The experience of Spain in modelling and planning for climate change impacts on water resources

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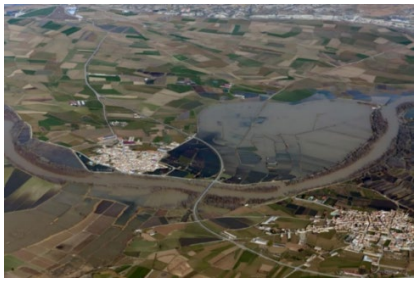
GOBIERNO DE ESPAÑA
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
CONFEDERACIÓN HIDROGRÁFICA DEL JÚCAR O. A.

A bit of context

Water demand

- Population: 45 M inhabitants + 64 M tourists.
- Irrigated areas: 3,5 M Hectares



Hydrological regime

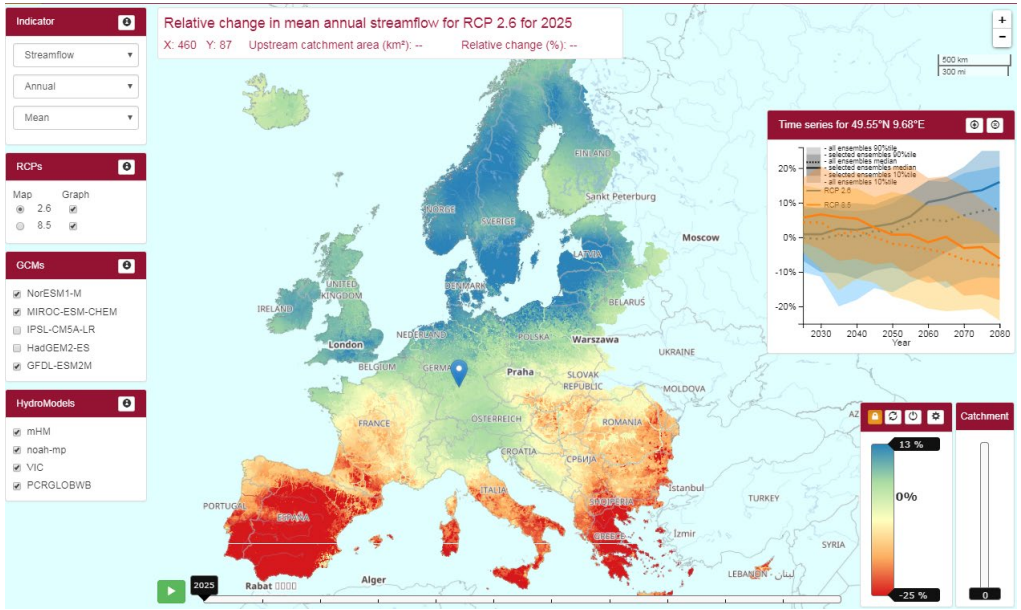
- Extremely irregular.
- Very fragile balances between water resources, water demands and environmental needs.
- Situation aggravated by climate change.

