GOBIERNO DE ESPAÑA
MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

Management of Droughts: Needs of research

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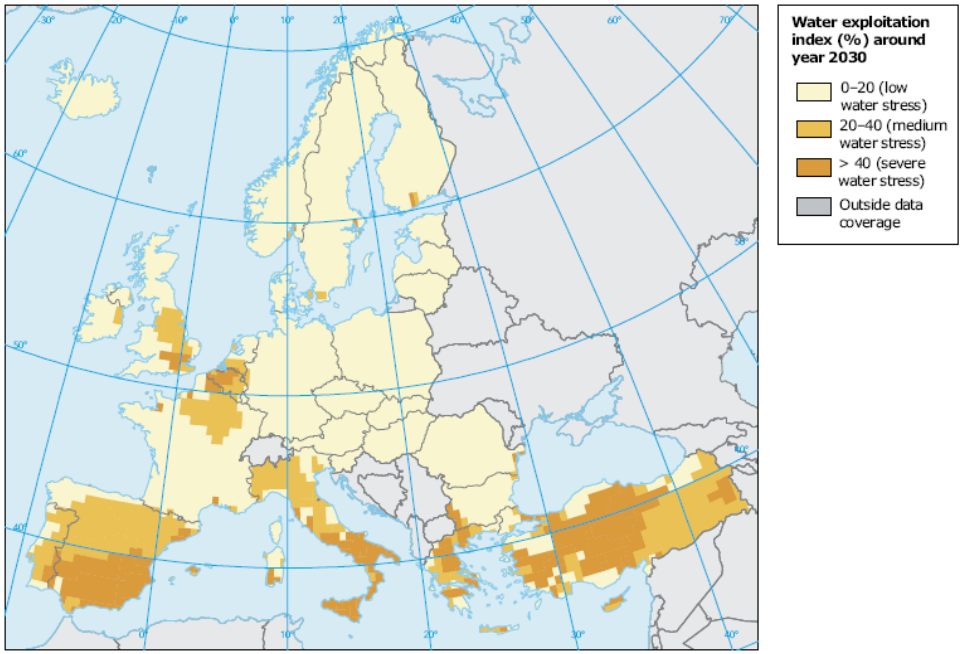
The European framework

The European framework

Impacts produced by droughts can be exacerbated in regions with imbalances between resources and water demands.



Water Exploitation index in the EU (expected for 2030). Source:EEA

The European framework

Communication on Water Scarcity and Droughts of the EC to the Council and European Parliament in July 2007.

- Recognizes the importance of both problems and the need for undertaking European actions.

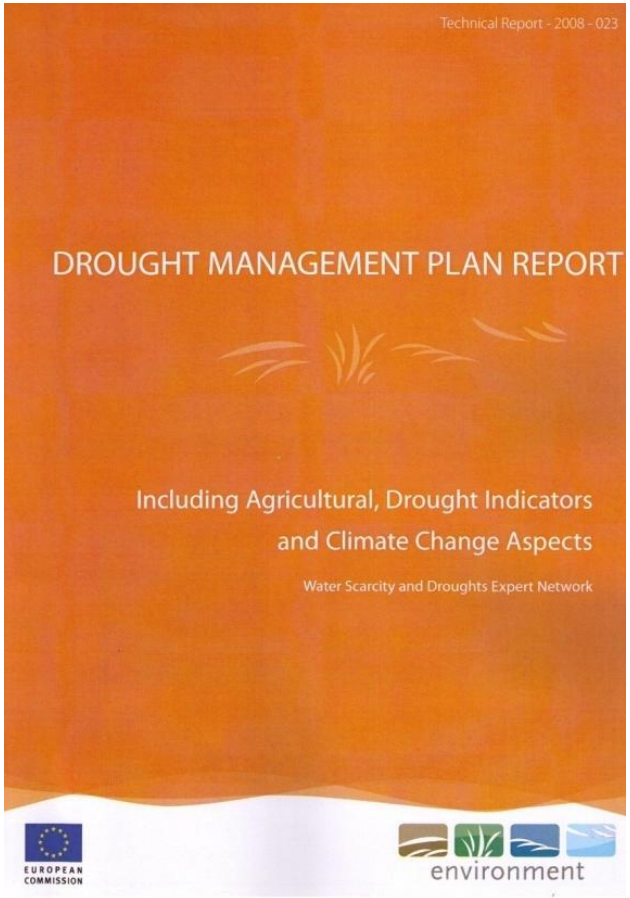
- Water saving must become the priority, and improving water efficiency must be explored prior to increasing supply.

