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Strategic Environmental Assessment of the Special Plan of Action in Situations of Warning and Eventual Droughts of the Tagus River Basin

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SUMMARY – In accordance with Article 27 of the Spanish Law 10/2001, where the National Hydrologic Plan is passed, the Spanish Tagus River Basin Water Organism devised, during the period of 2005-2007, the Special Plan of Action in Situations of Warning and Eventual Drought of the Tagus River Basin (Special Drought Plan-SDP). Simultaneously, in application of the European Directive 2001/42/CE, (SEA Directive) and the national Law 9/2006 on the assessment of the effects of certain plans and programmes on the environment, a Strategic Environmental Assessment (SEA) was carried out, identifying, describing and assessing the possible significant effects on the environment of the application of the Special Drought Plan. The aim of this Strategic Environmental Assessment is to obtain an environmental integration of the SDP of the Tagus River Basin, taking into account both environmental and territorial objectives by using different instruments of assessment via an environmental diagnosis, so in the end, a programme of measures of effective integration can be recommended.

Key words: Application of SEA Directive, drought, Strategic Environmental Assessment, Special Drought Plans, Tagus River Basin.

Special Plan of Action in situations of warning and eventual droughts of the Tagus River Basin – Special Drought Plans (SDP)

During the period 2005-2007, the Tagus River Basin Water Organism, under the guidelines of the Spanish Ministry of Environment (OM/628/2007), elaborated the Special Plan of Action in situations of warning and eventual drought (SDP) in compliance with the art 27 of the Law 10/2001 and also, in order to meet the requirements of the European guideline, the Water Framework Directive (Directive 2000/60/CE- WFD), which promotes a sustainable use of water, based on the long-term protection of the available resources, that will serve to lessen the effects of droughts (Soriano and Garrote, 2007a)

The importance of elaborating these Special Plans is based not only under legal request, but on periodical drought situations that Spain has suffered with huge socioeconomic and environmental consequences. It is therefore of high importance, to have an instrument to identify this phenomenon, and to develop a decision-making tool so prevention measures and mitigation instruments can be implemented with the fewest damages.

Precisely, in the Tagus River Basin, episodes of drought of high repercussion have occurred within its territory, where there are references since Prehistory. According to Diodoro Siculo, Garibay and other old historians a great drought depopulated the Iberian Peninsula, passing from a drought in the year 224 BC with a duration of 26 years, to the last main registered droughts 1943-44 and 1944-45 (2 years); 1979-80 to 1982-83 (4 years); 1990-91 to (5 years) and 2004- present time (OPH, 2002).

The main objective of this Special Drought Plan of the river Tagus Basin is to minimize the damages in their social, economic, and environmental aspects caused by droughts. This objective is gained, through some specific objectives, such as guarantee of availability of required water to assure the health of the population; minimization of droughts negative effects on the ecological status on the water bodies, especially on the state of ecological volumes avoiding permanent effects to the associated aquatic ecosystem; reduction of the negative effects on the urban provision, and the reduction of

negative effects on the economic activities according to the established priorities of uses related to water.

To comply with these specific objectives, mechanisms for the forecast and detection of the droughts were needed to be defined; settlement of thresholds to determine the worsening of the situations of drought; and definition of the programme of measures to obtain the specific objectives in each phase, and to assure the transparency and public participation during the development of the plans. See Figs 1 and 2.

