Action plan to mitigate the effects of the current drought, 2005-2007, in the Júcar River system

J. Ferrer*, M.A. Pérez, J.B. Artés***, M.A. Honrubia*** and F. Pérez****
*Hydrological Planning Department, Júcar River Basin Authority,
Av. Blasco Ibáñez 48, 46010 Valencia, Spain
**Polytechnic University of Valencia, Camino de Vera s/n, 46022 Valencia, Spain
***Technical Drought Department, c/ Ramón Gordillo 7, 46010 Valencia, Spain

SUMMARY – The hydrologic drought which began in the area of the Júcar River Basin Authority in 2004/05 and that persists up to the present day needed the introduction and, given its special intensity and persistence, the continuation of a series of emergency measures to alleviate the drought effects. The measures applied during the drought were approved in the Procedure Plan approved 13 February 2006 by the Permanent Drought Commission, and are presently included in the Special Alert and Temporary Drought Plan in the Júcar River Basin Authority (PES) and grouped in four categories, which are described in this paper.

Key words: Drought, water resources management, environment, mitigation.

Introduction

As indicated in the Special Alert and Temporary Drought Plan in the Júcar River Basin Authority (PES), approved by the Ministry of Environment order 687/2007 of 21 March (CHJ, 2007), when one or several exploitation systems are in a pre-alert scenario, the Drought Technical Department (OTS) will be constituted with the responsibility for monitoring the drought indicators in this phase. In the event the situation deteriorates further, and after passing through the alert scenario, when one or several exploitation systems are in an emergency situation, the Governing Board of the Júcar River Basin Authority will request the need for a National Decree declaring a drought situation and regulate the constitution of the Permanent Drought Commission.

In this fashion, at the end of October 2005, the Statutory Law 1265/2005 of 21 October 2005 was published in the Official State Gazette. This measure adopted exceptional administrative measures for water resources management to correct the effects of the drought in the river basins of the Júcar, Segura and Tajo. It establishes in article 2 point 3 that in order to fulfil the functions defined by the law for each governing body, a permanent commission will be formed, delegated to the Júcar, for monitoring and management of the drought.

The Permanent Drought Commission (CPS) was constituted for the first time in the month of December 2005, along the lines indicated by Statutory Law 1265/2005, for the area of the Júcar River Basin Authority, with the aid of the OTS (Technical Drought Department) in coordinating the necessary studies and works for the realization and monitoring of actions that might be taken during the Drought.

Due to the special intensity of the aforementioned drought, the CPS approved the Procedure Plan, dated 13 February 2006, for mitigating the drought effects, basing it upon the "Júcar River Basin Drought Protocol" (CHJ, 2005) (drawn for the Special Drought Plan approved 21 March 2007), which contemplates a series of actions of four types: measures for environmental protection, administrative measures for management and control, demand and supply management measures, and measures for the creation of additional resources and alternative sources. On account of the persistence of the drought in the Júcar system and its extension to the Turia system, this Procedure Plan for the mitigation of the drought effects remain in effect, renewing the actions now under way for as long as the said situation may continue.

Drought management measures

The present PES (CHJ, 2007) for the Júcar basin, like the technical guide for the publication of special Procedural Plans in stages of alert and eventual drought, published by the Directorate General for Water of the Ministry of the Environment in 1995 (MIMAM, 1995), groups the measures for mitigation of the effects of drought from the operative point of view in: strategic, tactical and emergency.

The Special Drought Plan (CHJ, 2007) includes, among its main objectives, establishing a logical sequence of inter-connected measures to be applied throughout the advance of the drought, indicating the moment they must go into effect, and quantifying the degree to which they should be applied.

The entrance of the Júcar exploitation system into the emergency scenario in September 2005 (the second month in the emergency stage), together with the approval of the Drought Decree, Statutory Law 1265/2005, in October and the constitution of the CPS on 1 December 2005, initiated the introduction of a series of procedural measures included in the Protocol for Action in situations of alert and temporary drought approved by the Governing Body of the Júcar River Basin Authority on 21 December 2005 (CHJ, 2005), the predecessor of the present PES (CHJ, 2007) and presently incorporated within that plan.

The measures that have been applied during the drought, are grouped in the following four categories: water environment protection measures, administrative, management, and control measures, water demand and saving measures and additional resource and alternative source generation measures.