Water policies has to be developed in a climate change adaptation framework

Climate Change Impacts in EU

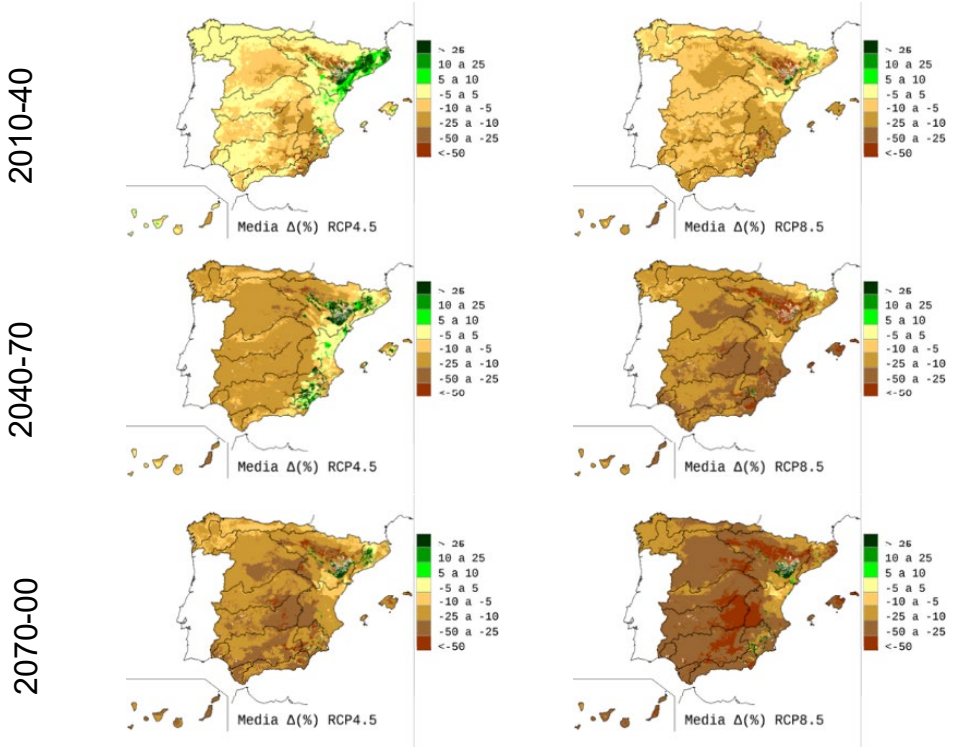
Climate and hydrological studies carried out in UE show in Spain:

- A significant reduction in water resources
- An increased frequency of droughts



Hydrological scenarios from the EU's COPERNICUS Climate Programme's EDGE project
http://edge.climate.copernicus.eu/

Climate Change Impacts in Spain



Averages changes in mean annual runoff

- Rainfall reduction.
- PET increase.
- Runoff reduction (15% - 40%).
- Frequency of droughts increased.

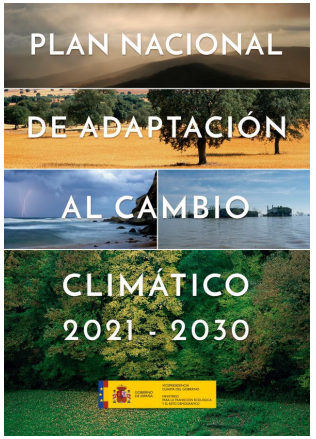
Source: CEDEX (2017). Climate Change Impact Assessment in Water Resources and Droughts in Spain.

Climate change regulation in Spain

- National Climate Change Adaptation Plan 2021-2030 (NCCAP) September 2020:

  Reducing exposure, vulnerability, and risk:

  - water resources,
  - ecosystems,
  - socioeconomic activities.



- Law 7/2021, of May 20, on climate change and energy transition.
  - Article 19. Climate Change in hydrological planning

Climate Change regulation in water planning

Hydrological Planning Regulation (RD 907/2007).

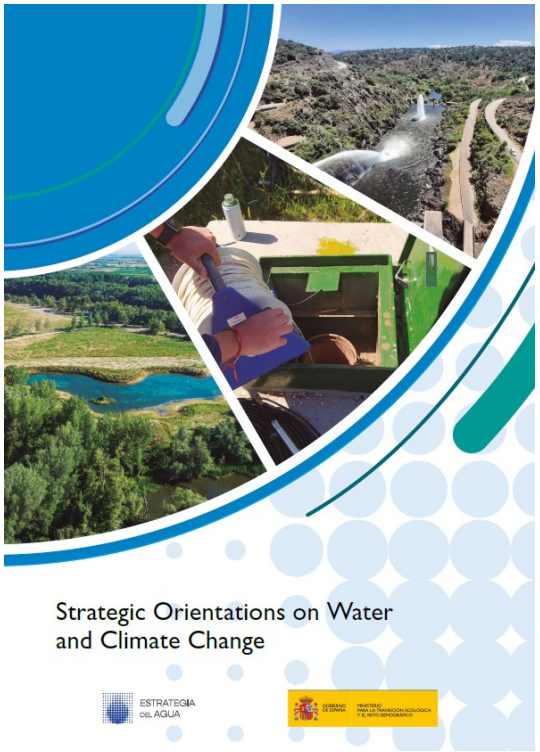
Amended by RD 1159/2021 to adapt it to Law 7/2021 on climate change and energy transition.