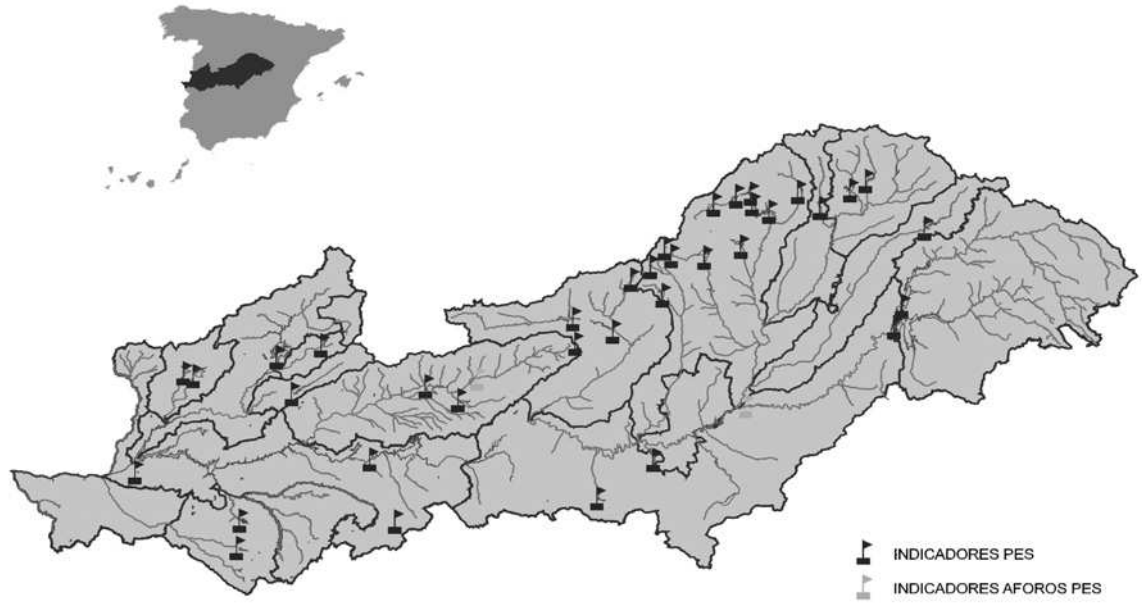

Fig. 1. Thresholds-indicators within the Tagus River Basin.

STATE OF DROUGHT	NORMAL	PREALERT	ALERT	EMERGENCY
OBJECTIVE	PLANNING	CONTROL - INFORMATION	CONSERVATION	RESTRICTION
MEASURES	STRATEGIC		TACTIC	EMERGENCY

Fig. 2. Links between thresholds and associated measures defined by the SDP.

Procedure of the Strategic Environmental Assessment of the Special Plan of Action in situations of warning and eventual droughts of the Tagus River Basin

Meeting the requirements of the European Directive 2001/42/CE, (SEA Directive) and the national Law 9/2006 on the assessment of the effects of certain plans and programmes on the environment, a Strategic Environmental Assessment was carried out for the Special Drought Plan.

Basic objectives and methodological procedures of the Strategic Environmental Assessment of the SDP of the Tagus River Basin

The Strategic Environmental Assessment (SEA) suggests main objectives in order to obtain an environmental integration of the SDP through out the process of elaboration and application by making use of some instruments of evaluation and environmental diagnoses. These objectives are: (i) to devise a diagnosis of the environmental effects of the SDP that will allow adoption of a decision on their acceptability; (ii) to propose a programme of measures and recommendations to integrate in an

effective way the environmental dimensions in the design of itself; (iii) to verify that a system of monitoring of the compliance of objectives and measures are included, and when needed, to adopt complementary measures; and (iv) finally to verify the transparency and good public participation through out the process.

The methodological process of this SEA was based on carrying out the following instruments of evaluation: (i) analysis of the plan; (ii) analysis of the diagnosis; (iii) analysis of the objectives, analysis of the programme of measures; (iv) analysis of the system of management; (v) analysis of the monitoring program; (vi) recommendations for environmental integration; (vii) summary of the information of the environmental report; and (viii) report on economic viability of the measures.

Process of Strategic Environmental Assessment

Following the guidelines proposed by regulations, in March of 2006 (see Fig. 3), the Water Organism of the Tagus River Basin (Development Body), edited the Initial Document that followed the communication of the beginning of the drafting of the Special Drought plan to the Environmental Body of the Ministry of Environment (Soriano and Garrote, 2007b) In July of 2006, the Ministry of Environment, devised the Document of Reference, and in November of 2006, the planning Development Body edited the Environmental Report, under the guidelines of the Environmental Body. A period of public consultation was established, required also by the Directives 2003/4/CE and 2003/35/CE, and the Spanish Law 27/2006 of access to environmental information. In February 2007 the Tagus River Basin Water Organism remitted to the Ministry of Environment a Synthesis Document with all allegations from the public consultation and jointly the Ministry of Environment and the Water Organism devised an Environmental Memory, where the result of the public consultations were evaluated and the forecast of the significant impacts of the application of the SDP were assessed.