Water environment protection measures

These measures have monitored the protection of the environment during this period of drought in which the water average was especially vulnerable, due to a reduction in the volumes of water in the reservoirs and the instream flow can produce a worsening in water quality or the aquatic ecosystems.

The management of water resources, and specifically the management of the reservoirs, have been carried out in a manner conditioned by maintenance of the ecologic basins at all times, with the intention of avoiding the drying of any section of the river.

(i) Monitoring the instream flow at the most serious trouble spots of the Júcar and Turia systems

In the middle section of the Júcar River, the use of underground waters from the Mancha Oriental aquifer has reduced the contributions of water that source used to produce for the Júcar river, endangering the ecological flow of the middle section of the Júcar river in drought situations (Fig. 1).

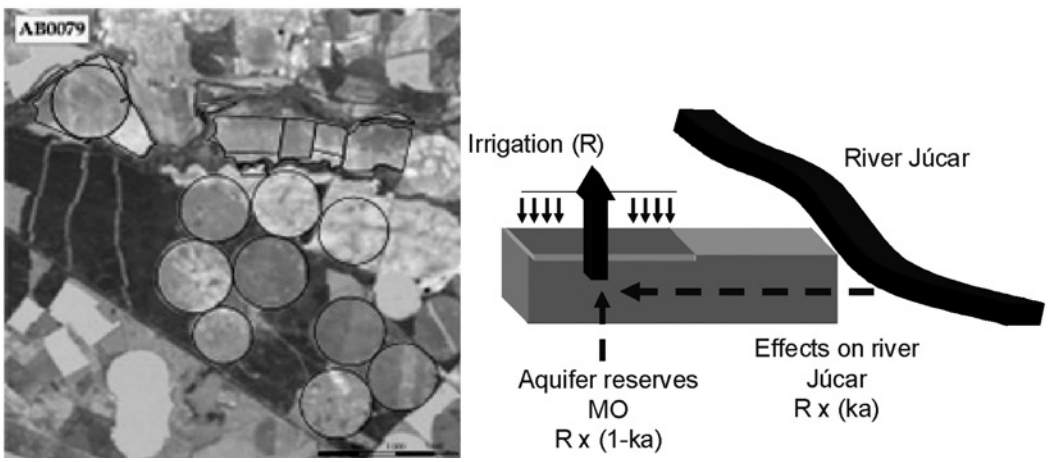

Fig. 1. Irrigation pivots with underground waters in the surroundings of the Júcar River and its effect on the river itself. Information for the CPS.

For that reason, it has been one of the points of greater monitoring in the Júcar River, since the risk existed that it might dry out in some section between the Alarcón and Molinar reservoirs, specifically at Cuasiermas, where the river did dry up during the last drought of 1994-96.

The final section of the River Júcar presented a complex challenge, due to the high number of derivations and the incorporation of water contributions, etc. It required the monitoring of water quantity as much as water quality, since the reduction in the instream flows could result in a worsening of water quality.

The lower section of the Turia, poses an array of problems similar to that of the final section of the Júcar River, and also required monitoring quantity as much as quality of the water.

(ii) Monitoring of places of special environmental value, as emphasised in the monitoring of the quantity and quality of water in the Albufera Lake of Valencia, a wetland area included in the RAMSAR list of wetlands

In the Albufera Lake, Valencia, improvement of the existing measurement networks was carried out, which allowed for the monitoring of water levels in the lake and evaluation of the water contributions it received at all times.

In addition, the monitoring of water quality in the lake was carried out, analyzing the influence of agricultural activities going on in the Nature Reserve itself or the surrounding areas.

The Spring of Massalavés, source of the Verde River, is a natural enclave particularly sensitive to drought, which is the reason why a special monitoring effort was mounted throughout the entire drought period, thus limiting any effects that might be produced.

(iii) Other specific measures

Water Rights Exchange Centre: In 2006 as well as 2007, similar public bids for the acquisition of water rights (OPAD) were offered for the middle section of the Júcar in the areas located over the Mancha Oriental aquifer, whose intention was to reduce the environmental effects that agricultural activities might produce on the water flow in the river.

Administrative, management, and control measures

The measures of management and control have pursued, among other goals, the improvement and optimization of the water resource management and the quality control of waters and the Public Hydraulic Domain.