- Lists measures to cope with water scarcity and droughts, recommends drought management plans, supports a European drought strategy, considers using European funds when suffering prolonged droughts, and proposes establishing a European drought observatory.

The European framework

- Technical report published by EC in 2007 for elaborating Drought Management Plans in the EU, supplementing River Basin Management Plans (WFD article 13.5).

- DMPs must establish measures, in accordance with indicator systems, to minimize the impacts of droughts.



Drought management in Spain

Drought management as an emergency situation

- Spain has suffered important drought periods with severe impacts on water resources and water uses.

- Traditionally, droughts have been considered as an emergency situation to be restored with extraordinary water resources and measures.

Policy bases for Drought Management Plans

Law 10/2001, July 5, of the National Hydrological Plan, establishes the bases for the drought planned management:

- The **Ministry of Environment** will establish a **global hydrologic indicator system** to foresee drought situations and to serve as general reference for the formal declaration of droughts.

- **River Basin Organizations** will develop **Drought Management Plans (DMP).**

Drought Management Plans

Objective: minimize environmental, social and economic impacts of drought situations

Entities in charge: River Basin Organizations

Contents: includes diagnosis of situation, hydrological indicator system, programme of measures and management and follow-up system.

Approval: Ministerial Order in 2007

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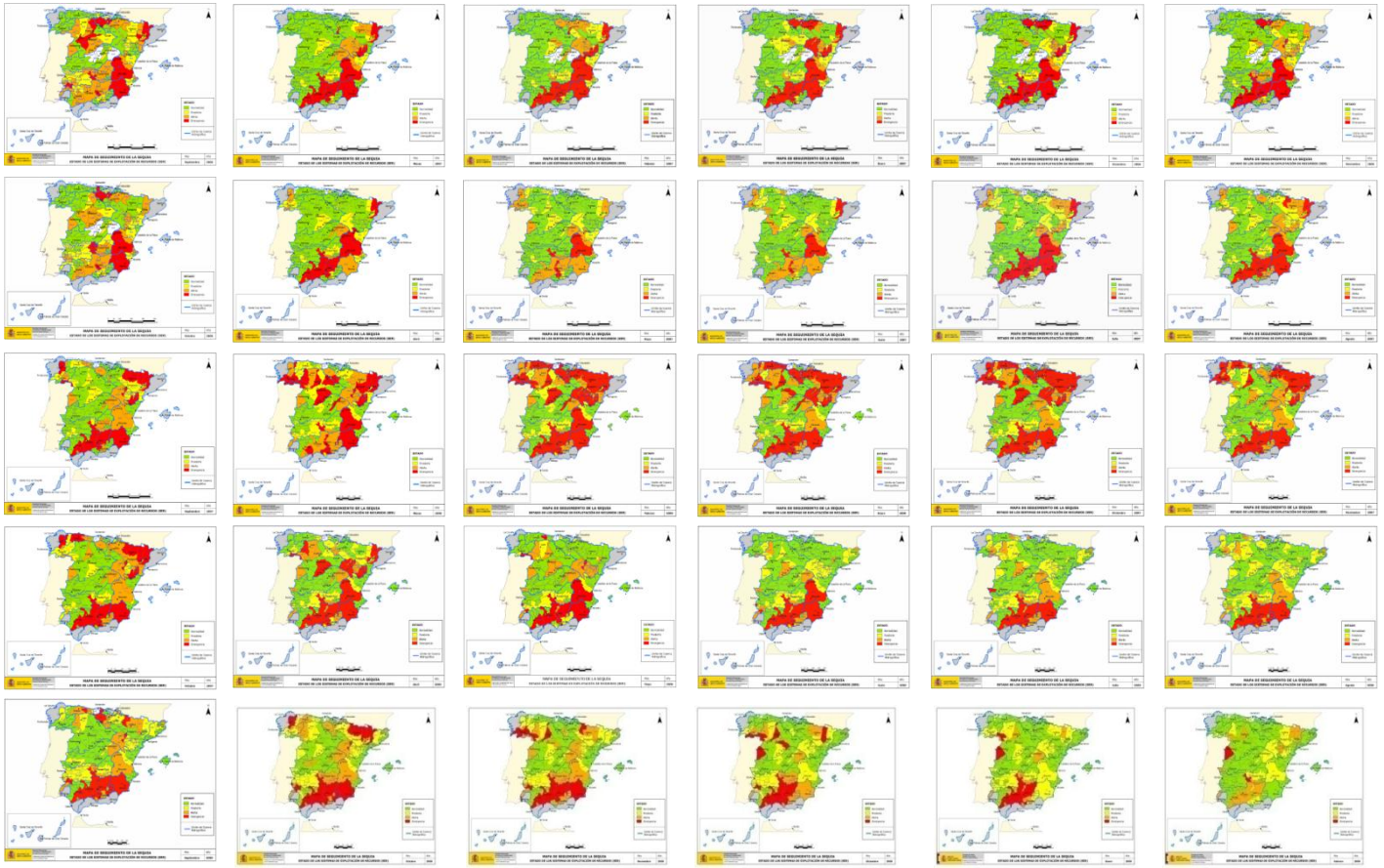
Global Drought Indicator System

