Water policy in Spain: a portrait

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Summary. This work is a snapshot of the foundations and the basic lines of water policy in Spain. In a territory which is highly conditioned by the aridity of the climate and ongoing cycles of drought, traditional water policy has concentrated on the availability of the supply, especially for agricultural irrigation purposes, the economic driving force of a traditionally rural and relatively undeveloped country. The problems originated by a policy which met its objectives but which was no longer satisfactory (due to environmental impact, lower specific weight of agriculture in the economy and the current demographic pressure on the Mediterranean seaboard) have shown the need for a new orientation in water policy. A new discourse based on principles such as the environment, the concept of water as something more than just a commodity and participatory decision-making are all ideas which have taken on substance in the regulations through the approval of the new Water Framework Directive. Adaptation to the new European regulations, the modernization of Spain´s irrigation systems, new water management in the urban cycle (supply and treatment), a risk policy based on planning and an environmental line of action are the new pillars of water policy in Spain.

Keywords. Water policy – Management – Environment – Agriculture - Urban water cycle - Natural risks.

Politique de l'eau en Espagne: un portrait

Résumé. *Ce travail présente les grands axes de la politique espagnole dans le domaine de l´eau. Bien qu'étant un pays généralement soumis à des conditions climatiques arides et marqué par des périodes de sécheresse fréquentes, la politique espagnole menée jusqu´à un passé récent se basait sur la mobilisation de la ressource, destinée principalement à l´irrigation en milieu agricole qui était le moteur économique d'un pays de tradition rurale et peu développé. Cette politique a atteint les objectifs initialement fixés mais elle ne répond plus aux contraintes actuelles (impacts environnementaux, réduction du poids de l´agriculture dans l´économie du pays, forte pression démographique sur le littoral méditerranéen), ce qui impose sa réorientation. Conformément à la directive européenne sur l´eau, cette réorientation doit concerner, entre autres, la prise en considération des préoccupations environnementales, le changement de la perception de la ressource en eau et la révision des mécanismes de concertation en matière de prise des décisions. La transposition de la nouvelle norme européenne dans le cadre réglementaire espagnol, la modernisation de l´irrigation, la nouvelle gestion du cycle de l´eau en milieu urbain (eau potable et assainissement), une politique des risques basée sur la planification et une ligne d´action environnementale, seront les nouveaux axes de la politique de l´eau en Espagne.*

Mots-clés. Politique de l´eau - Gestion - Environnement - Agriculture - Cycle urbain de l´eau - Risques naturel.

I - Introduction

Hydraulic infrastructures are a key element for economic growth in a developing country that has extensive fields not yet cultivated and an economy that is mainly agricultural. This was the case of Spain in the last century; since getting new resources was relatively easy during this period; their use seemed unlimited while the concern for environmental problems and water quality merely existed.

The hydraulic policy was highly beneficial, since it allowed an improvement in the quality of life, the growth of flourishing irrigation agriculture and the development of other economic sectors

such as industry, and more recently, tourism. Nonetheless, the traditional water management model has shown signs of collapse for several years now, since after decades of strong public investment, Spain is still subject of severe and frequent conflicts related to water. It is also worth mentioning that the economic structure of the country, its political situation and the perception of the problems has significantly changed over the years.

We live in the transition of a model based on the construction of dams and water transfers to a new one more concerned for the management of the water demand. In this context, a new policy is developing that considers water as an economic, social and environmental heritage that we must conserve and protect. In other words, a policy that will make us feel proud of the heritage we leave for future generations.

This change occurs just in the middle of the process of adjustment to the Water Framework Directive (WFD) 2000/60/CE (2000) which implies a new conception of water management. The main goal of the WFD is to maintain and improve the aquatic environment of the European Union. The Directive forces the Member States to reach a good ecological and chemical status of all water bodies (groundwater, surface, coastal and transitional) by 2015.

