

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Meeting of the European River Basin District Authorities

Stockholm, August 20, 2009

**Juan José Moragues Terrades, Júcar River Basin
Authority, Valencia (SPAIN)**

**WFD CONFERENCE
Stockholm, 20th August 2009**





CLIMATE CHANGE CHALLENGES TO WATER MANAGEMENT IN JUCAR RIVER BASIN AUTHORITY

1. Definition. International Panorama
2. Situation in Spain
3. The case of the Júcar District

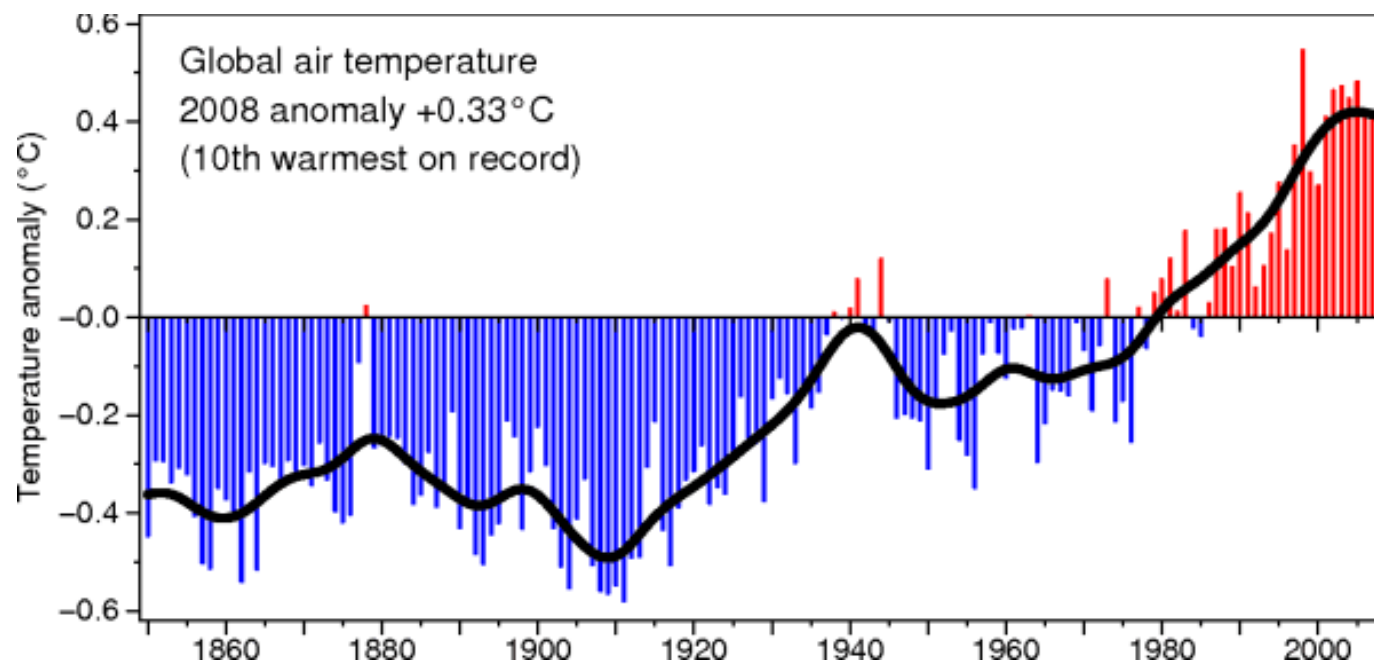


1. CLIMATE CHANGE DEFINITION. INTERNATIONAL PANORAMA



CLIMATE: Normal state of the atmosphere in a place, understanding as normal the values with a probability higher than 0.033 and lower than 0.967 in the frequency curve, adjusting the best distribution to thirty years periods (J.Sanz Donaire).

Global air temperature 1856-2003:

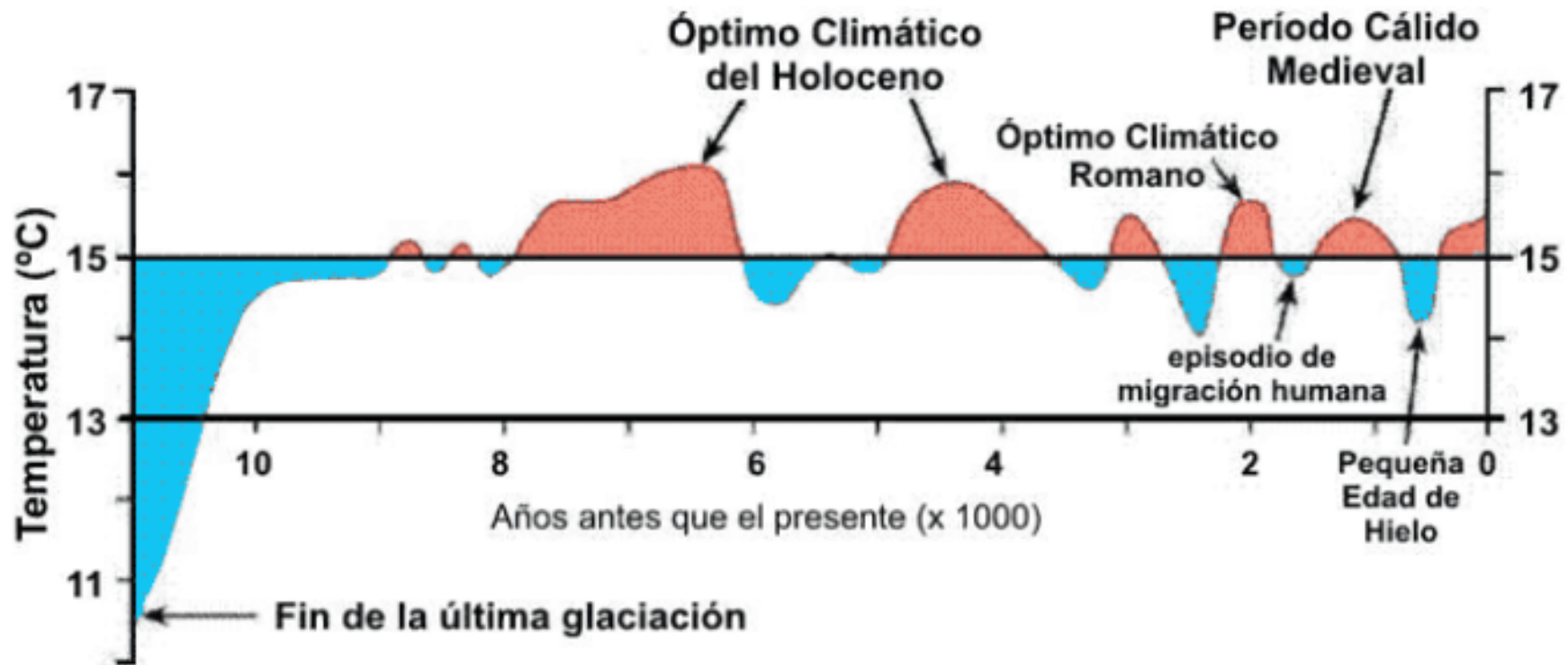


Phil Jones



TEMPERATURE EVOLUTION

Average Temperature in the Northern hemisphere surface in the last 11.000 years.