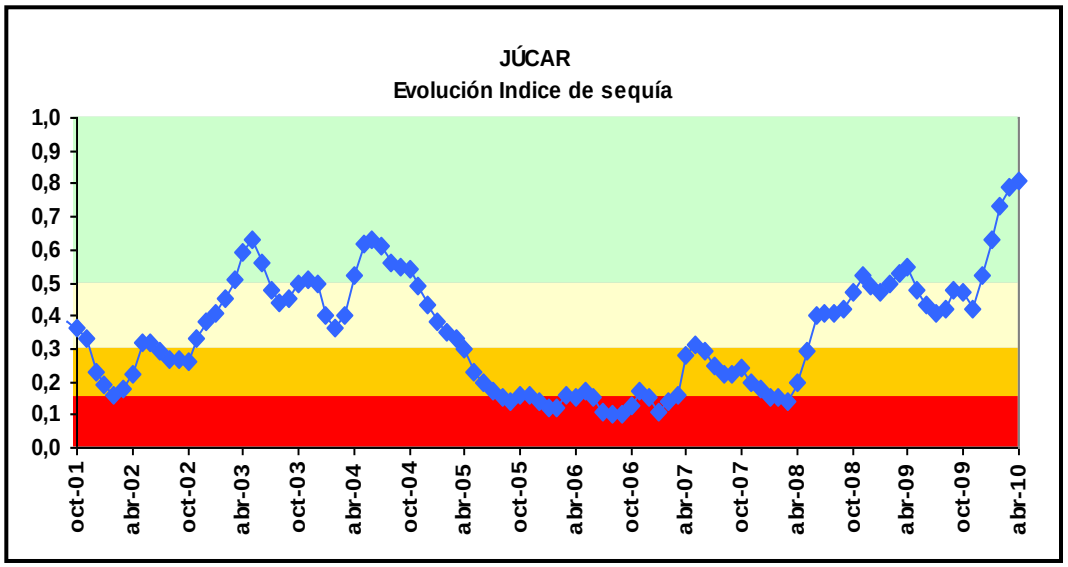
Objective

Follow-up of the Spanish water resource systems status which will be taken into account for the formal declaration of droughts and for applying measures in river basins districts



Maps are published on a monthly base since December 2005 (web page of Ministry of Agriculture, Food and Environment)

Drought Management Plans



Drought indicator system is used to activate the measures to be applied.