- Preparation of an CC adaptation study for each RBD
- Estimation of water resources for different CC scenarios.
- Water balances in each water resources system.
- Risk assessment: level of exposure and vulnerability, impact on water uses, and impacts on water bodies.

Strategic orientations on Water and Climate Change

Development of article 19.2. Law 7/2021, of May 20, on Climate Change and Energy Transition.

Approved by the Council of Ministers on July 19, 2022



Main instruments of the Strategy:

- River Basin Management Plans (February 2023).
- Drought Management Plans (public consultation completed).
- Flood Risk Management Plans (January 2023).
- National River Restoration Strategy (July 2023).
- Groundwater Action Plan (July 2023).

River Basin Management Planning (RBMP)

Objectives

- Waterbody environmental protection
- Establish water allocations for water uses

Main issues addressed

- Climate change, environmental objectives, water body status, water security, program of measures,...

- Approval new RBMPs in February 2022.

River Genil's Natural Reserve

Water resource allocations take into consideration the impacts of climate change on water resources

Drought Management

Drought Management Plans (DMPs)

Developed by River Basin Authorities

Drought Emergency Plans

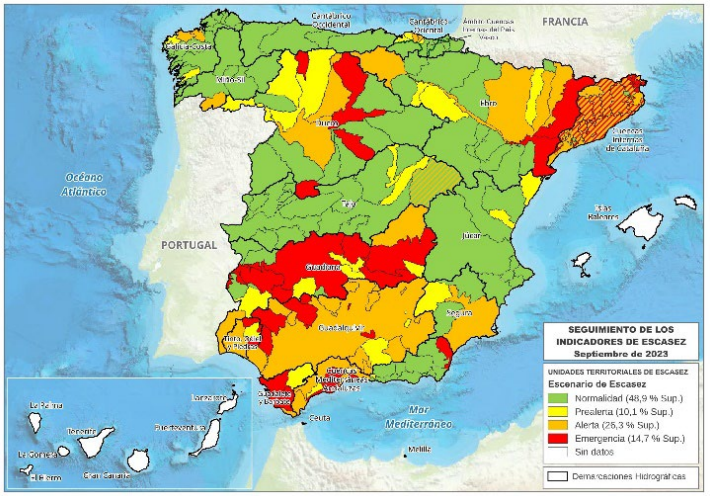
Developed for 20,000+ inhabitant populations.

Drought Observatory (in operation since 2009)

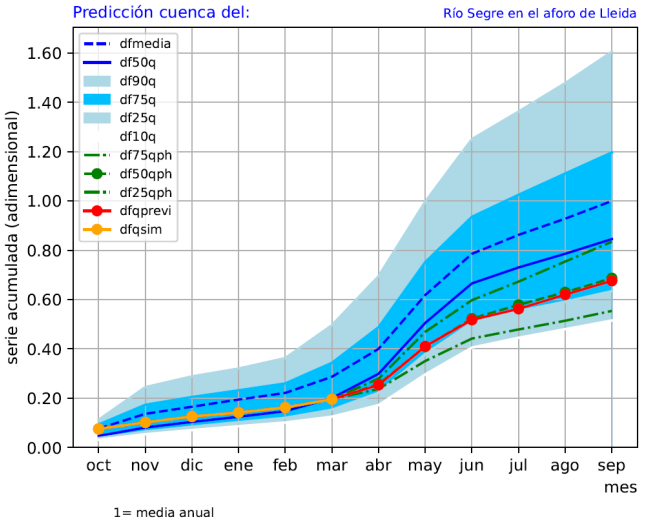
Global data system of hydrological indicators developed by the Ministry (web page)

Seasonal Hydrological Forecasting (in operation since 2023)

Seasonal hydrological forecasting for main river basins and for all RBDs (web page)