Temperaturas medias de superficie del Hemisferio Norte durante los últimos 11.000 años (de Dansgaard et al., 1969, y Schönwiese, 1995)



The regions most affected by Climate Change, with immediately visible impacts are:

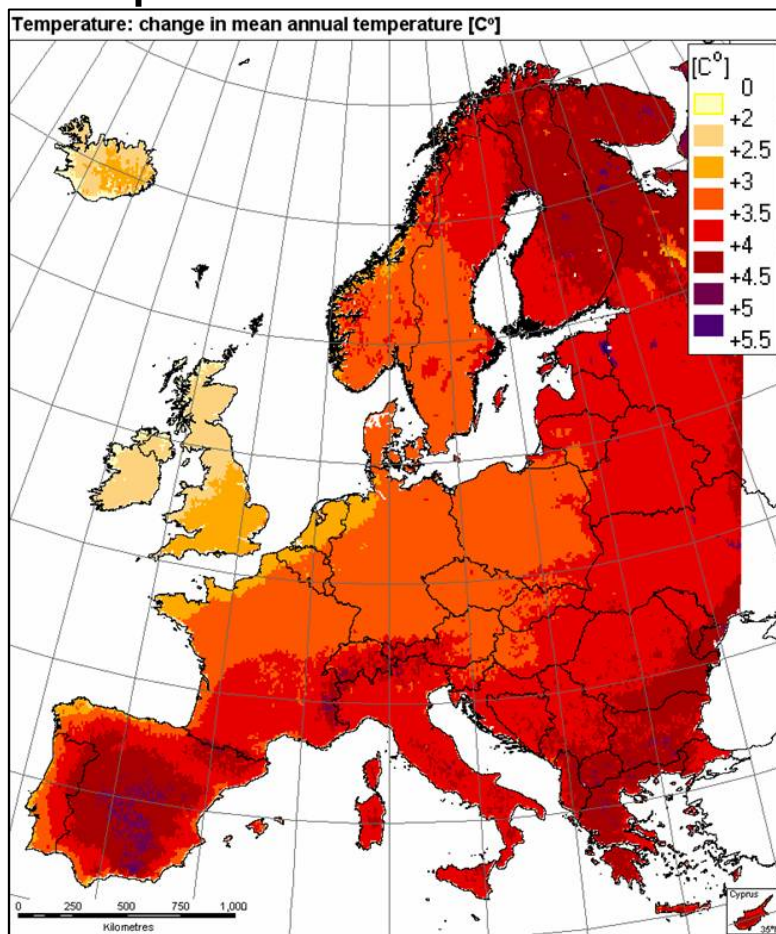
- North Africa
- Middle East
- South-eastern Europe
- Mediterranean countries of the EU
 - CC was one of the main topics addressed in the Mediterranean Session during the 5th WWF in Istanbul
 - For the Mediterranean Water Strategy, CC will be one of the central subjects



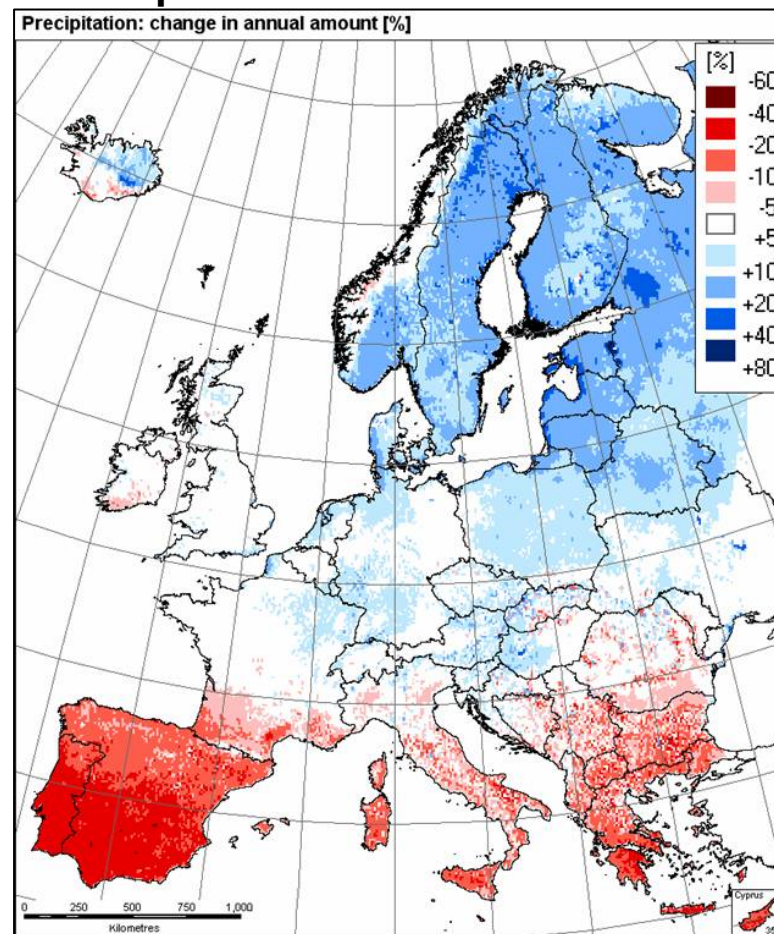
EUROPEAN CC PREDICTIONS

Temperature and Precipitation Changes Predictions for 2071-2100. EC Green Paper Scenarios A2.