These measures are defined according to the following classification:

(i) Water quality and control of Public Hydraulic Domain (DPH)

An increase in the physical-chemical control has been carried out and reports on the trouble spots of the Júcar River during the current drought have been produced.

The controls will be carried out by using two automatic Mobile Water Quality Stations, equipped with multi-parameter probes and three analyzers able to control up to nine variables in fifteen-minute intervals, and to transmit the data to the Water Quality and Environmental Management Department of the Water Authority to be integrated into the corresponding databases and reports.

The analytical control of spills has been strengthened, and both monitoring of DPH use and the number of sanctions have increased. Modification of the conditions set forth in the refuse dumping authorisations, Statutory Law 1265/2005, including the possibility of closure for the charge of illegal spills in collaboration with SEPRONA (Nature Protection Services).

(ii) Control and monitoring of underground water sources

The present situation of the water reserves in the Júcar RIver Basin, as a result of the lack of rain at the head of the river together with reductions in surface supply, motivated by the continuity of the drought in the present hydrological year, determines that the usual irrigation demands cannot be met by using surface waters. In those cases where it is possible, it is necessary to resort to the use of underground waters by means of the introduction of so-called drought wells, that is to say, wells that are not usually used. In situations like the present one, the organization of the river basin in question authorises and sets the conditions for their use.

The authorizations of drought wells and drought re-pumping facilities in the current 2006-2007 hydrological year have been assigned, in order to increase the guarantee for the 2007 irrigation campaign.

The CHJ and IGME (Spanish Geological and Mining Institute) decided to sign a collaboration agreement to carry out specific tasks that would allow them to know the status of aquifers impacted by the drought alleviation operations. Specifically, it concerned the realisation of general diagnostic studies centred in evaluating the initial and final status of the aquifers (Caroch Norte, Plana de Valencia Sur, Plana de Valencia Norte and Buñol-Cheste), as well as the range of actions that might arise based on the studies.

A periodic monitoring and control of variations in the piezometric level, the conductivity and the chlorides that have taken place in the aquifers has been carried out.

(iii) Control and monitoring of surface water sources

The permanent recognition of existing resources and the needs and demands of the users constitutes the first step towards guaranteeing supply and a sensible distribution. To achieve that, continuous monitoring of the variables that represent the collection of resources (the variable figure of water entering reservoirs) and of user supply (water gauge stations and extraordinary supplies) are carried out.

The daily representation of these variables, published on a weekly or monthly basis in an aggregate manner, allow us to know that the supply goals established at the beginning of the campaign are being fulfilled.

Water demand and saving measures

The saving measures applied to all the activities that we carry out imply the co-ordination of all our efforts in order to preserve a resource that is necessary for human life and economic development.

The following classifications are employed with regard to saving measures (development of measures for water saving in relation to urban and agricultural users):

(i) Savings in the urban supply

In order to communicate their findings to the Permanent Drought Commission, the OTS has regularly compiled a relation of supply data for the main urban zones that employ superficial water from the Júcar (Fig. 2).

(ii) Savings in the supply to agricultural zones

At the present time, agricultural savings constitute one of the preferred objectives in relation to the management of water resources, due in part to the high percentage of overall water use that they represent and the fact that the long-term savings that such measures facilitate justify the changes effect to otherwise unalterable uses and practices.