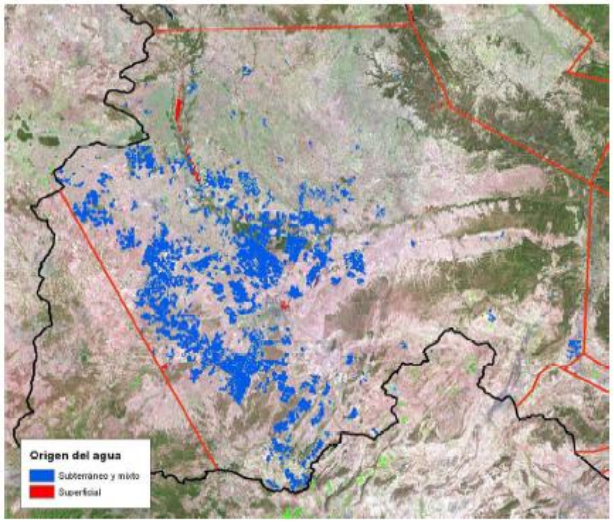
TYPE OF MITIGATION MEASURES							
Indicator	1-0.5	0.5-0.4	0.4-0.3	0.3-0.2	0.2-0.15	0.15-0.1	**0.1-0**
Status	Normal	Pre-alert		Alert		Emergency	
Objective	Planning	Information-control		Conservation		Restriction	
Type of measure	Strategic			Tactics		Emergency	

Experience gained during 2005-2008 drought in Spain

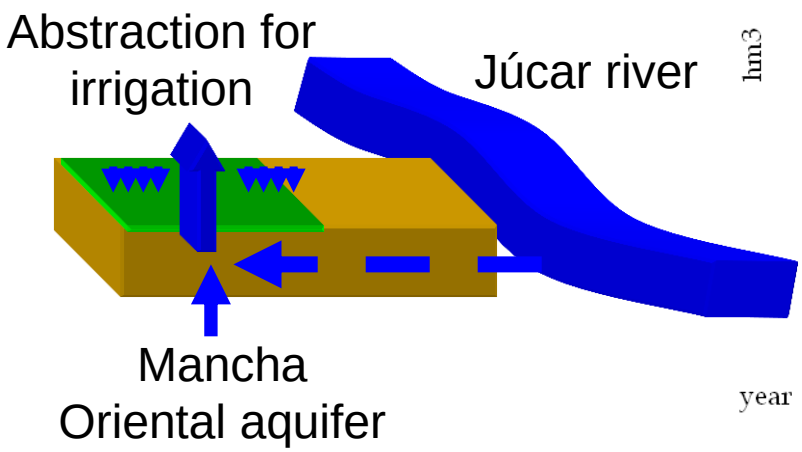
Measures applied

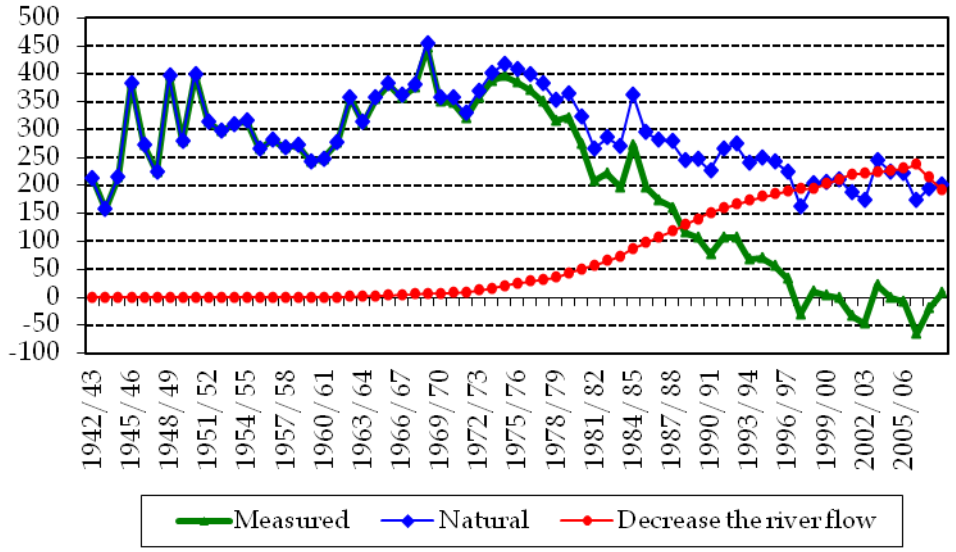
- Environmental measures
  - Control of water body status and environmental flows.
- Water use rights exchange.
  - Farmers renounced to irrigate their lands receiving an economic compensation
- Management and control measures
  - Changes in water allocations
  - Water savings and restrictions mainly in agriculture (fee exemptions)
- Investments in emergency works (charged to users):
  - New alternative water resources (emergency groundwater wells, water reuse,…)
  - Improvements in the efficiency of water resources systems

