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Epilogue

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In this epilogue I will try to emphasize and summarize the main characteristics of Spain's Water Policy with its traditions, current problems, and potential solutions. The general aspects of the whole Iberian Peninsula water policy and its connection with the wider scope of the Mediterranean area have been dealt with in the Introduction to this special issue written by Evan Vlachos.

Different opinions on relevant aspects of Iberian water management can be found in the various articles of this special issue. This is not a coincidence, but something intended by the editors. Variability and complexity characterize water problems. There is not a blueprint, a universal solution for all them. The right solution has to be tailormade, in accordance with the circumstances of each region.

Spain is a varied and old country where many different cultures have lived. It is the driest country in the European Union (EU). This circumstance ensures that the Spanish water problems are more relevant than in the other EU Member States. Spain is a developed country, but it is not in the highest echelon of the industrialized countries. Moreover, Spain has undergone a significant social transition during recent decades that has had a strong impact on the agricultural sector, the main water user in the Iberian Peninsula.

In 2000, the Spanish Ministry for Environment published the final version of a White Paper on Water. This document recognized the urgent necessity of changing from water supply management to water demand management. It was also recognized that the Water Administration had to be remodeled in depth to cope with the current problems. Nevertheless, the institutional inertia and other factors like vested interests in traditional subsidies have not allowed the implementation of these so desperately needed changes in order to achieve effective water governance in Spain. Probably a similar situation may occur in other arid and semiarid, developing, and developed countries. Therefore, the analysis of the current situation in Spain, with its successes and its failures, may provide useful data to improve water management in other regions.

Legal Framework

Embid, in this issue, presents a summary of the current water legislation in Spain and of its evolution from the former 1879 Water Act to the current 1985-99 one.

As Embid emphasizes, the current Water Act changed two important aspects of the previous legislation: a) the declaration of groundwater resources as public domain, and b) the consideration of water planning as the driving force for all water management.

Groundwater as Public Domain: Theory or Reality

According to the 1879 Water Act, practically all abstracted groundwater was a private good that could be bought and sold as any other economic good. Then such legislation was probably adequate because groundwater abstraction was not intensive and its impact on the local or regional hydrological cycle was not relevant. Nevertheless, the scientific and technological advances achieved during the last half-century, mainly the invention and popularization of the submersible pump, changed the situation and induced a spectacular increase in groundwater abstraction. Some local problems related to intensive groundwater use occurred in the eighties. Water policy decision-makers considered that to solve these local problems the solution was to declare groundwater within the public domain. By contrast, in Portugal groundwater is considered private property.

The 1985 Water Act declared all groundwater public dominion, as it was surface water in the 1879 Water Act, but the legislator respected the "grandfather's rights." In other words, those who have groundwater resources developed before January 1, 1986 could keep them as a private property. Probably in the mind of legislators, groundwater development in Spain was almost irrelevant in most zones although some experts had warned that groundwater development was relevant. They estimated that the number of water wells might be higher than half a million. They considered that the economic value of ground-

water irrigated agriculture might be similar to that of surface water irrigated agriculture although the amount of groundwater used was only a small fraction of the surface water volume used for irrigation. These warnings went unheeded.

The current situation in relation to groundwater can be described as an administrative and legal chaos. The current inventory of groundwater rights only includes between 10 and 20 percent out from more than 1.5 million existing water wells. This situation, after almost twenty years of the enactment of the new Water Act, can be explained by the double effect of: a) lack of adequate mentality in the Water Authorities decision-makers (whose officials are almost exclusively surface hydraulic engineers); and b) the lack of economic resources. Moreover, not only are most of the old groundwater wells not inventoried, but also many of the new water wells drilled after the enactment of the 1985 Water Act are illegal. Riesco's article in this issue presents from a broader perspective the causes of the poor enforcement of water regulation in Spain. He emphasizes the lack of coordination among the different level of government institutions (national, regional, local). An extended view on the groundwater situation in Spain can be read in Llamas (2003).

Water Planning

The 1985 Water Act emphasizes very strongly the relevance of water planning in each watershed. The already approved Water Plans are theoretically the main tools for the water management in each watershed. According to them, the fate of almost every water drop has to be planned in the corresponding basin Water Plan. In this issue Sastre shows that the implementation of this ultra-planning has been fraught with great practical difficulties. As a matter of fact, the approval of the first Basin Water Plans was done in 1999. In other words, they required more than twelve years for their first approval. In the papers by Barreira and del Moral, data about the planning process can be found.