Temperature



Precipitation

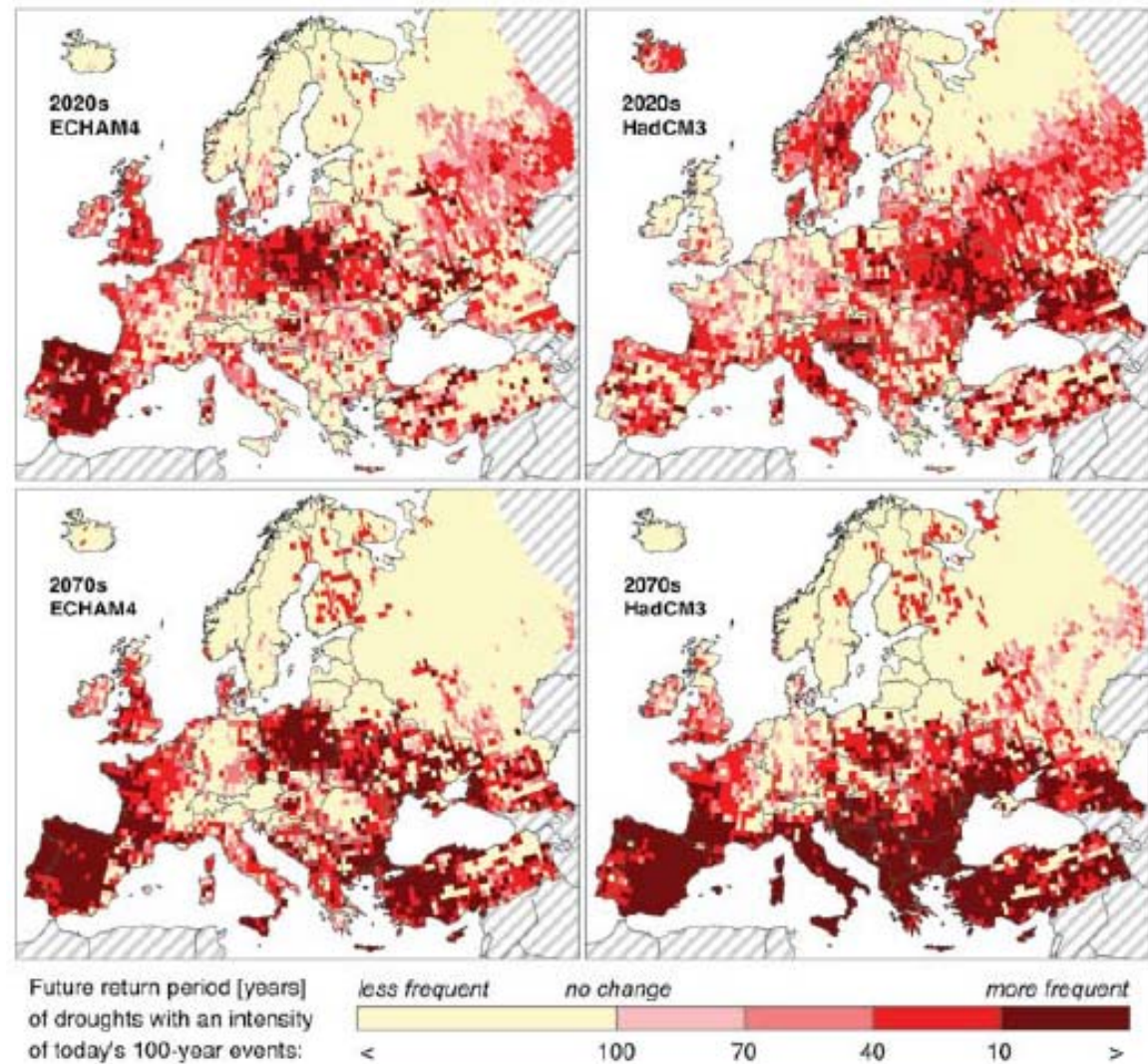




INCREASED RISK OF DROUGHTS

Change in the future recurrence of 100-year droughts, based on comparisons between climate and water use in 1961–1990 (*Lehner et al., 2005*)

“Climate Change and Water”, IPCC Technical Paper VI. IPPC”, June 2008





- **Mitigation alone is not sufficient, **adaptation** measures are necessary.**
- **Climate Change has **effects** on:**
 - Intensity and frequency of Floods & Droughts
 - Water availability & demand
 - Water quality
- **Climate Change **also affects** socio-economic and environmental development and goods.**
- **Need for adaptation in regards to storing, managing, distributing and delivering water resources.**



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2. CLIMATE CHANGE IN SPAIN

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1. Preliminary assessment report on climate change impacts in Spain predict:

1.1. Decrease in water resources mean values expected:

For a decrease of 5% in mean annual precipitation and an increase of 1°C in mean annual temperature, a **decrease between 9 and 25% in runoff is expected depending on the river basin districts**.

1.2. Increase in water resources variability.

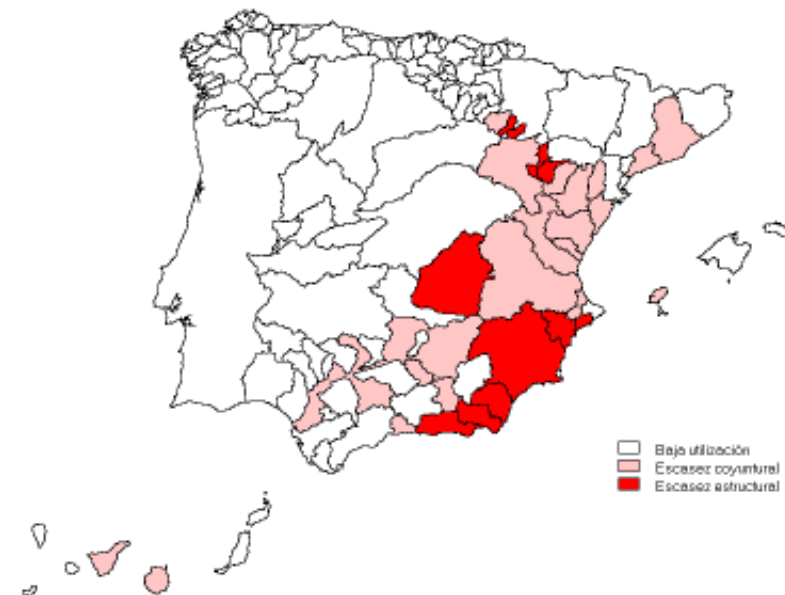
2. The most critical Spanish areas are arid and semiarid ones where **water scarcity and drought** problems are already more pressing.



IMPACT ON WATER RESOURCES & AVAILABILITY - NATIONAL SCALE

Runoff Reduction Map for a decrease of 5% in mean annual precipitation and an increase of 1°C