After reviewing crucial landscape issues to understand the singularity of the Spanish situation and the phases of the traditional water policy during the 19th and 20th century, this paper intends to show the key themes of the new water policy. These are: (i) adjustment to the new European regulation (WFD); (ii) agriculture and the modernization of irrigation; (iii) the urban water cycle (supply and sanitation); (iv) risk management (droughts and floods) and (v) the new environmental line of this policy.

II - Approach to the Spanish landscape

1. Physical framework

The main characteristic of the physical and biological part of the Spanish landscape is the variety of environments, which implies the existence of very different hydrological environments, with strong aridity gradients, with islands of humidity in dry contexts, of strong runoff variability, with a hydrogeology with significant regional differences and high water distribution heterogeneity.

The location trends of the Spanish population are: the population stagnation in the inland and demographic and territorial pressure on the coast due to the growing economic dynamism derived from tourism, the new agriculture and the strategic situation of the coast. This demographic boost will trigger an increase in the hydrological demand in the mind and long term, so that the availability of hydrological resources, in quantity and quality, can be a limiting factor for tourism development and the maintenance of the associated economic activity in these territories.

Irrigation is a key element in the landscape structure and one of the territorial variables that configure the total demand of hydrological resources. It is the most important sector, considering both land occupancy and water use and consumption. Occupation in the agricultural sector has decreased to almost half in 10 years, from almost 2 millions in 1984 to a little more than 1 million in 1994. These tendencies are expected to continue in the next few years; in the year 2010, the population actively dedicated to agriculture will not surpass a half million employees. The current and future situation of irrigation agriculture is a key factor to determinate the water requirements in the different Spanish regions.

2. The Institutional framework

The organization of the territory as a result of the Regional Government's scheme is a significant element in the current configuration of the Spanish Institutional framework. This organization has

brought new legislative problems in regards to the competencies concerning water and topics such as sovereignty, territoriality, public organization, etc.

There is a complex reality in which the National and the Regional Governments have important competences and shared responsibilities regarding environmental issues and resources management, on which the Municipalities also have a saying. This situation has caused an important change in the political and administrative organization of the territory; change that has a great influence on water issues.

Two of the most important organizations are: the Basin Organizations or the Hydraulic Administrations in the watersheds enclosed within a single autonomic region, and the Irrigation Communities. The first ones because they are the basic competent administrative organizations in this subject, and the second ones for being the receivers of the greater part of the consumptive use of water in Spain.

3. Existing problems: hydrological resources

It is very important an adequate conservation of the measuring networks for the correct estimation of hydrological resources, since they are one of the components of the hydrological planning practice. The large number of existing networks and organizations in charge of their management requires a coordinated effort and the establishment of unification and information exchange procedures.

Regarding the hydrological resource must be remarkable: (i) The marked spatial and temporal irregularity of the resource; (ii) the fraction of groundwater origin; (iii) the uneven territorial use of groundwater; (iv) the Spanish hydrological singularity in the European context; (v) the difference between natural resources and available resources; (vi) the local importance of non conventional resources and (vii) the climate change.

In Spain, the average annual runoff is unevenly distributed in the territory. In addition to this spatial irregularity, there is also a marked temporal variability in the contributions in some areas. Regarding the fraction of groundwater origin. There is the need to study aquifer recharge in depth, especially since this knowledge would improve the understanding of the role of groundwater in the hydrological resource as a whole. Such role is extremely important in some of the main basins, especially in those with the greatest hydrological difficulties.

When we analyze the Spanish hydrological singularity in the European context, the contrast between our natural resources and the equivalent ones in other European countries show that Spain is the most arid Community Member, with a precipitation equivalent to 85% of the European Union average and one of the highest potential evapotranspiration of the continent, causing the least runoff of the Member States (approximately half of the European average).

The difference between natural resources and available resources is due to the seasonal irregularity of the resources in the natural regime that prevents their full exploitation to satisfy the different water requirements, since available resources are much less than the natural or existing ones. In fact, just a little fraction, less than 10%, could be used in the natural regimen was not artificially altered.