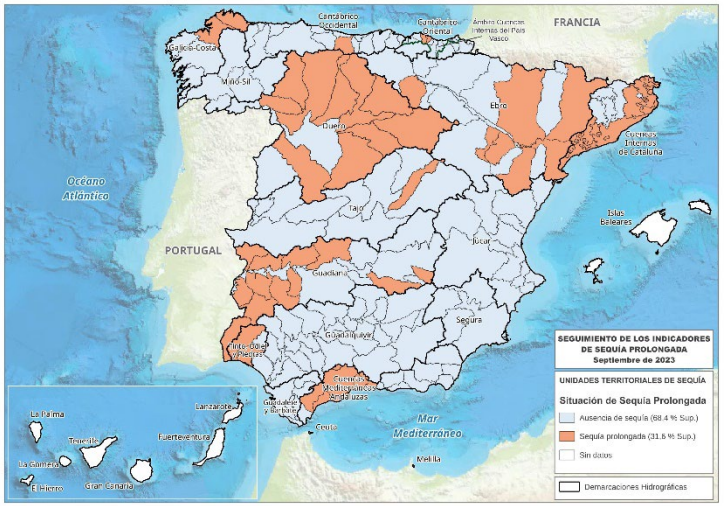


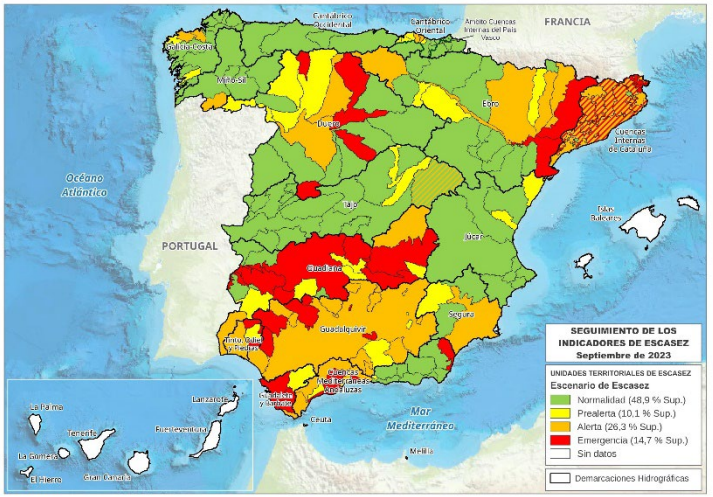
Water scarcity indicator map (September 2023)



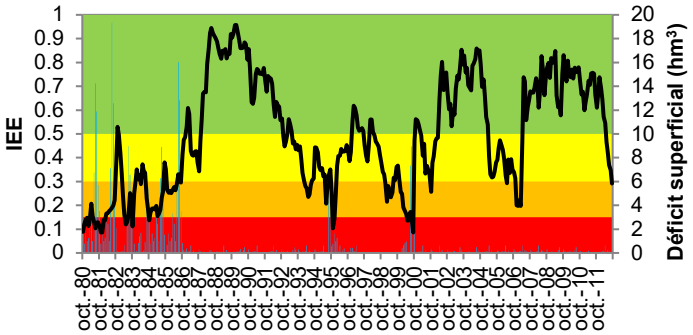
Sesonal forecasting for Segre river in Lleida

Drought Management Plans





- Objective: minimize social, economic, and environmental impacts
- A double indicator system: prolonged drought and temporary scarcity.
- Management measures: based on the status of the indicators
  - Groundwater use: dry wells.
  - Change in supply sources.
  - Reduction in supplies per unit of demand.



What's been improved in the 2nd cycle Flood Risk Management Plans (January 2023)

- Elaboration of the National Strategy for Flood Risk Communication
- Flood Risk Climate Change Adaptation Programmes
- Technological evolution of Meteorological and Hydrological Information Systems and coordination with Civil Protection
- Nature Based Solutions (NbS)
- Sediment Program
- River Restoration as part of Flood Protection Works

http://sig.mapama.es/snczi

Hazard map of the Ebro River in Zaragoza (100-year-return period)

Review of FRMP after 2024 flood in Valencia

- Maximum discharges much higher than 500-year return period flood.
- Re-think the FRMP carried out to date in these basins and in other Spanish Mediterranean basins.
- The experience of the DANA makes it advisable:
  - to consider regulatory changes in flood-prone zones and urban planning.
  - to improve early warning systems adapted to basin characteristics.
  - to promote adaptation and self-protection measures
  - need of integrate Nature Based Solutions.