Water Scarcity Risk in water resource systems map in a global Scale

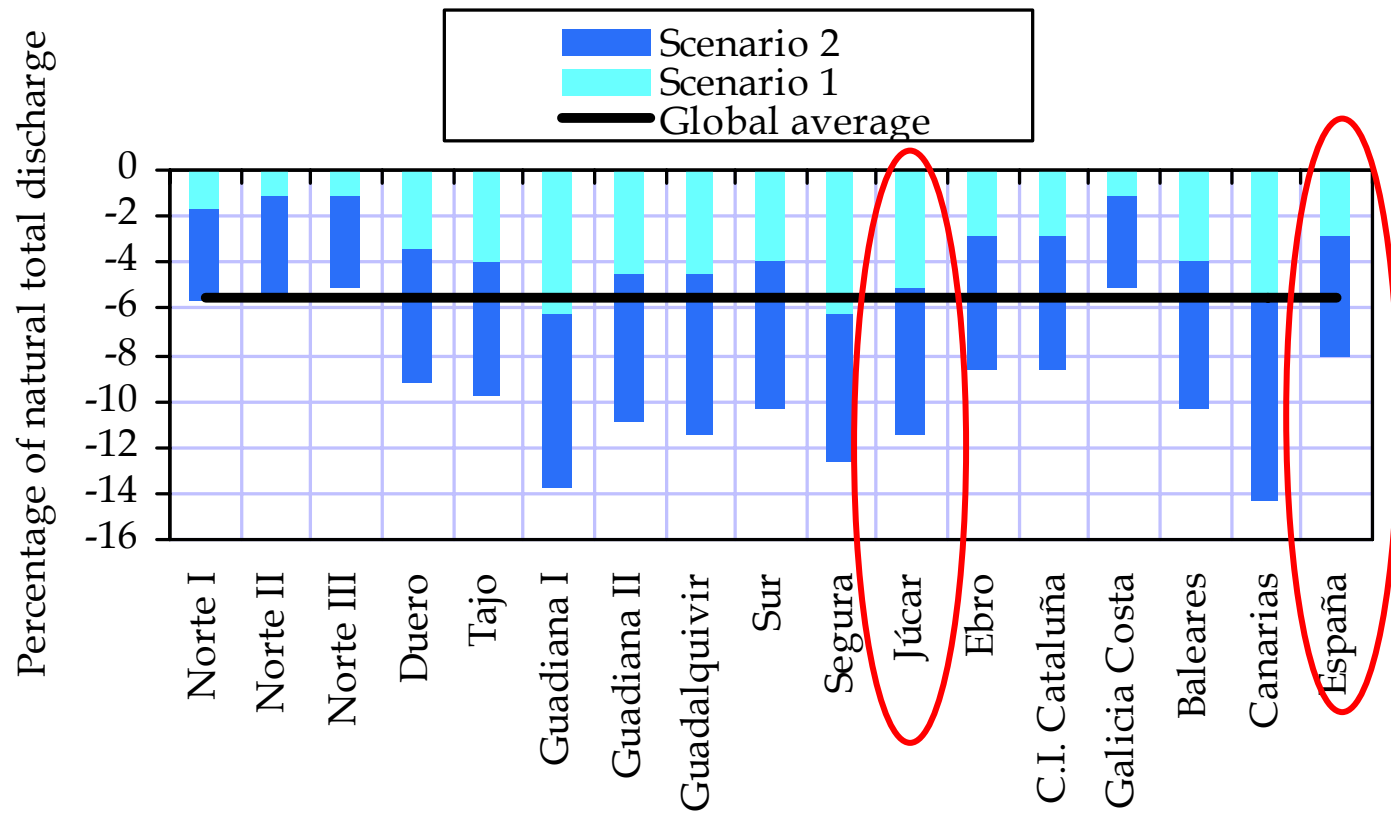


Water scarcity means that water demands exceed the available water resources under sustainable conditions



Total income reduction percentage, for considered climatic scenarios, in long term of hydrological planning

(Source: LBAE y Technical Documentation National Hydrological Plan-PHN)





The Directorate General for Water (DGA) charged CEDEX (Centre for Studies and Experiment on Public Works) for the analysis of climate change impact in water resources and water bodies within the frame of the National Adaptation Plan for Climate Change.

- Signed in April 2007 with a duration of 40 months



1. Predictions to Climate Change (CC) are **changes in water resources availability (QUANTITY) and QUALITY** all over the world.
2. Need of assessing impacts of CC on water resources in the national frame of:

2.1. NATIONAL ADAPTATION PLAN ON CC

2.2. HYDROLOGICAL PLANNING



- Assessment reports of climate change impacts on water resources were not taken into consideration in River Basin Management Plans approved in 1998.
- The first time these reports are considered in some detail was in the development of the Technical Documentation of National Hydrological Plan.



- **RIVER BASIN MANAGEMENT PLAN REGULATIONS
(Royal Decree, RD 907/2007)**

- Inventory of natural water resources (article 11.4)

The hydrological plan will assess possible effects of climate change on natural water resources of the river basin district. It will consider the resources that would correspond to the climate scenarios foreseen by the Ministry of Environment, that will be taken in consideration in the time horizon indicated in article 21.4.



- **RIVER BASIN MANAGEMENT PLAN REGULATIONS (Royal Decree, RD 907/2007)**
 - Resources balances, assignment and reserve (article 21.4)

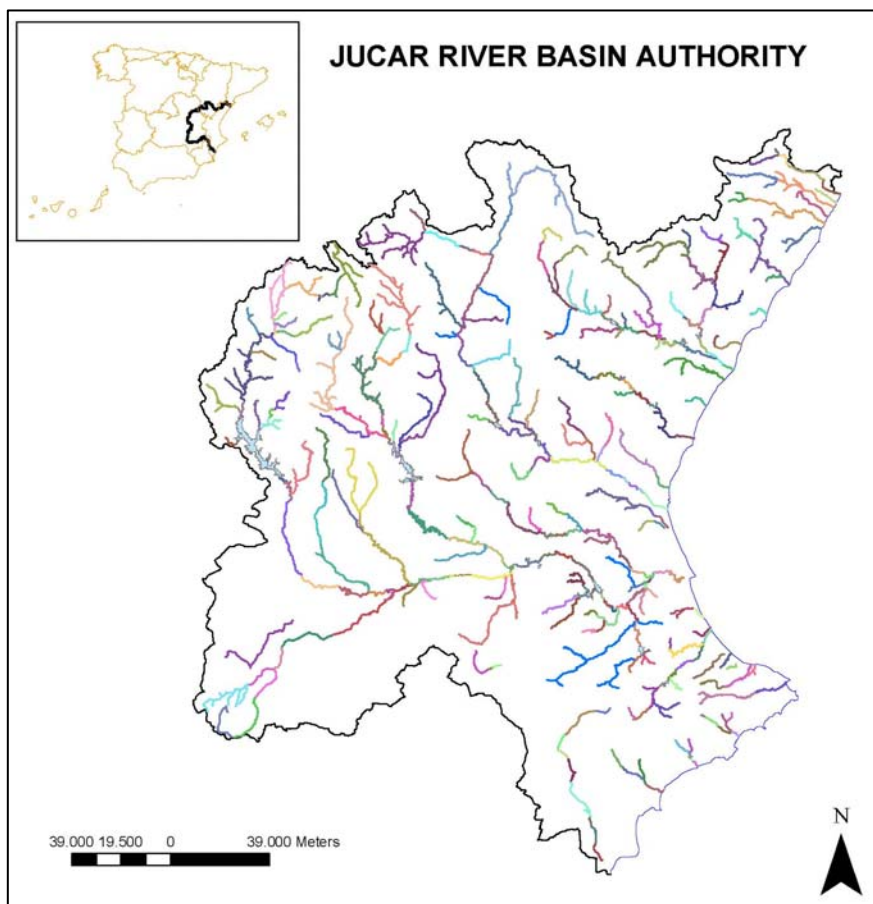
In order to assess long term trends, for the time horizon of the year 2027 the hydrological plan will consider the balance or balances between predictably available resources and probable demands corresponding different uses. For the carrying out of this balance, it will be taken in consideration the possible effect of climate change on natural water resources of the river basin district, in accordance with article 11. The mentioned time horizon will be increased in six years in the consecutives updates of the plans.