Regarding the local importance of non conventional resources, in addition to the conventional resources, there are others that, due to the experimental character of the techniques used or for its *uniqueness*, are considered as non conventional resources. Currently the direct reuse of purified wastewater and the desalinization of marine and brackish waters are regarded as non conventional resources. Currently the use of non conventional resources is approximately 1% of the available conventional resources. Even though they are essential for solving local problems, its participation in the solution of global water shortage problems in Spain is very little.

Regarding the climate change, it is important mention that the climate scenarios foreseen for Spain by the Climate National Commission show a slight reduction of the average annual rainfall and an increase in the temperatures that will being a decrease in the overall runoff.

In sum, the arid and semiarid conditions of the Iberian Peninsula (generally associated with rainfall irregularity and the risk of droughts), the traditional irrigation agriculture and the demographic pressure on the Mediterranean coastal landscape can be considered as the tree key drivers of the Spanish territory, setting the geographic framework of this paper.

4. Foundations for a new water policy

The traditional understanding of the term hydraulic policy is currently insufficient to include all the requirements and uncertainties of our society and to give adequate answers to all water problems. The search for a balance between economic growth and the limits and capacities of the natural environment, in a way that guarantees its conservation in the mid and long term, forces us to make a turn in the definition of the policy goals.

Currently, the term “water policy” is more widely used. Having a multidisciplinary and integrating character, it is understood as the actions performed by the Public Administrations, at different levels and fields that affect the development, allocation, preservation and management of hydrological resources.

The inspiring principle of this water policy is the desire to reach a rational use of water in terms os sustainability. Currently, water policy is considered a complex concept that incorporates all actions related with, on one hand, the use of the resource, in its double facet of consumption good and production factor, considering its quantitative and qualitative aspects, and on the other hand, the management of the public hydraulic domain, but understanding it as an integrating part of the natural hydrological environment that we need to conserve, protect and improve. The search for mechanisms that contribute to this goal lays in different foundations, as: (i) Legislative; (ii) Environmental; (iii) Economic; (iv) Socio-political and (v) technical basis.

Legislative foundations: Right now, there is a search for the new instruments that will allow for the correction of the problems identified, such as: (i) management of the aquatic environment and associated ecosystems; (ii) control of authorizations and concessions systems; (iii) economic-financial regime of hydrological resources; (iv) extreme situations management and (v) adjustment of the Hydraulic Administration to the new challenges.

Regarding the Environmental foundations, the inclusion of the environment in the new plans implies the appearance of specific difficulties when dealing with management in terms of sustainability. It is essential for the new water policy to count with well-done Environmental Impact Assessments, which can be an important tool if used correctly. To maintain the current environment is the only mean society has to make sure their wealth will not reduce the options available for future generations.

From an economic perspective, and the experiences of the implementation of the current economic and financial water regime, we can say that this regime can be improved so the user can perceive and be aware of the real costs of his actions for the rest of the society. The complexity and multiplicity of aspects to be considered in the management of hydrological resources show the variety of economic instruments that can be used, which cover: (i) the use of economic incentives to improve the allocation of resources; (ii) regulation through fixed rules and (iii) establishing standard values that are considered satisfactory in relation to the most significant parameters in water management and execution of project with objectives that are specifically environmental (works to correct the impact of the environment, regeneration of valuable natural spaces, etc.).

Regarding the socio-political foundations, there are some foundations in the current legislative framework that are not ignored as important references in the new water policy. These judgments

and valuations are part of the public conscious and have its roots in the costumes, cultures and myths of every town. Public participation mechanisms permit that this variable is taken into account in the decision making process, ensuring an innovative social management of water.

In technical basis, in addition to the progress made in the location, development and exploitation processes of new water sources (regulation, combined use of surface and ground waters, reuse, desalinization and transfers between basins), and the improvement of estimation procedures and methodologies (databases and simulation and optimization models, among others) other measures are being studied for the management of the water demand (programs to reduce loses in infrastructures, to promote water saving, efficiency, management, etc.).