The EU Water Framework Directive (WFD) is also going to require the preparation of Water Plans for each basin. The approach to prepare these Plans is rather different than the one of the Spanish Water Act. The WFD planning emphasizes the good ecological status of water systems, is more flexible, demands a greater participation of civil society, and requires that coastal waters are to be included in the corresponding Basin Water Plan.

The WFD demands coordination in the Water Plans of the basins shared by several member states. This is going to be the case in five Portuguese-Spanish rivers covering about half of the Iberian Peninsula surface (almost 600 square kilometers) and may become a good example for the 263 transboundary rivers that exist world-wide. Apparently, this aspect is not going to create special problems between Spain and Portugal. The recently-approved agreement (Albufeira Convention in 1998) between Portugal and Spain seems to be a good example of hydrosolidarity in international river management. Maia from Portugal and Santafe from Spain analyze this topic in detail in their papers. In general, it can be told that most people are satisfied with the Albufeira Convention, but it will be necessary to have a few years of experience to know potential implementation problems. Probably the most critical situation will occur in the Guadiana Basin during a severe drought.

The WFD does not require the preparation of a National Water Plan. This is only a requirement of the 1985 Spanish Water Act. The main goals of this National Plan are the approval of interbasin water transfers and the coordination among the different Basin Water Plans. The National Water Plan must be enacted as a Law by the two chambers of Parliament. The Law of the first National Water Plan was promulgated in July of 2001. Its main purpose has been to approve a water transfer of a little more than one cubic kilometer per year from the Ebro River in Northern Spain to the Mediterranean coastal regions. The main objective of this transfer is to eradicate the "overexploitation" of some aquifers, as it is clearly stated by Sanchez in his article in this issue. Although legally approved by the Parliaments, the Ebro water transfer has caused torrents of controversy not only in Spain, but also in the EU Commission and Parliament. The Spanish Government has asked to spend EU funds for the construction of the necessary engineering infrastructure for the water transfer, mainly an aqueduct over 1,000 kilometers long. The initial budget was over 4 billion € but it is quite possible that the final cost will be double or triple. Details about this debate can be read in the papers by Embid, and Arrojo. In addition, Michael Hanemann, from University of California Berkeley, has elsewhere written an interesting piece on the economic aspects of the Spanish National Hydrologic Plan (Hanemann, 2003). Neither the Spanish nor the European debate has been settled yet. The debate is becoming more political than a technological discussion, both in Spain and in Brussels.

Water and Agriculture

In Spain, like in most arid and semiarid countries, the main use of water abstracted from rivers, reservoirs, and aquifers is irrigation. The water applied for irrigation is about 25 km^3/year or 80 percent of total uses. Out of these 25 km^3, 20 come from rivers and reservoir and 5 from aquifers. In Spain during the last four decades, there has also been a great social change in the agricultural sector. The percentage of population devoted to agriculture has decreased from about 40 percent to the current 6 to 7 percent and it continues to diminish. The participation of the agricultural sector in the Gross National Product is only about 3 to 4 percent. This simple proportion indicates that agricultural sector is not the best paid in Spanish soci-

ety and explains why many jobs in this sector are now served by legal or illegal immigrants.

As in many other countries, the efficiency of surface irrigation is very low. The main cause of such low efficiency is the low price that farmers pay for the water. The average price is around 0.01 €/m^3. The real average cost of this surface water for irrigation is estimated about ten times higher. This means an implicit subsidy for agriculture of 0.09 € /m^3. This implies huge subsidies for crops that are high water consumers such as rice or cotton. The situation in groundwater irrigation is quite different. The farmers usually pay the whole direct cost of the water abstracted from aquifers. This cost ranges usually between 0.02 and 0.10 €/m^3. Because of this higher price and other motives in Spain, the average economic and social efficiency of groundwater irrigation is about five times greater than the corresponding efficiency of surface water irrigation. In their respective papers Ferrero, Vives, and Martinez Cortina and Hernandez-Mora show from different points of view relevant aspects of irrigation in Spain. An important aspect discussed in Vives' paper is the great differences among the water needs for different crops in order to create jobs. For instance, in Andalusia (Southern Spain) the water necessary to create one job in growing rice or cotton is almost one hundred times greater than the equivalent water to create one job in greenhouse crops. One moral of this analysis is that to put together all kinds of agricultural activities is meaningless.