3. CLIMATE CHANGE IN THE JÚCAR DISTRICT



DESCRIPTION OF THE JRBA



Irregular hydrological regimes in Spain

MAIN FIGURES

Surface (km²)	42.989
Population (inhabitants)	4.742.528
Equivalent Population including tourism	571.319
Irrigated crops (Ha)	360.000
Renewable resources (cubic hectometres/year)	3.251
Superficial resources (25%)	
Groundwater resources (75%)	
Total Water Demand (cubic hectometres/year)	3.600
Urban	20%
Industrial	4%
Irrigation	76%

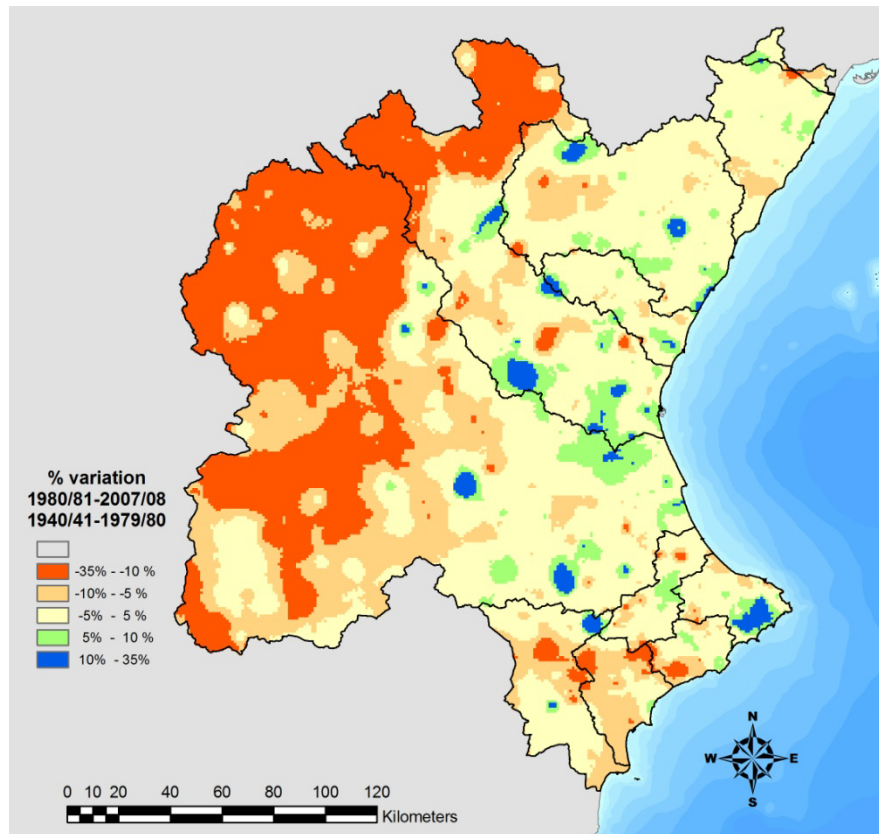


Main measures to fight water scarcity in JRBA:

- Development of water supply infrastructures
- Metering programmes of water abstractions
- Water savings and water-efficient technologies
- Joint management of surface water and groundwater
- Use of non-conventional water resources: waste water reuse and desalination

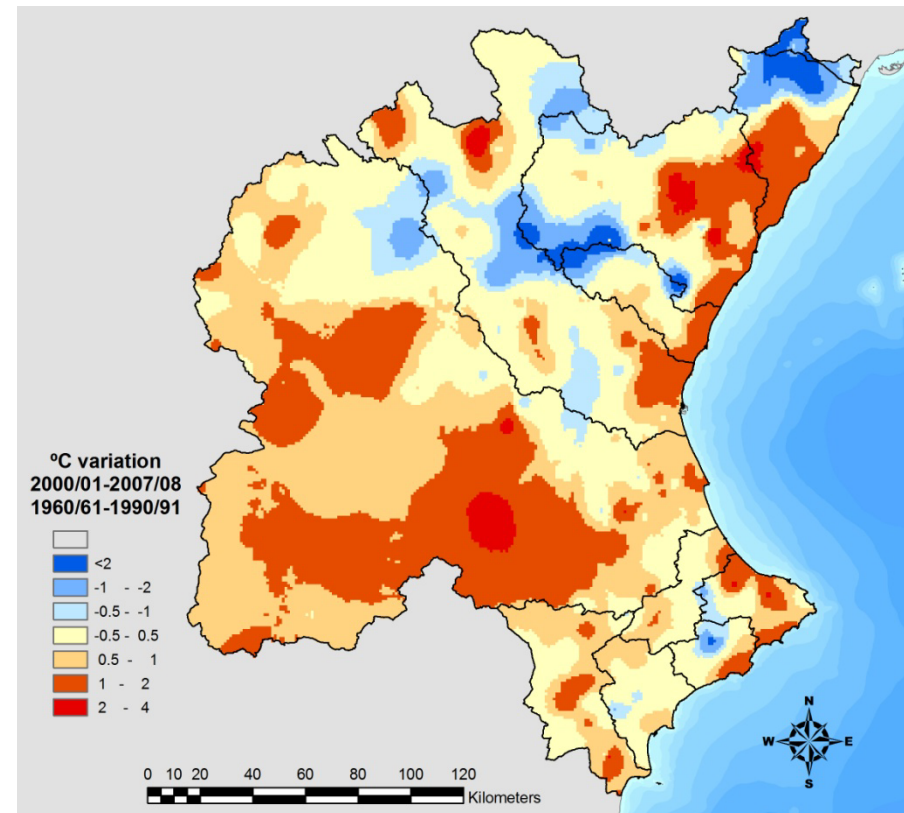


Rainfall variation at the last 30 years,
since year 1980



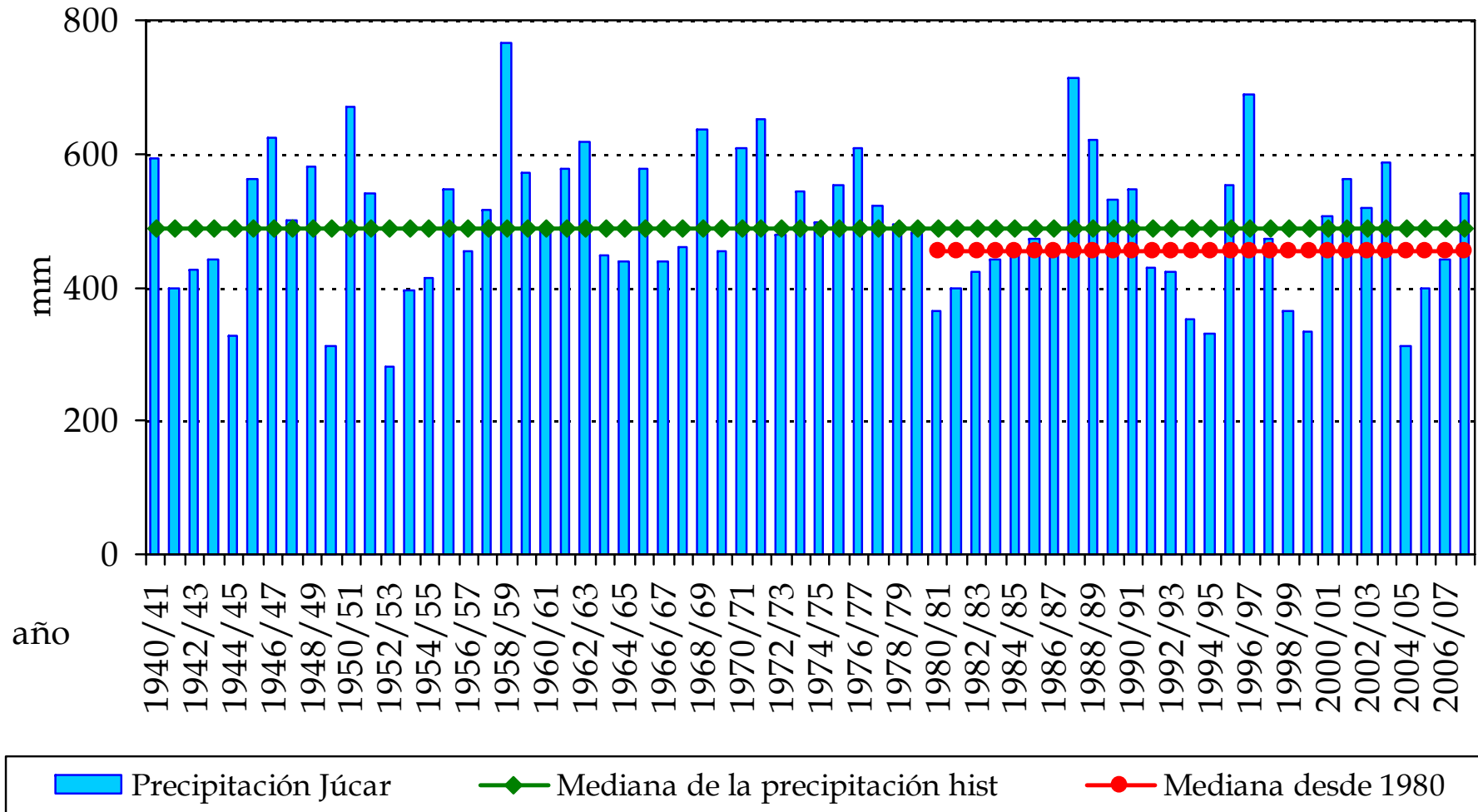
Inland moderate reductions 10-30%
Coastal weak changes