Damages in the Poyo ravine in Chiva

Vehicles accumulated in Sedaví/Alfafar

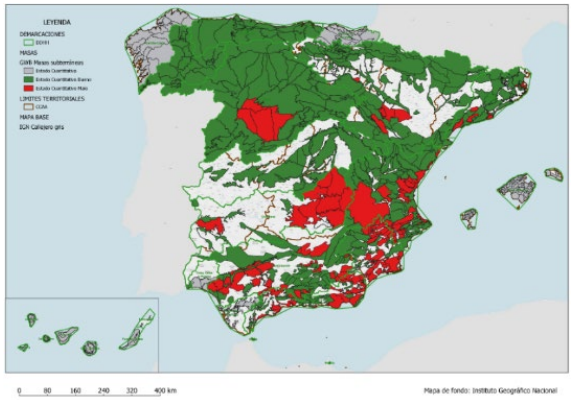
Groundwater Action Plan

2 in 5 groundwater bodies are not in good status due mainly to:

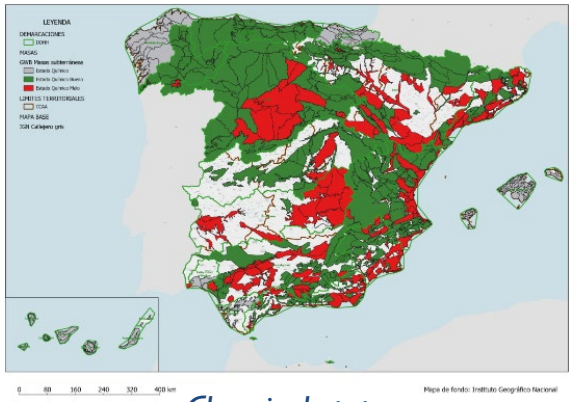
- Overexploitation.
- High concentrations of nitrates.

Groundwater Action Plan will:

- Improve knowledge: aquifer characterizations
- Extend monitoring networks
- Hydrodynamic and quality numerical models
- A better governance



Quantitative status

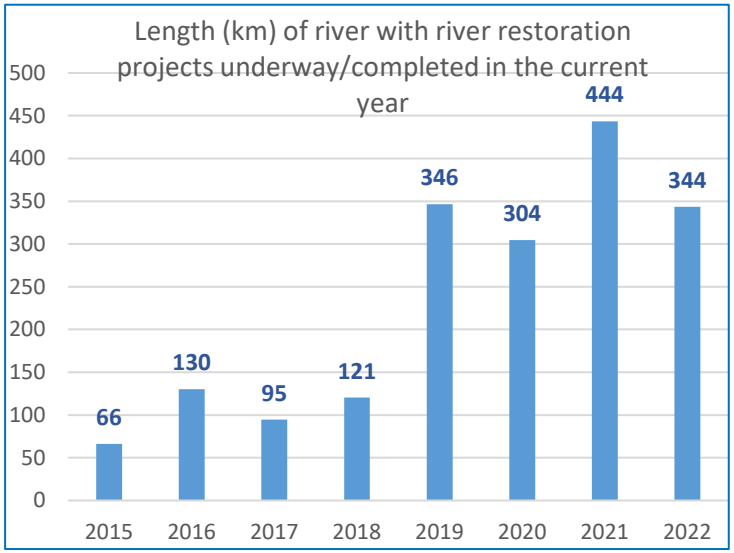


Chemical status

River restoration strategy

Objectives

- Enhance longitudinal continuity
  Removal/adaptation of obstacles
- Promote Nature-Based Solutions.
- Recover riparian vegetation.
  Shaded areas
- Re-naturalization of river in urban reaches.



Thanks for your attention