Desalination and Wastewater Reuse

The debate on the relative value of desalination to solve water problems is now a hot issue in Spain, mainly in relation to the economic analysis on the cost of the water from the Ebro River transfer. Data and opinions on this topic can be read in the paper by Arrojo. Desalination technology has a rather long tradition in Spain. The first seawater desalting plants were built in the Canary Islands about thirty years ago. Currently about 8 percent of the Spanish citizens have their public water supply from seawater desalting plants. For instance, in 2003 work has begun to operate a large seawater desalting plant (about 40 million m^3/year) in southern Spain. The cost of this partially subsidized water is 0.30 €/m^3 and is mainly used to grow greenhouse crops (primarily tomatoes and cucumbers).

In the Canary Islands and in many zones of southeastern Spain, some farmers use small desalting plants to desalinate brackish groundwater. Many of these small plants are creating environmental problems due to the brine illegally rejected to the nearest creek.

Reuse of treated wastewater for irrigation is being made in a few places of Spain, mainly in the Canary Islands and in the Mediterranean zone. A certain emphasis on this solution is included in the National Water Plan. Nevertheless, the regulation on the necessary sanitary conditions for this use is still practically missing. The current concern in North America about the uncertainties related to artificial aquifer recharge with treated urban wastewater is not relevant in Spain yet.

Valuing Water in Spain

Spanish farmers, with the help of the Government and other lobbies, were very active in their opposition to the principle of "full cost recovery" that was one of the most innovative aspects of the WFD. The final provision on this issue included in the WFD was less strict than the initial proposal. Nevertheless, the WFD is going to require a greater transparency on the real costs of water. This will probably have a great impact in the future water policies because it will help to identify the "perverse subsidies," i.e. those subsidies that are deleterious for the environment and the economy of Spain.

The economic analyses on water policies were rather scarce in Spain until one decade ago. During the last years, a certain number of scholars, mainly University professors, have published many studies on this topic. Arrojo, and Martinez Cortina and Hernandez-Mora quote many of them in their papers in this issue.

Urban water supply and sanitation are beginning to practice the full cost recovery principle in a good number of municipalities. Industrial use of water usually has no problem in paying for the full cost of water.

The main difficulty is to enforce this principle in surface water irrigation, the greatest user of water (about 20 km^3/per year). As previously stated, the average cost of 0.10 €/m^3 and at an average price of 0.01€/m^3. Most Spanish water decision-makers seem to be convinced that Spanish farmers require subsidized water in order to be able to compete with the farmers from most EU Member States where it rains more often and productive rain-fed farming is feasible. Recent studies on the role of groundwater irrigation in Spain have shown that in Spain the farmers using groundwater not only pay the direct full cost of the abstracted water, but they also are the most efficient from the socio-economic point of view (see Vives, Arrojo, and Martinez Cortina and Hernandez-Mora in this issue). They are fully achieving the motto "more crops and jobs per drop."

The driving force of the spectacular increase of groundwater irrigation in Spain and in most arid and semiarid regions is simply that the direct full cost of groundwater abstraction is only a small fraction of the value of the crops obtained. One relevant aspect of this spectacular development is that it has been mainly performed in Spain by thousands of modest farmers with scarce public planning, funding, and control. This is a usual and recent phenomenon world-wide in arid or semiarid regions. This uncontrolled intensive groundwater use has produced many benefits but also some problems that often are described with the confusing concept of aquifer overexploitation.

These supposedly overexploited aquifers are the main motivation to approve the Ebro River water transfer to the Mediterranean zones. Nevertheless, the current legal and administrative chaos in groundwater management, if it is not corrected, can make totally useless the Ebro River Water transfer.

Water and Ecosystems

The WFD emphasizes the need to restore or enhance the aquatic ecosystems, with a special emphasis in wetlands. This is the main water policy problem in the humid Member States of the EU. In Spain, this is also a serious problem that needs to be better addressed realistically. In the domain of general official statements, for example in the 1985 Water Act, the basic principles to protect ecosystems are correctly defined, but the enforcement of these provisions is rather weak. Unfortunately the paper by a limnologist foreseen to describe the sad situation of the heavily contaminated Spanish rivers has not been received in time for this issue. The information on the potential contamination of aquifers is scarce, but probably the diffuse contamination by agricultural activities and by point sources is significant.