Environmental measures

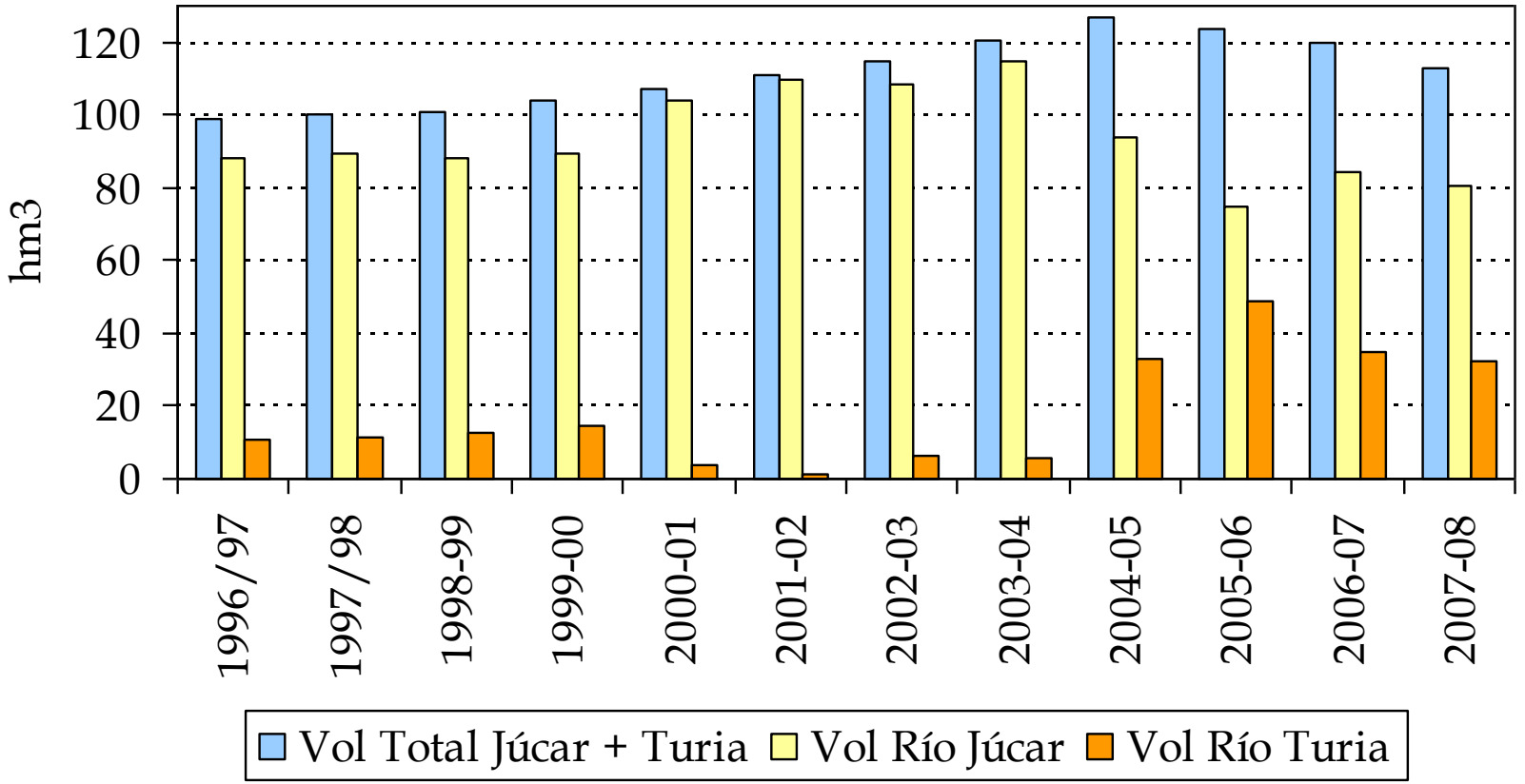


Agreement for temporal water rights acquisition (wells near the river) between Administration and users for environmental reasons in the Júcar river