It is worth highlighting the large potential of the direct reuse of purified wastewaters and the desalinization of marine and brackish waters. Regarding the reuse of treated wastewaters, it is remarkable the actual Royal Decree 1620/2007 where is regulated the legal regime for reuse of these waters according to different uses: urban, agricultural, industrial, recreational and environmental (Spanish Ministry of the Presidency, 2007c).

On the other hand the integration of surface and ground waters in schemes of joint exploitation is other alternative currently in consideration, although there are certain limiting factors, as: (i) natural; (ii) economic and (iii) related to the existing hydraulic infrastructures) that make it difficult to put into practice this option.

These new grounds, inspires of the new water policy that gains legislative value with the WFD, are materialized in the Spanish water policy through the *Programa Agua* (*Water Program*) (Spanish Ministry of Environment. (2004).

5. Key elements of the new water policy

A. The WFD (2000/60/EC)

The *Water Program* entails a redirection of the water policy in Spain, a new direction that occurs in the middle of the adjustment process to the WFD that implies a new management model.

This is the most important regulation on water policy in the European Union countries. It establishes criteria for water protection, to prevent its pollution, to promote its sustainable use, to protect the environment, to lessen the effect of droughts or floods and to improve the status of aquatic ecosystems.

The main goal of the WFD is the maintenance and improvement of the aquatic environment in the European Union, and compels the Member States to reach a good ecological and chemical status of all water bodies (groundwater, surface, coastal and transitional waters), as well as to take into consideration all the social and environmental costs of the use of the water in pre-established timelines.

The WFD principles the Spanish water policy should be based on are: (i) Sustainability; (ii) Subsidiary; (iii) Effectiveness and (iv) Participation.

The sustainability Principle (no deterioration) is based on: (i) to prevent damages; (ii) to protect and improve the status of aquatic ecosystems and (iii) the integrated management at the watershed level to improve the ecological status. Estuaries, deltas and coastal waters are included.

The Subsidiary Principle is based on the principle that decisions must be adopted as closet to the problem as possible.

On the other hand, the Effectiveness Principle is based on: (i) to determinate sufficiently detailed and justified previsions of costs and prices; (ii) to apply combinations of measures with the

best cost/effectiveness relationship and (iii) to estimate and recover real costs, including the environmental and shortage ones.

Finally, the Participation Principle is based on: (i) to ensure transparency in the information and decisions and (ii) to facilitate active participation of all the actors.

The key points of the WFD would be: (i) we will only have safe and healthy water supply if our aquatic ecosystems are also safe and healthy; (ii) the main goal of the water policy should be to improve the ecological status of aquatic ecosystems and (iii) the ecological status is defined as four levels (physical-chemical condition- water quality, quantitative state- river flows and other water bodies, biological condition- fauna and flora diversity, river flows and banks and finally morphodynamic processes- erosion, transport and sedimentation.

In 2015, all water bodies in the European Union should be un a “good ecological status”.

The transposition of the WFD to the Spanish regulation was made through the Law 62/2003 on fiscal, administrative and social measures, accompanying law to the Government’s General Budget for 2004. It is the modification of the adapted text of the Water Law.

The improvement in the exchange of information between States is one of the key actions. For this reason, a public access platform, WFD Circa, has been created with valuable information on the process, and regular meetings are organized to specify agreements such as the commitment for the sustainability of the Mediterranean, subscribed by Spain to defend the historic, cultural and climatic singularity of this zone in the elaboration of a common water policy.

B. Reform of the Basin Organizations

To fulfill the goals of the WFD, the new management policy of the Spanish Government has to implement a reform to the Basin Organizations. The objective is to change the traditional priorities and promotion measures of hydraulic works by the environmental management of hydrological ecosystems, which will demand a new approach that is multidisciplinary, more transparent and open to the citizenship. This reform is not only directed to a new water management model but it is also aimed a greater implication of the Regional Governments in the management of hydrological resources.