Temperature variation at the
last 10 years





RAINFALL IN THE JÚCAR SYSTEM

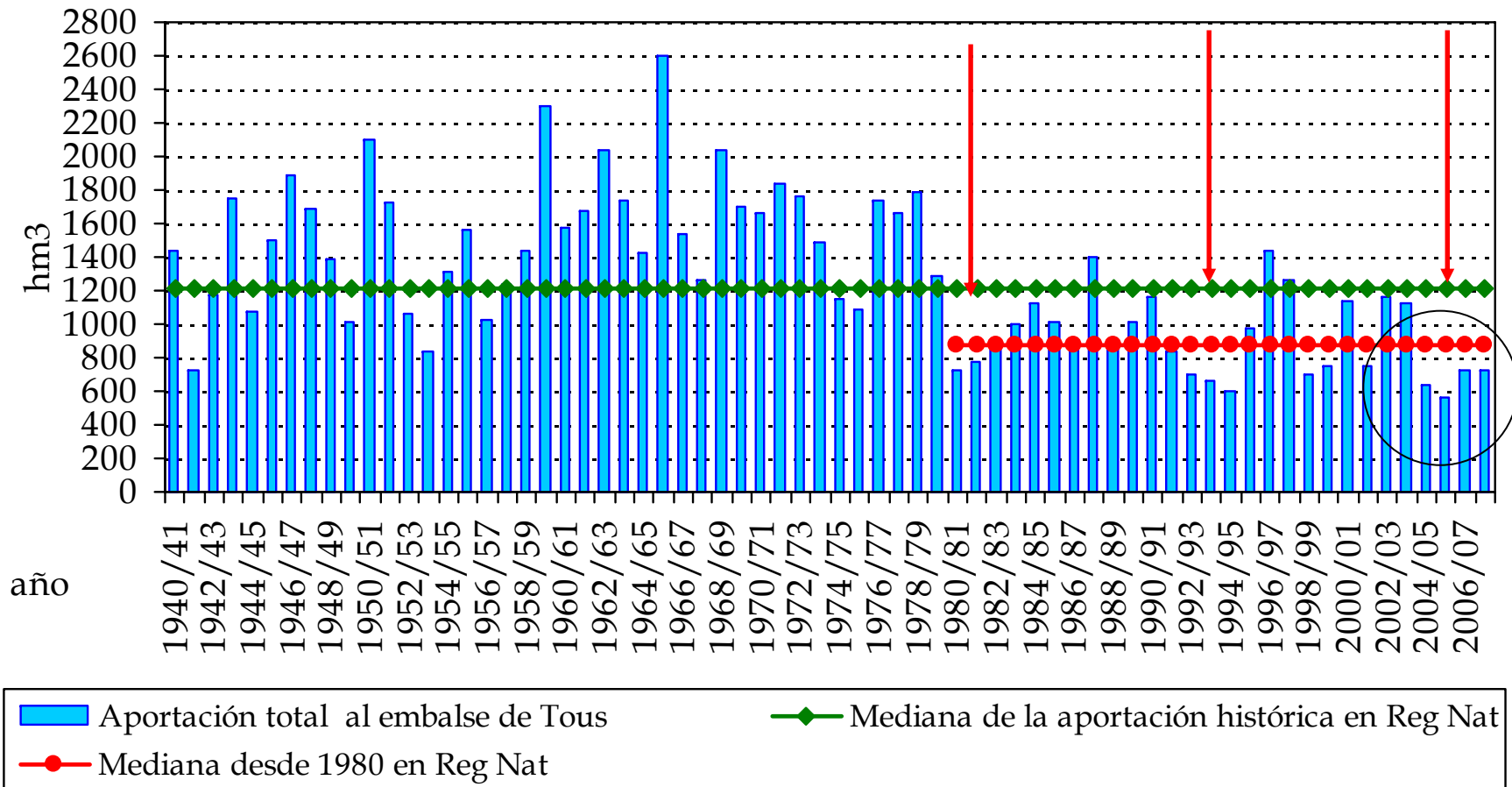


Since year 1980 moderate reduction



Natural discharge up to the Tous reservoir

Three drought periods in the last 30 years - Year 2005/06 **historical minimum** since 1940/41





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DROUGHTS IN JÚCAR DISTRICT



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Special Action Plan for Alert and Eventual Drought Situation

Drought Indicator System

Objective

Drought follow-up through an indicator system which allows the elaboration of periodic reports.

