

# Droughts management in Spanish river basins

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## Abstract:

*In this paper it will explain special actions taken in:*

*i) Geographic zoning of the river basin, essentially along the lines of Water Usage Systems, a traditional device that has been maintained in present water management legislation.*

*ii) A system of hydrological indicators for characterizing drought severity, defined in four phases which are, in increasing order of severity: normality, pre-warning, alert and emergency.*

*iii) The basic indicators are: reservoir levels, piezometric readings – which take account of aquifer reserves –, runoff data in certain parts of the system and rain gauge readings, as well as indicators of water quality or environmental effects.*

*iv) The above indicators have been grouped into different categories: by their purpose (warning, effect and efficiency indicators), type of PES measurements involved (forecasting, operating and organizational and management indicators) and by the availability of information (initial and potential indicators).*

*v) Following a similar procedure in all basins, all the drought indicators were converted into dimensionless values ranging from 0 to 1 (status index). One task – based on the analysis of historic droughts and hydrological simulation techniques – that proved to be highly complex was the definition of the "threshold values" of the indicators used to characterize drought and measure its severity. See figure below as example.*

## Legal framework

Policy development has evolved and improved through years, and focused on the concept of integrated water resources management at the river basin level.

Currently water management competencies are shared between the Ministry of Environment, the RBAs and the regional governments:

- Act 10/2001 of 5 July on the National Water Resource Management Plan establishes the grounds for planned drought management in Article 27, items 1, 2 and 3:

Item 1. For inter-regional drainage basins, the Ministry of the Environment will establish an overall system of hydrological indicators to minimize the environmental, economic and social impact of possible droughts; such indicators will be designed to foresee these situations and serve as a general reference for basin management institutions for the formal declaration of drought alert and possible drought. Such declarations will entail the entry into effect of the special Plan referred to in the following item.

Item 2. Within no more than two years of the entry into effect of the present act, drainage basin management institutions will formulate special action plans for drought alert and possible drought – hereafter PES – in the scope of the respective Water Resource Management Plans. Such plans will include system operating rules and the measures to be applied in connection with the use of public water resources. After review by each basin's Water Management Council, such plans will be submitted to the Ministry of the Environment for approval.

Item 3. The public authorities responsible for municipal water supply that individually or jointly service populations of 20,000 or more, must have a Drought Emergency Plan. Such Plans, which will be reviewed by the respective drainage basin management institution or water management authority, must accommodate the rules and measures envisaged in the special plans referred to in item 2 and must be operational within no more than four years.”

- Article 58 of the Consolidated Text of the Water Management Act – approved under Royal Legislative Decree 1/2001 of 20 July – provides, in the event of exceptional drought, for the adoption by the Government of the necessary measures to address such situations and ensure the rational use of public water resources.
- Royal Decree-Acts on exceptional emergency measures. These measures entail the declaration of the works and any probing or surveys required to conduct them as public utility endeavours for the intents and purposes of temporary occupation, expropriation of goods and rights and the urgency of such occupation.
- Directive 2000/70 OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 23 October 2000 establishing a Community framework for action in the field of water policy. Particularly relevant in this regard is its Article 4.6 on temporary deterioration of bodies of water during droughts:
  - Droughts constitute an exemption from some WFD requirements.
  - The declaration of *drought situation* must be defined in the Basin Management Plan, adopting adequate indicators.
  - Measures to be adopted in *drought situation* must be incorporated in the Programme of Measures.
  - The Basin Management Plan, once updated, will summarize the effects of droughts and measures.
  - Low water requiring crops should be applied in areas affected by droughts.

### **National strategy to mitigate water deficiencies due to droughts.**

The Ministry of the Environment has undertaken the following action to tackle this situation:

1) Institution of the Special Action Plans for Drought Alert and Possible Drought – PES – referred to in aforementioned Article 27 of Act 10/2001 of 5 July on the National Water Resource Management Plan.

2) Drafting of action protocols which, by way of preliminary drought plans that are simpler and quicker to implement, were adopted in the summer of 2005, providing management tools that served as a guide for the measures taken during the most critical months of the drought.

3) Legislative instruments such as Royal Decree 1265/2005 of 21 October passed under the provisions of Article 58 of the Consolidated Text of the Water Management Act, adopting exceptional administrative measures for water resource management to palliate the effects of the drought in the Júcar, Segura and Tagus River basins. Royal Decree 1419/2005 of 25 November was enacted for the same purpose in the Guadiana, Guadalquivir and Ebro River Basins.

4) Institution of Emergency Plans in towns and cities with a population of over 20,000 and promotion of a technical guidebook for the formulation of such plans.

5) Periodic updates on drought reports to adopt the most suitable measures at any given time.