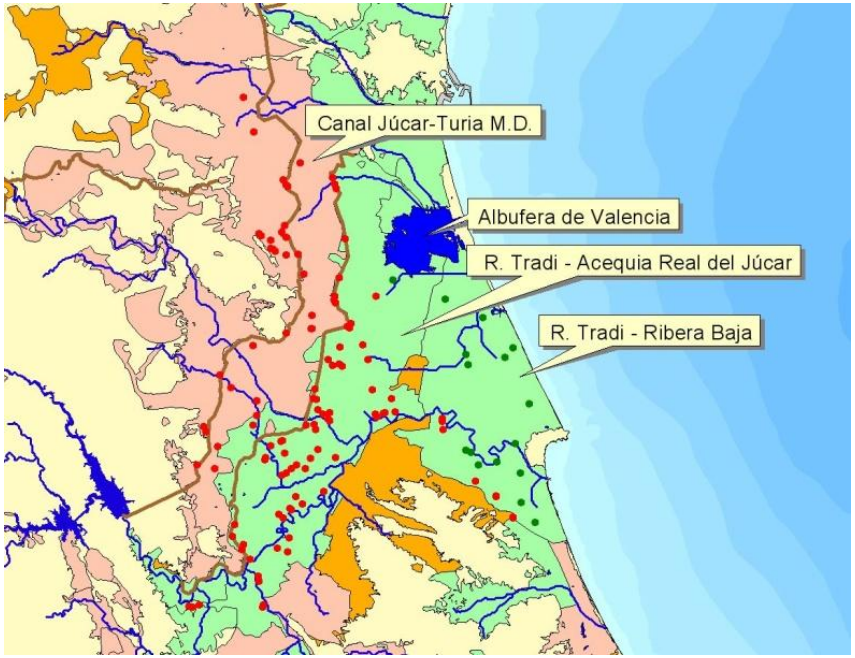


Management measures

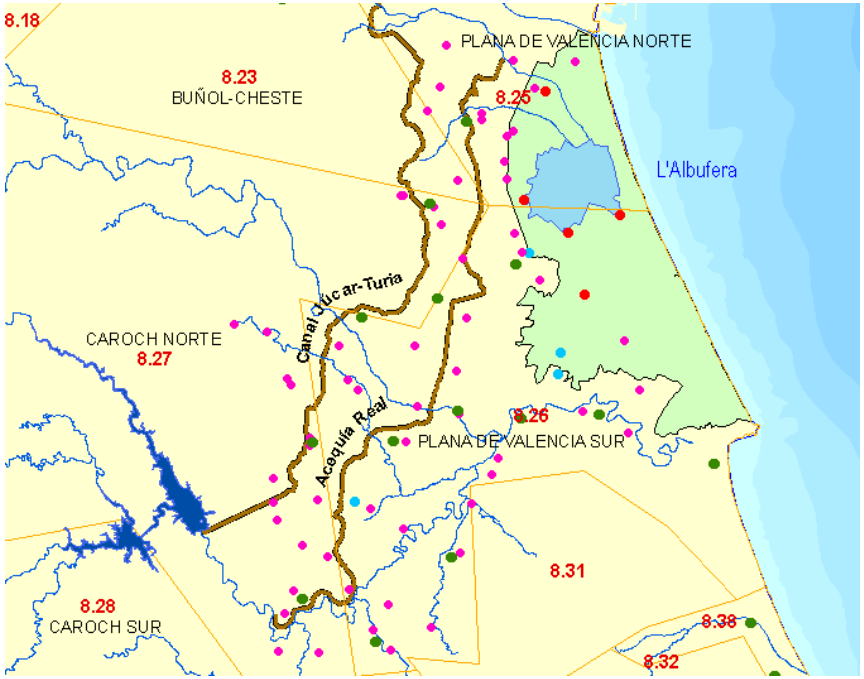


Supply for the metropolitan area of Valencia with surface water from rivers Júcar and Turia

Measures for additional resources



Drought wells for irrigation



Monitoring networks to control the possible impact of groundwater abstractions on the Albufera Lake

Experience acquired

- Drought management plans have revealed as essential tools for drought management.
- Public Water Supply restrictions did not occur in spite of being a large drought cycle of 4 years.
- Improvement of water management, coordinated use of surface water and groundwater, water markets, water saves on irrigation and improving on the monitoring networks have been key elements to cope droughts.