C. Agriculture: modernization of irrigation

80% percent of Spanish hydrological resources assigned to agriculture, where irrigation is a key piece: it contributes more than 50% of the final agricultural production and uses up to 13% of the useful agricultural land. Currently, Spain has almost four million hectares of irrigated land.

Due to the losses in conduction and distribution depend on great part on the state and characteristics of the infrastructures, it is convenient to rehabilitate and modernize the irrigation schemes. For this reason, the Spanish Government implemented emergency measures as the National Plan on Irrigation with the following objectives: (i) to rationalize water consumption through efficient technology; (ii) to improve the landscape from a social and an environmental perspective and (iii) To increase productivity. These improvements imply the need for investment, capacity building and commitment of all the interested actors, that is, the Government and the farmers with water use rights.

The expected results of the Modernization of the 2006-2007 Irrigation Plan, from the Ministries of Environment and Agriculture, Fishing and Food are; (i) to prevent the overexploitation of aquifers; (ii) to control spills and soil degradation; (iii) recover wetlands; (iv) fight desertification and (v) prevent migration through improving the quality of life of rural people.

D. Optimization of the urban distribution networks

In a goal demographic expansion context, the challenges of the urban supply management include anticipating future provision requirements in regards to the water extraction and the adequate maintenance of the network. The objectives would be the following; (i) to improve control of the water generated and supplied; (ii) to adapt facilities; and (iii) to reform and improve the water network, consumption management and incorporate technology into the process.

E. Sanitation, purification and reuse

According to the European Directive on urban waste water treatment (91/271/EC) (1991), the Sanitation and Purification Plan 1995-2005 (Spanish Ministry of Environment, 1995) foresaw the purification of drainages from urban populations of more than 2,000 inhabitants equivalent before December 31st, 2005. This plan established as a financial model to pay for the investment costs; however, regional deficiencies have not allowed a full compliance of the requirements of the Directive, which can bring significant sanctions for Spain. Furthermore, several European regulations on water quality, approved after 1995, call for an important complementary investment effort from the Public Administrations. In **Figure 1** is showed the actions in sanitation and purification during the application of this plan.

In 2006, the Ministry of Environment worked with all the Regional Governments to establish the basis for a new National Plan on Water Quality: Sanitation and Purification 2007-2015 (Spanish Ministry of Environment, 2007a). The objectives are: (i) to accomplish all the requirements established in the Directive 91/271 and (ii) to contribute to reach the environmental goals of the WFD by 2015.

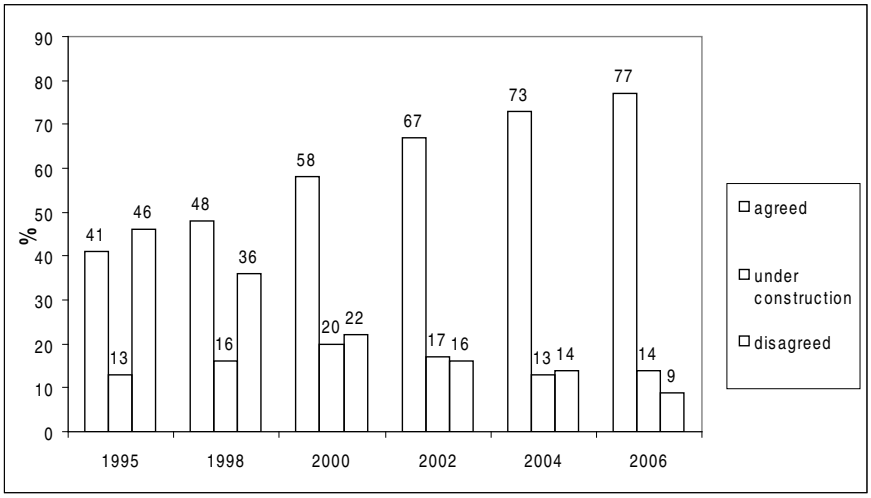

Figure 1: Actions in sanitation and purification during the application of Spanish sanitation and Purification Plan 1995-2005, published by Spanish Ministery of Environment, (http://www.mma.es/...2007).