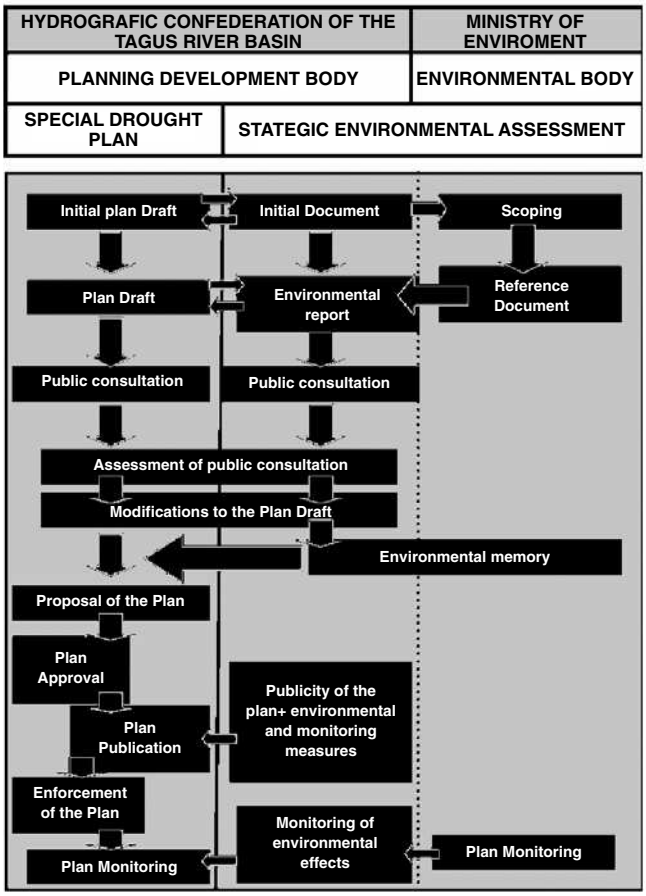

Fig. 3. Process SEA of SDP of Tagus River Basin.

Initial Document: Estimation of the territorial and environmental diagnosis and approximation to the foreseeable environmental effects

The Initial Document was drafted to trigger the procedure of SEA of the SDP, so that the Environmental body determined the scope of the Environmental Sustainability Report. This Initial Document was determinant since it identified a succession of factors that had to be taken into account during the evaluation of the droughts; environmental, territorial, natural, infrastructural and management factors. These were used as the baseline to define all scenarios and the programme of measures related to the SDP (see Fig. 4).

	ASPECTS ASSESED			
NATURAL	TOTAL WATER CONTRIBUTION		GROUND WATER CONTRIBUTION	
	11.900 HM3/y (period 1940-200)		Anual renewable resources 1275 Hm3/y	
ENVIRONMENTAL	Sites of Community Importance (SCI)	Special Protected Areas (SPAS)	RAMSAR	RESERVAS BIOSFERA
	102. 77 highly vulnerable and 7 vulnerables.	72, 53 highly vulnerable and 10 vulnerables.	Lagunas de Puebla de Beleña	Parque de Monfragüe
	HMWB	SUPERFICIAL WATER BODIES	GROUND WATER BODIES	
	85	Those linked to a protected area	Aquifer Ocaña and Guadalaja	
TERRITORIAL	URBAN+ INDUSTRIAL DEMAND	AGRICULTURAL DEMAND	HYDROELECTRIC DEMAND	ENVIRONMENTAL DEMAND (PHT 1998)
	852Hm3/y	1785 HM3/y	1173HM3/Y	753HM3/Y
INFRASTRUCTURAL	REGULATION	VOLUMEN OF RESERVOIR	OTHER	
	HIGHLY REGULATED	11.000HM3 aprox	47 RESERVOIRS > 10hM3	

Fig. 4. Identification, characterization and priorization of the territorial and environmental elements.