Another relevant and genuine issue in Spain is the frequent conflicts between groundwater development (mainly for irrigation) and wetlands conservation. Two well-known cases of these conflicts are related to the Donana and Tablas de Daimiel National Parks. In the last RAMSAR Convention (Valencia, Spain, November 2002) the resolution VIII.40 was unanimously approved in order to cope with this problem that is becoming worldwide, mainly in the arid and semiarid regions where the appetite for groundwater development is higher.

Institutions for Collective Management of Water

The concepts of participation, transparency, accountability, subsidizing, and other similar concepts are currently pervasive in water resources literature. Spain has a long and positive tradition in the implementation of institutions driven by these concepts. Possibly the most known is the mythical "Tribunal de las Aguas de Valencia" (Water Jury of Valencia) that has been in operation for almost one millennium. This is a Jury formed by seven farmers, democratically elected by their fellow-irrigator farmers. They meet every Thursday at the Cathedral door in Valencia (at the Mosque door during the previous Islamic dominion) to solve all the claims among the irrigators. The process is oral and cannot be appealed. This is one more example showing that the "tragedy of the commons" is not a necessary consequence in the common-pool resource management.

About 6,000 Communities of Irrigator exist in Spain, which more or less follow the same pattern although not each Jury meets at a Church door and sentences can be appealed to a higher Court.

The modern concept about the convenience of organizing the Water Administration according to the watershed borders and not according to the political border is in operation in Spain since 1926 when the "Confederacion Hidrografica del Ebro" (Ebro River Water Authority) was created. In practically one decade, all the watersheds in Spain were controlled with similar institutions. The creation of these Spanish institutions were practically synchronous to that of the Tennessee Valley Authority and almost half a century before than the "Agences de Basin" in France and thirty years before than the Water Authorities in the U.K. Nevertheless, now the Confederaciones Hidrograficas need a strong remodeling due mainly to their strong dependence on public state funds and to the scarce participation of the real stakeholders both in funding and in the decision-making processes, as described by Barreira.

Finally, it is worth mentioning the pros and cons of the recent Spanish experience in aquifer management. The 1985 Water Act, trying to transpose the positive and multisecular experience of the Water User Associations, previously described, not only created the concept of Groundwater User Associations, but also made compulsory the creation of these Associations in the aquifers that would be legally declared "overexploited." This theoretically good initiative has been until now a failure as it is described in detail in the papers by Martinez Cortina and Hernandez-Mora and by Lopez-Gunn. The main causes of this "failure" are the following: a) the Water Authorities do not have enough experts in either Hydrogeology or in conflict resolution; b) the concept of "overexploitation" such as it is in the Spanish regulations is confusing and has not been correctly applied. For example, one of the only four aquifers legally declared overexploited is one of the aquifers less developed in Spain; and c) as Sanchez's paper in this issue states, the legal declaration of overexploitation and the compulsory order of forming a Groundwater User Community was done top-down, i.e. by the Water Authority officials, and it has been fraught with a strong resistance by the farmers. As a matter of fact, only four or five out the 16 aquifers declared legally overexploited have created a Groundwater User Community, and only two of them have been able to establish regular management plans. Lopez-Gunn, in this issue, analyzes the structure and the pros and cons of these Groundwater User Associations.

Conclusion: Water Governance in Spain

In this short epilogue, I have intended to show that water governance in Spain, based in a long, multisecular experience, has many positive and interesting aspects that can be exported to other countries with similar conditions. But I also intended to show that Spain's Water Policy is suffering due to the persistence of obsolete paradigms that dominate the minds of many water policy decision-mak-

ers. Some groups or lobbies are strongly entrenched into trying to maintain those old ideas because of a blend of ignorance, institutional inertia, and vested interests linked to the policy of perverse subsidies. Nevertheless, it is hoped that the transparency and accountability linked to the democratic processes and facilitated by the new communication technology are going to allow new water management paradigms to be accepted soon by the general public and by the water policy decision-makers.

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