Selection criteria for indicators

- Identification of the resources origin zones associated to specific demand units.
- Higher representativeness of the resources offer evolution
 - stored volume in superficial reservoirs
 - piezometric levels in aquifers
 - rainfall in natural regime
 - pluviometry in representative stations



Special Action Plan for Alert and Eventual Drought Situation

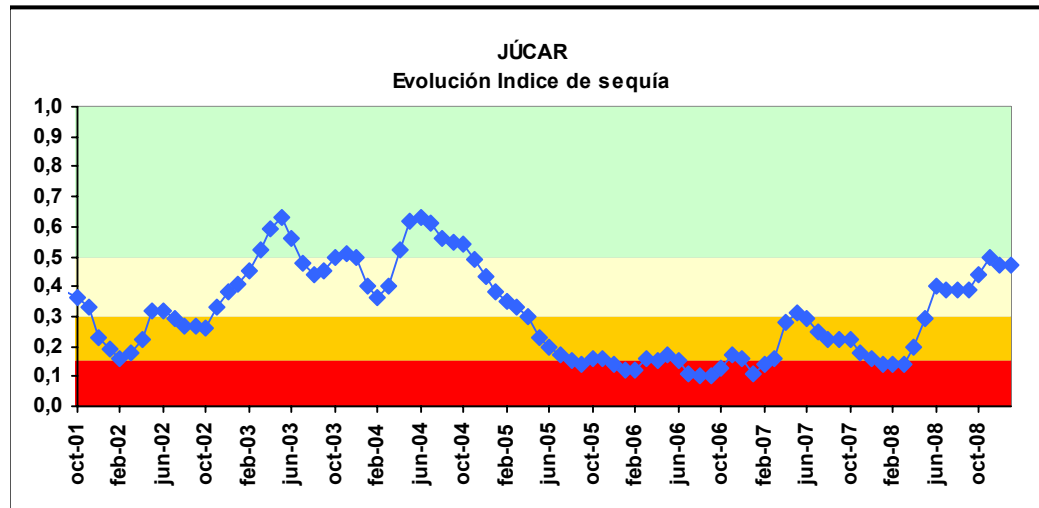
Typology of the measures to adopt

TIPOLOGÍA DE LAS MEDIDAS DE MITIGACIÓN							
Indicador	1 - 0,5	0,5 - 0,4	0,4 - 0,3	0,3 - 0,2	0,2 - 0,15	0,15 - 0,1	0,1 - 0
Estado	Normalidad	Prealerta		Alerta		Emergencia	
Objetivo	Planificación	Control-Información		Conservación		Restricciones	
Tipo Medida	Estratégicas			Tácticas		Emergencia	



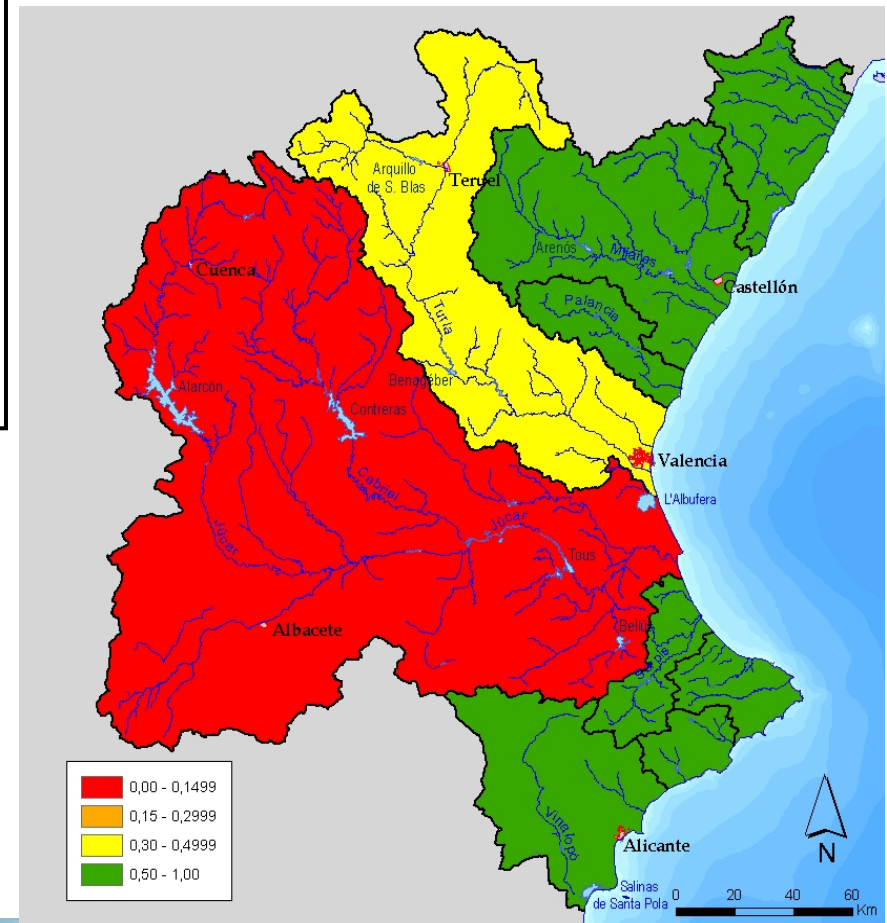
DROUGHTS IN JÚCAR DISTRICT

Special Action Plan for Alert and Eventual Drought Situation



Investment in Drought-related Emergency Works

➔ 95M€





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FLOODS IN THE JÚCAR DISTRICT



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Main Investments

<u>Name of Action</u>	<u>Budget (million €)</u>
Emergency works	45
Júcar River Global Plan	699
Poyo Basin Project	256
“Riu Sec” Conditioning Project	46