Needs of research

Research in drought management

- Important scientific and technical efforts in relation with droughts have been being carried out by different researchers in Europe.
- Several research projects funded by the European Union show useful results to better manage water scarcity and droughts such as:
  - ARIDE, SEDEMED, WAMME, PRODIM, MEDROPLAN, WATCH, MIRAGE, XEROCHORE and others.

Research in drought management

- Scientific and technical approaches for:
  - characterization of drought episodes,
  - development of risk indicators,
  - identification, selection, prioritizing and application of measures to alleviate the effects of droughts in the framework of drought management plans.
  - study of social, economical and environmental effects of measures.

Characterisation of drought episodes and development of risk indicators

- Studies of the incidence of drought in Europe during the 20th century based on monthly values of the Standard Precipitation Index (SPI) (Lloyd-Hughes and Saunders, 2002)
- Regionalisation and identification of droughts at pan European scale delimiting regions with a homogeneous climatic behaviour in the framework of the ARIDE project (Alvarez and Estrela, 2003)
- Analysis of trends in drought and wetness in Europe using SPI with monthly precipitation data (Bordi el al. (2009)
- Application of the Reconnaissance Drought Index (RDI) based on the precipitation to PET ratio in Europe, in the framework of MEDROPLAM and PRODIM projects (Tsakiris et al., 2007 and Vangelis, H. et al., 2011).

Characterisation of drought episodes and development of risk indicators

- Drought monitoring and forecasting are essential tools for implementing mitigation measures. Methodologies for the seasonal forecasting of SPI developed under MEDROPLAN project framework (Cancelliere et al., 2007).
- Development of methods to calculate the probability of a specific area to be affected by a drought of a given severity and thereby return periods could be assigned to historical drought events (Hisdal and Tallaksen, 2003).
- Study of the drought propagation at the catchment scale using spatially aggregated drought characteristics as part of the WATCH project (Tallaksen et al., 2009)
- Assessment of hydrological droughts using a water balance derived drought index at sub-watershed scale in Greece (Vasiliades et al, 2011).

Drought management plans

- Methodologies to link operational drought indicators to policy management actions have been developed in the Tagus River Basin Drought Management Plan in Spain (Garrote et al, 2007).
- Development of methodologies to assess alternatives that takes into account economic, environmental, and social impacts of different measures (Rossi et al., 2005).
- Methodologies for the analysis of water resources systems for designing and planning operational measures to avoid or mitigate the negative effects of droughts in the Júcar RBD in Spain the framework of the of WAMME and SEDEMED projects (Andreu and Solera, 2006).

Drought management plans

- Development of guidelines for drought preparedness plans in the framework of MEDROPLAN research project. These guidelines (2007) provide Mediterranean countries with a framework to prevent and/or minimize the impacts of droughts, promoting a risk based preparedness and mitigation approach.
- Research addressing water scarcity and droughts is covered by the XEROCHORE 7th FP that establishes the state of the art of drought related policies and identify research gaps on various drought aspects (climate, hydrology, impacts, management, and policy) and steps to fill them.
- Networking is developed e.g. the European Drought Centre and relevant research projects which include drought components such as the WATCH, CIRCE and MIRAGE projects (Quevauviller, 2011).

Conclusions

Conclusions

- Impacts produced by droughts can be exacerbated in regions with imbalances between water resources and water demands.
- Policy actions and research efforts have been carried out in European Union in the last years.
- Drought management plans can become into essential tools for drought management in European Union. The case of Spain is an example.
- Scientific and technical approaches are needed for:
  - characterization of drought episodes,
  - development of risk indicators,
  - identification, selection, prioritizing and application of measures related to indicators and
  - study of social, economical and environmental effects of measures.