At the same time, a prior evaluation of the environmental effects was carried out in order to assess future settings: foreseeable evolution of the vulnerable elements in absence of intervention (non-existence of the Plan), a foreseeable evolution of the vulnerable elements with the intervention of the Plan (how environmental aspects are modified by the effect of the application of the types of measures contemplated in the SDP), and a foreseeable effect of the SDP on territory strategic elements and on related planning and appraisal of the programme of measures.

Reference Document

The reference document was drafted by the Environmental body. In this case the Ministry of Environment, which after a period of scoping or public consultation, elaborated a guide to be followed in the next step, the Environmental Sustainability Report.

Environmental Sustainability Report. Environmental diagnosis and assessment of scenarios

It is the summary of the Initial Document, taking into account the results of the scoping carried out by the Environmental Body. It also evaluated the associated dynamics to the proclivity or null alternative, and the alternatives finally determined to be assessed and its different effects on the final territorial and environmental objectives.

(i) Evaluation of the territorial and environmental diagnosis: identification, characterization and priorization of the territorial and environmental elements that could be affected by the measures of the Plan, as well as the forecast of the evolution of these aspects in absence of the Plan (Fig. 5).

(ii) Assessment of the plan's objective: analysis of the presence of objectives and environmental considerations, external coherence, internal coherence contemplating coherence between objectives and problems detected in the diagnosis and, finally an analysis of compatibility, divergence and hierarchy among objectives.

	Environmental aspects that can be affected by the SDP
Measures that can have as effect a variation of contribution of water	Decrease of volumes drained to the river bed since the regulation reservoirs are either for attending demands or because decreases after attend demands. In both cases the ecosystems are affected.)
	Exploitation of aquifers to the extent of reducing the water levels until annulling the connection with vulnerable wetlands or with the own river bed.
	Extraction of volumes in reservoirs until descending the most minimum levels required because of environmental protection. The environmental elements that can be affected in a significant way are the vulnerable elements before the decreasing of water.
Environmental elements that can be affected in a significant way, are the vulnerable elements before the contribution water decreasing, that are found in some of these situations	To be associated to courses of abundant water and can be affected by measures. In general, the sections of regular river and the associated to discharges of risk exploitation aquifers
	To be directly associated to discharges of risk exploitation aquifers
	To be associated to reservoirs in risk of pollution or in which the level come to descend under the most minimum level required by environmental reasons.
	Most minimum volumes, to maintain by environmental reasons in the reservoirs of the basin.

Fig. 5. Criteria for environmental aspects that can be affected by SDP.

(iii) Evaluation of the programme of measures: criteria for the selection of the measures. They were assessed from the environmental point of view and from the conservation point of view: functional environment, territorial environment, temporary application (strategic or preventive and tactical or current). Different hypotheses presented combining different variables and parameters when assessing different scenarios. The basic variables were restrictions to demands and coverage of environmental hydrorequirements, elements such as priority, drought state and quantity were analyzed to figure out the most suitable alternative (Figs 6 and 7).

Priority	Unconditional priority with the object of management (served the provision to population) to attend environmental water requests		Priority conditioned of according to vulnerability of the environmental elements affected	
Drought fase	Application of restrictions to other uses at the warning phase	Application of restrictions to other uses at the emergency	Application of restrictions environmental uses at the warning phase	Application of restrictions environmental uses at the emergency phase
Restrictions	Partial restriction of supply to other uses	Total restriction to all other uses when necessary	Partial restriction to envrionmental uses	

Fig. 6. Hypotheses presented combining different variables and parameters when assessing different scenarios.