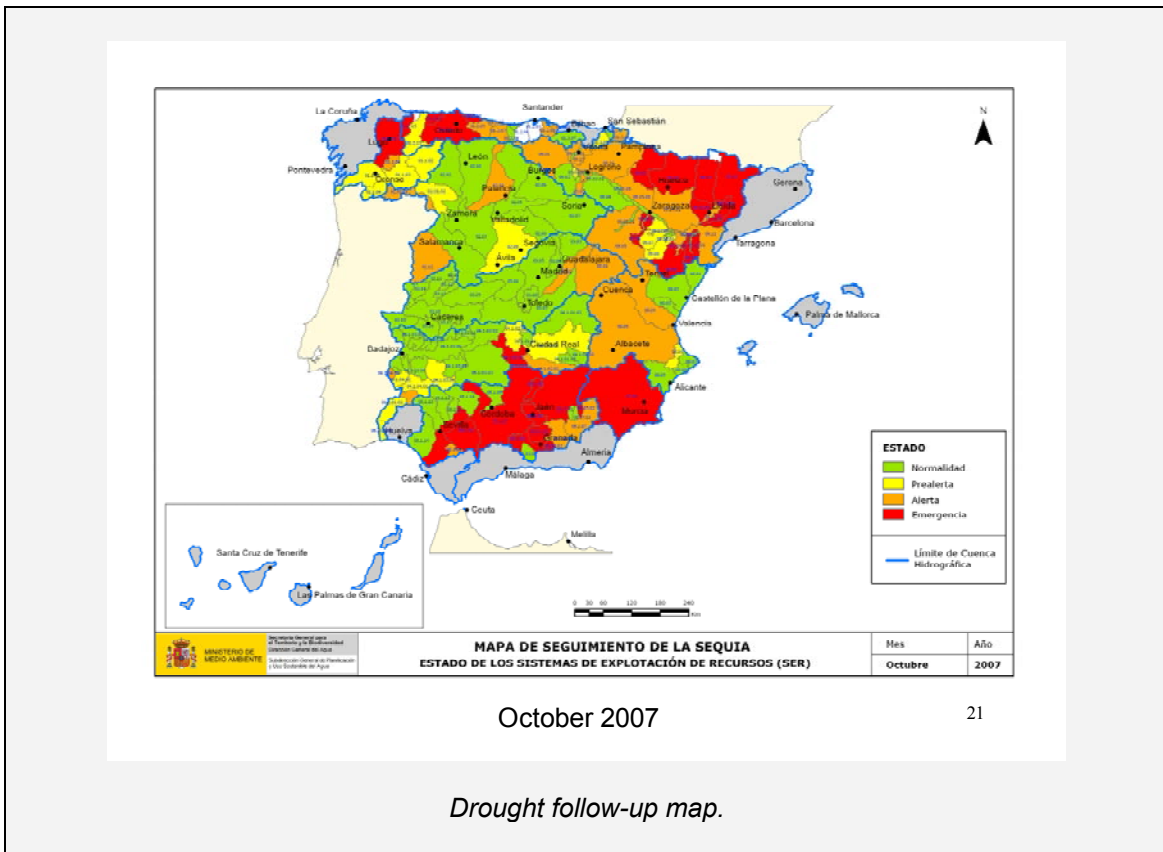
6) “Zero” tolerance for discharges as a way of directly encouraging the elimination of focal points of pollution, to which the water environment is especially sensitive during droughts.

7) Launch of emergency works and actions where supply – particularly municipal supply – failures were clearly foreseeable. By the end of May 2007, Ministry investment in emergency works underway to mitigate the consequences of the drought amounted to over 653 million euros.

### Use of climate and meteorological information, prediction systems and monitoring to mitigate droughts effects

The Special Action Plans include:

- i) Geographic zoning of the river basin, essentially along the lines of Water Usage Systems, a traditional device that has been maintained in present water management legislation.
- ii) A system of hydrological indicators for characterizing drought severity, defined in four phases which are, in increasing order of severity: normality, pre-warning, alert and emergency.
- iii) The basic indicators are: reservoir levels, piezometric readings – which take account of aquifer reserves –, runoff data in certain parts of the system and rain gauge readings, as well as indicators of water quality or environmental effects.
- iv) The above indicators have been grouped into different categories: by their purpose (warning, effect and efficiency indicators), type of PES measurements involved (forecasting, operating and organizational and management indicators) and by the availability of information (initial and potential indicators).
- v) Following a similar procedure in all basins, all the drought indicators were converted into dimensionless values ranging from 0 to 1 (status index). One task – based on the analysis of historic droughts and hydrological simulation techniques – that proved to be highly complex was the definition of the “threshold values” of the indicators used to characterize drought and measure its severity. See figure below as example.



## **Emergency systems on drought period and their integration in water management**

The measures can also be grouped in accordance with the following criteria:

A. Forecasting measures, which include:

A.1. Forecasting the onset of droughts, consisting in the definition and monitoring of the respective indicators.

A.2. Establishment of strategic reserves (reservoir volumes, reserves in aquifers, desalination and so forth) for use in drought situations.

B Operational measures to adjust supply and demand, which include:

B.1. Measures to attenuate demand (public sensitization, modifications of security of supply, use restriction – type of crop, irrigation methods and recreational use –, penalization for unjustifiably high consumption and so forth).

B.2. Measures to increase water supply by implementing infrastructural solutions (mobilization of strategic reserves, resource transfers...)

B.3. Combined supply/demand management (modifications in supply priorities, supply restrictions, authorization of right of use trading and so on).

C. Organizational measures, which include:

C.1. Designation of persons responsible and establishment of organizational structures for implementation and monitoring.

C.2. Coordination among public authorities and the public and private organizations involved in the problem.

D. Measures to monitor plan implementation and its effects (monitoring indicators relating to implementation, effects and attainment of objectives).

E. Coordination measures, with guidelines and standards to be followed in emergency municipal supply plans.

## **Conclusion**

Under these criteria, in this paper it was explained special actions taken in measures characterized as:

- Essentially management measures, not generally calling for works or infrastructures.
- With the exception of forecasting measures (monitoring of alert indicators and maintenance of strategic reserves), all the others are temporary measures to be adopted when drought occurs and after it subsides.
- Mitigation measures are applied progressively, establishing thresholds for application or intensification of measures as the drought grows more severe.