Learning from the past
Evolution of drought management in the Júcar River basin

The Júcar River basin is a highly regulated basin with regard to surface waters. Thus, the main concern of the Jucar River Authority are operative droughts, those situations when water demands cannot be fully supplied due to the lack of available water, either in reservoirs or streams.

Drought cycles (meteorological and hydrological) in the Jucar river basin are identified as those series of years which start with a monthly accumulated negative SPI lower than -1.28 and a negative standardised inflow index. The cycle ends when the inflows index is positive again.

The analysis of inflow data to the main regulation reservoirs of the Júcar river system shows a sudden decrease in the annual inflow from 1980 onwards of about 500Mm$^3$/year. This lower availability of water in the river stream means that the most intense drought periods in the basin have taken place since 1980.

Characterization of past drought events in the Júcar River basin

1992-1995
- Severe drought, part of a national scale event
- Affected sectors: Agriculture, environment and energy production

2005-2008
- Severe drought, part of a national scale event
- Affected sectors: Agriculture, environment and energy production

Why were these two events selected?
- Similar severity with different solution approaches
- Different management framework with the development of a Drought Plan between both episodes

The 1992-1995 Drought

This drought episode had a higher intensity than previous episodes. Although with a lower duration, the period started with an unfavorable situation of stored water in reservoirs, due to a short wet period after the previous drought (1987-1990) which was not enough for storage levels to recover.

During the 1992-1995 drought episode, a very important reduction in runoff occurred in the major part of Spanish territory. In particular, the Jucar River basin suffered a reduction of incoming runoff of 35%. Regarding water use, the total runoff during the episode did not exceed 29% of the total existing demand.

Agriculture supply restrictions of surface water were established, although groundwater extractions helped in mitigating the effects of drought in agriculture. These extractions however resulted in a decrease of the aquifer levels, an increase of salinity in soils and in urban supply wells. Due to drought there was a decrease of cultivated area and hence a reduction of productivity and income, as well as in the tree population.

From an environmental point of view, important but of difficult economic evaluation effects were observed in the ecosystems of the Jucar River basin. There was an increase of erosion and desertification processes in the most affected regions. Drought affected wetlands, such as the Albufera, with a reduction of nesting bird species and risk of fish mortality, as well as with an increase of water salinity. A stretch of about 30 km of in the middle course of the Jucar River ran dry for 2 summer months in 1994 and again in 1995.

This drought episode made evident the necessity of developing drought plans for improving preparedness to drought and for providing instruments and measures to mitigate its effects.
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The 1st Júcar River Basin Drought-RasPI Case Study Forum meeting
28 March 2012, UPV, Valencia

The 1st Meeting among the members of the Jucar Dialogue Platform Forum took place as a pilot experience for the project Case Studies, during a General Assembly meeting.

The topics of the 1st Forum meeting were the impacts and responses of past drought events. It was attended by members of the Jucar River Basin Authority (CHJ) and representatives of the several water users in the basin such as the Municipality of Valencia, Surface and Groundwater irrigators associations (ARJ and JCRMO), and the main hydropower production company (Iberdrola). The meeting was also attended by interested parties such as the environmental NGO AGRO and the agriculture insurance company Agroseguro.

Participants presented their views on the drought management in previous episodes. Afterwards, the discussion focused on the impacts and current vulnerabilities to drought of the Jucar River basin, and on the responses to the last episodes. The main conclusions were that the existence of a Drought Plan helped very much to mitigate the effects of drought with regard to the episodes when it did not exist, but there is still room for improvement for future drought episodes.

The 2005-2008 Drought

For the Júcar River basin, the event of 2005-2008 was one of the largest magnitude droughts in recent times. The comparison between the runoff values registered during the episode and the available historical records shows that values for all four years of the episode are among the ten lowest, year 2005/06 being the year with the second lowest runoff value ever registered, after that registered in the year 1994/95.

The Drought Plan of the Júcar River Basin Authority includes the definition of a series of indicators to determine the status of the system regarding a drought episode. According to the indicators, the system entered in pre-alert in January 2005, in alert in June 2005, and in emergency in January 2006 until September 2007. The Permanent Drought Committee was established in December 2005 and was in charge of executing and monitoring the actions directed to mitigate the drought effects. The committee was composed by representatives of the different sectors involved in water management.

The measures approved to mitigate the effects of the drought episode had four different courses of action: 1) Measures for environmental protection, which had the objective of protecting river and wetland ecosystems, guaranteeing the continuity of water flow; 2) Measures for management and control, by reducing reservoir withdrawals, use of simulations models for forecasting storage evolution, assessment of risks of failures to supply, and assessment of effectiveness of mitigation measures - all this contributed to assist and improve decision-making; 3) Measures for surface water saving both in urban and agricultural uses, which reduced surface water use by about 50% in some years; and 4) Use of alternative sources and generating additional resources, which consisted in using drought pumping facilities, recirculation of irrigation return by the so-called “re-pumpings”, and reutilisation of treated and regenerated waste waters for agriculture.

Lessons learnt from the analysis of past events

With the 1992-1995 drought episode, the need of regulating the different aspects related to drought became evident, i.e., characterisation of what drought is, measures for its early detection/forecasting, mitigating actions, monitoring of the drought effects. Usually, drought periods had been managed as crisis situations and the different measures aimed to combat their effects had been devised and executed as the episode was prolonged and its effects became more severe.

Since the 2005-2008 episode, these matters began to be regulated. In a first stage, applying Action Protocols for situations of probable or existing drought and, in a second stage, elaborating and applying the Drought Plan developed for the whole of the Júcar River Basin Authority territory. The Drought Plan establishes a framework for properly monitoring and managing future pre-alert, alert and emergency situations regarding to drought episodes.

From the application of the Drought Plan in the latter years of the 2005-2008 episode, the following conclusions are drawn:

• The water management performed allowed facing an intense drought period without restrictions in water supply for human consumption and maintaining agricultural supply at a point which saved crops.

• On the other side, a system of drought indicators was developed, which will allow anticipating future drought episodes and the planning of actions and decisions of all users, within a framework of consensus and transparency.

However, no drought episode is the same as another and, therefore, drought management should incorporate some ability to adapt to the specific conditions of future episodes.