	Alternatives of assessment based studied scenario
Alternative 0 (no SDP)	Environmental aspects: • Breach of the most minimum parameters relating to environmental water requests. • Negative affection to to the associated ecosystems in aspects as increase of the "ecological stress" • affection to communities of mammals and associated birds to the aquatic ecosystems • affection to the bank vegetation • decrease of the landscape appreciation Territorial aspects: • Urban Provision of water, works of emergency. irigation restrictions. Industrial uses and other uses
Alternative 1	It gives unconditional priority to the environmental water requirement against the other uses except for the urban provision. It minimizes the negative effects on aquatic ecosystems, on habitats and environmental protection zones species associated to the water ecosystem. Drifts, nevertheless, in the deterioration of the socioeconomic effects on other uses, especially the irrigation and the hydroelectric use
Alternative 2	Possibility of restrictions in the environmental water requests, coordinated with that of the not priority uses, provided that not significant environmental affection to vulnerable zones . The measures of this setting are less efficient related to the problems and environmental objectives but the restrictions in the environmental water requests, they enable a better situation in the socioeconomic.

Fig. 7. Alternatives of assessment based on the above scenario.

(iv) Test on the management system: assessment of the monitoring completed by the competent bodies.

(v) Evaluation of the monitoring program: the verification of the compliance of decisions, forecasts and objectives of the SDP performed through out the monitoring indicator system. The deviations occurred and the new proposals of measures to adjust them to comply with its objective were also appraised. The proposal of review is to be carried out through the Monitoring Report.

Environmental memory

It is the final document prepared equally between the Environment Body and the Tagus River Basin Water Organism, once a new consultation period was completed. New environmental aspects were integrated into the proposal of the SDP, where the process of environmental evaluation, the report of environmental sustainability, their quality of performance, and the result of the consultations carried out where also assessed. It also evaluated the forecast of significant impacts of the SDP when becoming effective and during its enforcement.

The environmental memory is mandatory and its guiding determinations were applied in the development of the final project of the SDP, which once passed, entered the phase of publicity and monitoring to verify the compliance of the forecasts performed and to correct the unexpected deviations.

Results of the SEA of the Special Drought Plan of the Tagus River Basin

The elaboration of the SEA has been prepared simultaneously with the elaboration of the SDP, where all recommendations from the environmental point of view have been included during the selection of criteria used on the SDP. Recommendations such as: (i) inclusion in the diagnosis, of the territorial and environmental elements that can be affected for the drought and by measures of SDP; (ii) analysis of the vulnerability of all these set elements against drought situations and with a view to prioritizing measures; (iii) introduction of environmental criteria in the definition of measures; (iv) consideration of reasonable and realistic alternatives of possible measures and to justify the selection of the program of measures proposed; (v) differentiation of the foreseeable effects of the droughts from the foreseeable effects of the measures; (vi) identification of specific or well determining measures and limitations of the measures predicted to counteract the foreseeable negative effects of the measures; (vii) configuration of a management system that guarantees the operating capacity of the SDP and the certainty of measures application; and (viii) establishment of an indicators system for the monitoring of enforcement and effects, beyond the indicators of forecast (of presentation and severity of droughts).

Other recommendations arose from the application of the SDP: (i) definition of states of ecological flow; (ii) updating of the most minimum volumes in reservoirs for environmental reasons; (iii) interrelations between water bodies; (iv) identification of water bodies (superficial and groundwater) and wetlands and protected areas; (v) identification of the mechanisms of the water dependences (and vulnerability against water reductions and availability) of aquatic ecosystems and of habitats and species protected areas; (vi) analysis of post-drought period and the effects on habitats and protected areas or associated wetlands in danger of extinction and water bodies; (vii) identification of the most vulnerable irrigable areas (social cultivations); (viii) maintenance of water-saving campaigns; (ix) complete with the irrigations modernization program; (x) promotion and encourage the installation systems of low water consumption; and (xi) study of socioeconomic effects of the volume reductions in the different uses.

Finally, from the appraisal of the recommendations that arose from the application of the SEA, it can be concluded that this environmental assessment, is of high importance because it integrates in the planning process all environmental issues and helps on the decision making for the near and future sake of ecological status of water bodies and associated ecosystems. It has helped not only in the assortment of best alternatives of appliance, but in identifying recent problems to be handled in the new planning process required by Art 13 of the WFD where the Tagus River Basin Water Organism is working right now.

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