Global Flood Plan in the Júcar River





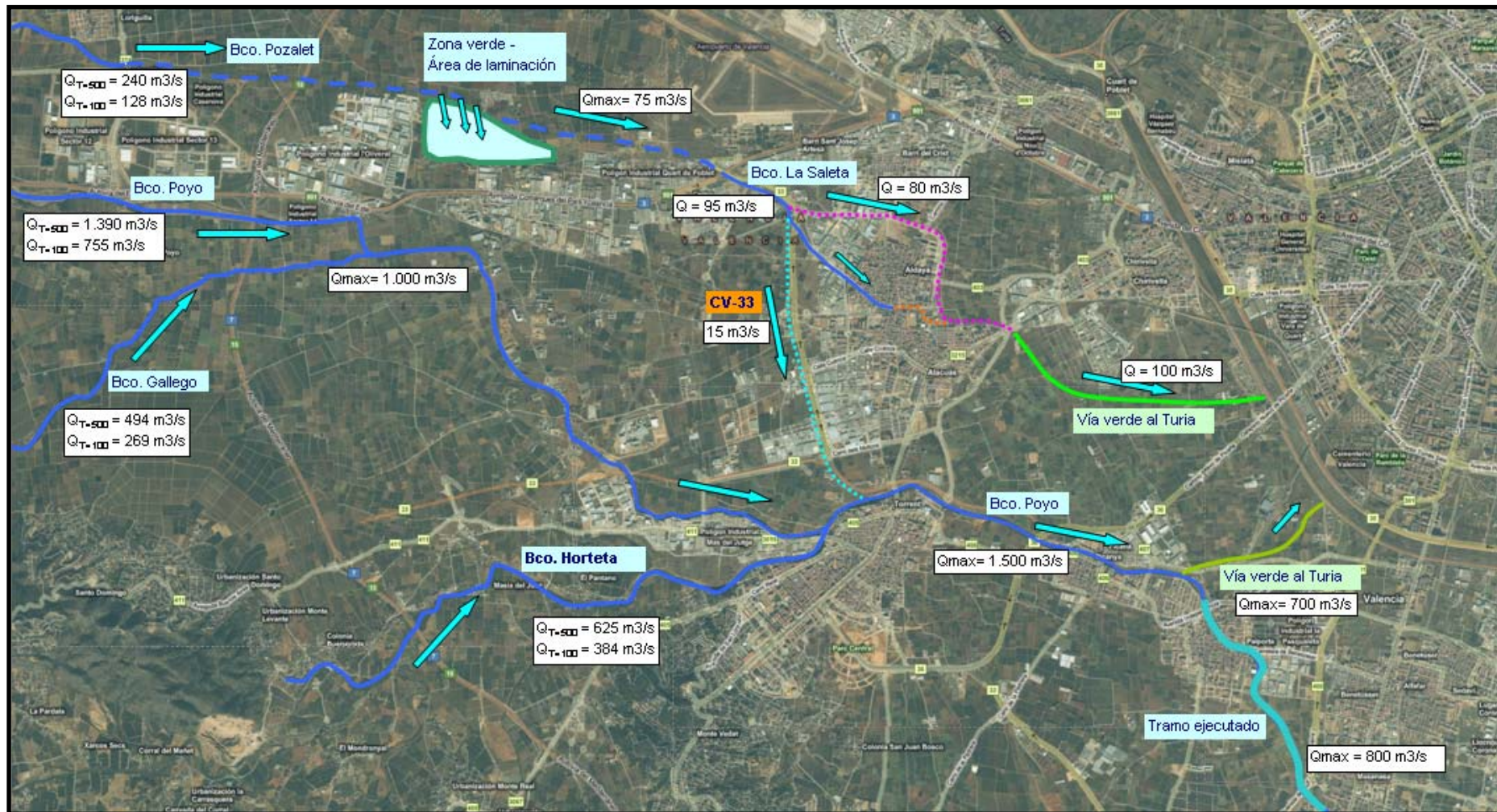
Global Flood Plan in the Júcar River

ACTION	INVESTMENT (MILLION €)	FINISHING YEAR	CURRENT SITUATION
LAMINATION STRUCTURES:	102,9		
Presa de Montesa	63,56	2014	Viability Study Elaborated.
Presa de Sellent	39,34	2014	Bidding Specifications elaboration
RIVER BED CONDITIONING	515,00	2014	Project in elaboration
HYDRO-FOREST RESTORATION	61,69	2009	In course
OTHER ACTIONS:	19,99		
Defensa de Riola	1,94	2010	Public Information
Defensa de Albalat de la Ribera	6,84	2012	Project in elaboration
Azud de la Marquesa	11,21	2012	Project in elaboration
TOTAL	699,58		



FLOODS IN THE JÚCAR DISTRICT

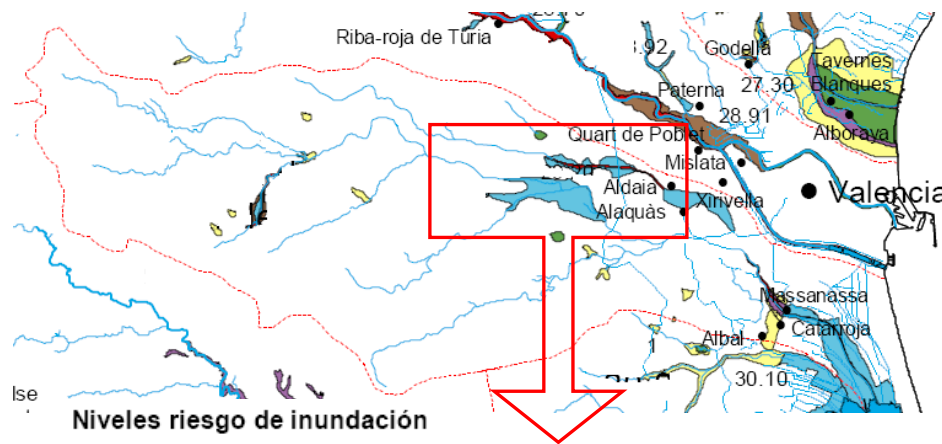
Integral Action in the Poyo Basin





Integral Action in the Poyo Basin

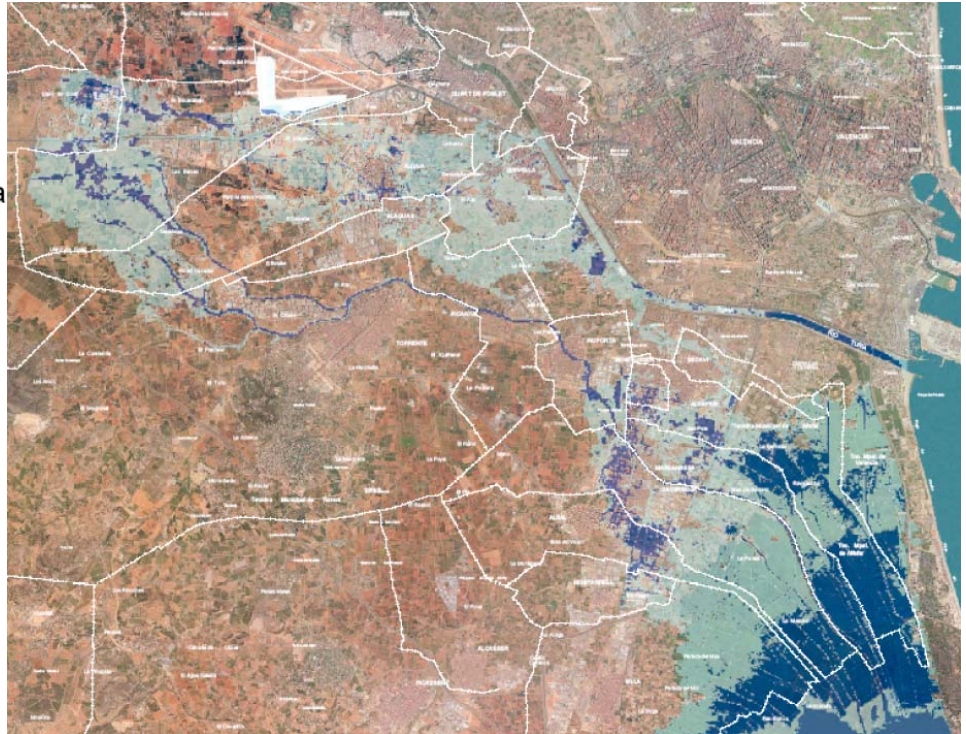
Developed studies on floods and flood risk



Niveles riesgo de inundación

- 1. Frecuencia menor 25 años; calado >0,8 m.
- 2. Frecuencia entre 25 y 100 años; calado >0,8 m.
- 3. Frecuencia menor 25 años; calado <0,8 m.
- 4. Frecuencia entre 25 y 100 años; calado <0,8 m.
- 5. Frecuencia entre 100 y 500 años; calado >0,8 m.
- 6. Frecuencia entre 100 y 500 años; calado <0,8 m.

Risk 3: frequency lower than 25 years and drenched <0,80 m



Flood Risk according to PATRICOVA

Flood studies for T= 500 years (June 2006)



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EXTREME PHENOMENA IN THE JRBA



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**THANK YOU FOR YOUR
ATTENTION!!**

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