F. Natural risks management: droughts, flooding and watercourses

Droughts can be a natural disaster when there is no capacity for hydrological resources management. It can also cause severe damages if water management is not efficient.

Spain has been particularly affected by the drought phenomena. During the period 1880-2000, more than half of the years have been classified as dry or very dry. In the decade of the 80s, seven years were considered as dry or very dry, and in the 90s five years received the same categorization. According to the agricultural organizations, during the period 1992-1995, the economic losses caused by drought events in the sector were higher than 9,000 million euro.

Even though droughts affect all regions in Spain, the territories where annual rainfall does not exceed 600 mm are the ones suffering the greatest consequences.

The measures taken to improve water management and fight the drought periods focus on the new Drought Observatory, the Special Drought Plans, basic infrastructures to increase water availability and the regularization of agricultural insurances.

Although precipitation in Spain is not abundant, rainfall can sometimes reach higher values than the annual average, such as in some regions of the Mediterranean coast. Consequently, the big difference between ordinary and extraordinary river flows makes floods a severe problem in Spain.

In the new policy, actions for the protection against floods are based on several basic criteria that ensure their efficiency in reducing damages. Among this criteria, we can highlight the coordination between the different administrations and institutions involved, decentralization, the separation of material and human damages, developing programs oriented to differentiated objectives, realism, admitting that complete protection does not exist, respect for the environment, prevention, avoiding urban occupation of floodplains and finally, transparency, clearly explaining all risks taken and the goals of the measures.

The organization of the actions for defense are implemented by sectors, through reforestation programs, the implementation of alert and prevision systems such as the Autonomic Systems of Hydrological Information (SAIH by its initials in Spanish), structural actions such as flood detention dams, artificial channels or longitudinal dikes, non-structural measures of landscape planning, actions on the transportation network with the double objective of saving human lives and reducing damages by service interruptions, and insurance programs oriented to the protection of agricultural goods.

Regarding the measures, in Spain, just like many other countries, has been traditionally applying structural measures based on infrastructures (mainly flood detention dams and artificial channels). Some of the non-structural measures mostly used are the prevision and alert systems (SAIH), already implemented in great part of the Spanish territory, and landscape planning of floodplain areas.

G. Environmental key elements: National Plan of River Restoration

It is a line of work from the environmental perspective, where water is not treated as a mere resource but as another element of the territory and the landscape. This plan intends to recover the structure and natural functioning of Spanish rivers and riversides. This was initiated because: (i) the goal of the WFD is to establish a framework for the protection of water bodies that prevents additional deterioration and protects and improves the status of aquatic and terrestrial ecosystems, and the wetlands directly dependent on them; (ii) the Water Program, based on the WFD principles, establishes the recovery of aquatic ecosystems and the associated terrestrial ones as keystones of the water policy and (iii) in addition to the previous points, the growing social demand of river recovery has motivated the Ministry of Environment to develop a National Plan of River Restoration (Spanish Ministry of Environment, 2007b).

The principal goals of the Spanish National of River Restoration are: (i) impulse to the current management of our rivers to reach a good ecological status, complying with the WFD; (ii) to promote the integration of policies, the ones regarding land use and management and the ones

related to the use and management of fluvial ecosystems, with sustainability criteria; (iii) to improve capacity building in the subjects related to the sustainable management of rivers and their restoration; (iv) to provide information and experiences to improve the actions related to river restoration in Spain and (v) to promote citizen participation and involve social groups in the management of fluvial ecosystems.

III - Conclusions

The traditional water policy in Spain has been concentrated principally on the availability of the supply. Currently adaptation to the new European regulations, demand us adapt our hydrological resources to these requirements, developing a new policy based on planning and an environmental line of action.

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