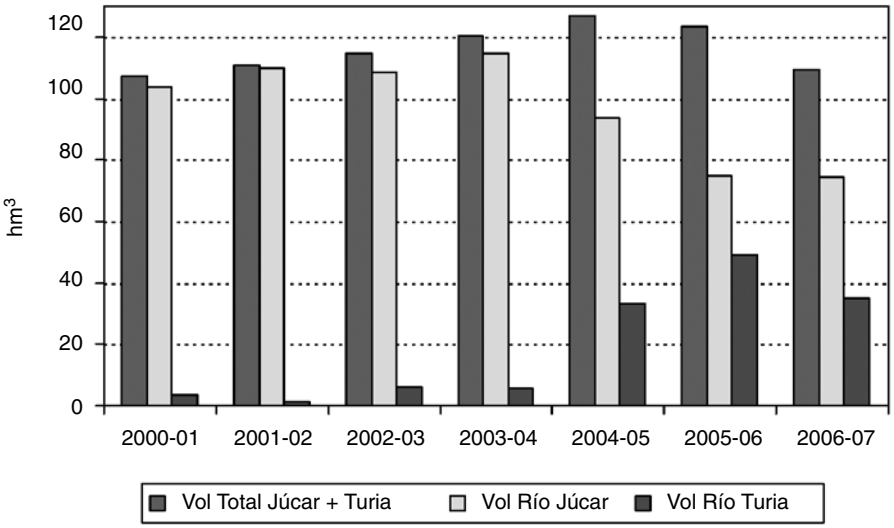

Fig. 2. Savings in the urban supply to the metropolitan area of Valencia Information for the CPS.

The Commission meeting of March 2006 saw the approval of savings of 60% with respect to 2004/05 campaign in the levels of irrigation associated to the Júcar-Turia Canal and the substitution of pumping in the Mancha Oriental Basin, and savings of 45% in relation to the traditional irrigation methods employed in the Júcar and Albacete Basins, and 43% in relation to the traditional irrigation in the Valencia area of the Júcar (Ribera Alta and Ribera Baixa)

Additional resource and alternative source generation measures

The measures regarding alternative sources and the generation of resources have been aimed at introducing and promoting the use of measures with the aim of reducing the pressure to which traditional sources are subjected, given that the increase in human activity and contamination have reduced their availability, causing loss in the quality of life and limiting productive activities and urban and rural development.

(i) Improvements in supply

These activities have been developed through the use of wells in order to supply Albacete, the adapting of the Turia output to the levels required during drought situations in relation with the Valencia supply, the introduction of an emergency supply point in the River Turia to cover the supply to Sagunto, the introduction of emergency works for the supply to Minglanilla from the Contreras Reservoir (Cuenca), the emergency repair of the Sagunto supply deposits, improvement work related to the supply infrastructure for the small villages around Alcalá del Júcar, Chinchilla, Casas de Juan Núñez, Cenizate and Valdeganga (Albacete), improvement work on the supply infrastructure in Arcas del Villar, Campillo de Altobuey, Carboneras de Guadazaón, Engídanos, San Lorenzo de la Parrilla, Las Valeras, Villar de Olalla y Villarejo (Cuenca), test drilling work, equipment and supply pipes in Iniesta and Casas de Juan Fernández, Granja de Iniesta, Pajarón, Alcalá de la Vega and El Herrumblar (Cuenca) and test drilling work, equipment and supply piping in Barrax, Casas Ibáñez, Fuente Álamo, Fuente del Pino, Higueruela, La Gineta and Pozo Lorente (Albacete).

(ii) Reuse of treated water

The quality of the potentially reusable water of the EDAR (waste water treatment plants) has been analysed and the introduction of these measures has enabled the supply to the Vega de Valencia agricultural operations to be met, thus demonstrating that the Valencia metropolitan area and irrigation communities are fully aware of the need to reuse and save water.

References

CHJ (2005). Júcar River Basin Authority Drought Protocol. Confederación Hidrográfica del Júcar, Valencia.
CHJ (2007). Special Alert and Temporary Drought Plan in the Júcar River Basin Authority (PES). Confederación Hidrográfica del Júcar, Valencia.
MIMAM (1995). Technical Guide for the drafting of Special Alert and Temporary Drought Procedural Plans. Ministerio de Medio Ambiente, Madrid.

Acronyms

CHJ, Júcar River Basin Authority (Confederación Hidrográfica del Júcar).
CPS, Permanent Drought Commission (Comisión Permanente de Sequías).
DPH, Public Hydraulic Domain (Dominio Público Hidráulico).
EDAR, Waste Water Treatment Plant (Estación Depuradora de Aguas Residuales).
IGME, Spanish Geological and Mining Institute (Instituto Geológico y Minero de España).
OPAD, Public Bid for the Acquisition of Water Rights (Oferta Pública de Adquisición de Derechos).
OTS, Drought Technical Department (Oficina Técnica de Sequías).
PES, Special Alert and Temporary Drought Plan in the Júcar River Basin (Plan Especial de Alerta y Eventual Sequía en la Confederación Hidrográfica del Júcar).
SEPRONA, Civil Guard Nature Protection Service (Servicio de Protección de la Naturaleza de la Guardia Civil).