José Carles Genovés
Marta García Mollá
Carles Sanchis Ibor

METHODOLOGICAL GUIDELINES FOR ISIIMM SPANISH CASE STUDIES

First part of ISIIMM project focuses on the collection and organisation of knowledge relevant to each of the case studies, in order to achieve a comparative understanding, and to establish the coherence of incoherence of water management in these basins in relation to present model of sustainable use of water, defined by the Water Framework directive. In order to implement this works, several methodological criteria specifically related to the particular characteristics of Spanish case studies have been defined.

1. MODELS OF USE OF WATER

The publication of the Water Framework Directive leads to a radical change of the public and private behaviors around water management in a short period of time, due to the fact that the document, of forced execution, puts the accent on the consideration of water as an ecosocial asset, defining some objectives and considering some instruments for its achievement that are common to the environmental policies rehearsed in other natural resources to improve its quality or to impede its deterioration.

This is a new model of use of water that we could denominate environmental model or model of sustainable growth, in opposition, not only to traditional models of development of the offer, but also to models of administration of the demand recently formulated and still little implanted. To defend this statement, we stand out the fundamental characteristics of the model of offer, the model of demand and the model of sustainable growth proposed by the European Union. We will analyze the important differences --conceptual of behavioral-- among them.

MODELS OF WATER USE
Water as a production factor

1. The water is not a very scarce resource (Models of Offer)

2. The water is a very scarce resource (Models of Demand)

3. Water considered as an ecosocial asset (Models of Sustainable Use)

1.1. Model of offer management

The model of offer is characterized by two principles: the consideration of water as a production factor that is on the basics of the economic growth, and the verification, with certain actions, that water is not scarce with regard to the necessities of the system and the main problem is to stimulate the economic agents for its use. The objective of hydraulic policies and allocation systems has been the supply of water to potential users with very low prices or null rates, so as to favor the supply of the more populated areas and to stimulate the economic development, especially the agriculture of irrigation.

This model is characteristic of the Rostownian "take off" phase of developing countries. In these situations water is not still a scarce resource and the allocation procedures are usually carried out by the public administration by means of concessions, usually very generous for users, in terms of flows, period of concession –frequently to perpetuity-- and guarantee of supply. These generous measures seek for the security of users' investments --usually with long periods of maturation-- even when they provoke the rise of unitary consumptions with regard to theoretical necessities and technical means.

This allocation system has an internal logic: instead a problem of water scarcity, we face a problem of economic and social mobilization of water. Nevertheless, when water begins to be scarce and competition among different users starts increasing, described allocation procedures cause the immobilization of resources and water rights, difficulting the reallocation in favor of new and more efficient activities.

MODEL OF OFFER
Water as a production factor

1. Water is not a very scarce resource

Objective: To favor the use of water as a development factor

Characteristics:

- Politics of promotion of expansion of uses

- Public allocation of resources

- Administration promotes hydraulic works

- Public financing of big hydraulic works

- Very low or null water prices

- Very high unitary consumptions

- Low control of uses

- Scarce attention to water quality

In general terms, developing societies don't have systems or financial markets capable to provide resources to possible users, especially to farmers with low saving capacity, unable to afford investments for the mobilization of water. This lack of activity and private initiative is usually covered by the State by means of the promotion and construction of big hydraulic works of regulation and transport that, in many cases, include works of urban supply systems and creation of new irrigated areas. Usually, afterwards, the State also manages these systems in order to provide water to users at the best place and time, and at the lowest price, to stimulate the development of economical activities.

Prices or costs supported by users don't play any role as mechanisms of allocation of resources and don't provide enough information about shortages of water or about the necessary cost of obtaining water. They are strongly subsidized and in many situations they are even insignificant, a fact that evidently favors the mobilization of the resource --which is the initial objective-- but causes that the whole cost of the construction and exploitation of the hydraulic infrastructures relapses on the public budgets and, what is much worst, it will also cause and it will root some public and private practices of water management that, even when they are coherent with this model, when the shortages appear will be considered as squanderers.

This has been the Spanish hydraulic an agrarian policies during the 20th century, inspired by Joaquín Costa's *Regeneracionismo*, even when the social and economical changes that took place after the sixties, and particularly after the eighties, dissuade this traditional model. There is no doubt that the effects of the persistent application of this model have been positive. Actually, some of the foreseen objectives were reached: security of the urban supplies --in a

context of intensive urbanization--, increasing of alimentary security or improvement of social conditions in rural areas, mainly caused by population establishment and expansion of irrigation.

But from some time ago, this model is in crisis, and the negative effects of its long period of permanency are increasing. Water is scarce in several regions; the obtaining of new resources --in the time and place desired-- is becoming more complex and it has growing marginal costs, what hinders public financing of hydraulic works; the permanence of old water rights generates, with an increasing frequency, new and growing conflicts between old and new users; agrarian and urban distribution systems become inefficient and squanderers in a context of scarcity and there's a growing deterioration of freshwater quality with severe impacts on wetlands and riparian ecosystems.

Moreover, it is generalize a "culture" of use of water where water rights are immobilized in the areas of major shortage in favor of old users and public authorities have the responsibility to solve these problems providing water --in quantity and quality-- to all citizens, in order to avoid any restriction for the development of economic activities. This new phase, common to many developed countries, is what Randall (1981) calls the "mature economy of the water", characterized by: growing offer costs, users' direct and intense competition and strong interdependences among uses. Problems appeared in this phase require new administration tools. Also, there's a need of new policies of demand to counteract the model of offer.

In this situation, a radical change of the model of offer has been demanded by experts in several forums, based on the principle that water is a scarce resource with regard to growing necessities of the productive system, so as to put the accent on a group of actions --public or private investments, incorporation of new technologies, new economic régime, condition and limitations of use, etc.-- that have, as their first objective, saving of water and preservation of water quality. That's what is called models of demand management, characteristic of the mature and developed societies with a sustained growth.

1.2. Models of demand management

In models of demand management water is a scarce resource, but is still considered fundamentally as a production factor. For this reason, water becomes an economic well. The objective of hydraulic policies is an efficient use of water, and no longer the provision of water at low cost to stimulate the economic activity. An efficient use of water involves technical considerations,

but mainly an economic optimum in the context of a welfare economy. To achieve this goal mobilization of water rights among competitors is required.

The allocation procedures can be public --administrative concessions-- or private, through water markets or rights exchanges, more or less controlled by the public administration. However, allocation procedures have different conditions. The main priority is no longer the security of users, but limitation of periods and volumes of water, according to the water saving technologies, and flexibility that allows exchanges of rights between current users and more efficient future users; exchanges that, in some way, could incorporate costs of impact to third parties.

In the case of public allocations, the administrative concessions should contemplate the competition among uses; flows are usually managed according to seasonal variations of consumption, and with regard to efficient techniques; periods of concession use to be linked to maturation of investments; supply guarantee is smaller and depends on the use of water -- best security for urban uses, and lesser for irrigation and other economic activities. Finally, the concessional system must reflect the competence among users in a context of scarcity.

MODEL OF DEMAND
Water as a production factor

2. Water is a very scarce resource

Objective: Improvement of technical and economic efficiency of use of water

Characteristics:

- Politics of demand management

- Public administration promotes and stimulates development of saving technologies

- Demand of reduction of unitary consumptions

- Flexibilization of public or private allocation procedures. Water markets

- Prices reflect scarcity

- Attention on water quality

- Implementation of mechanisms of control of uses and wastewater

The reformation of the article 63 of the Spanish Water Law of 1985 for the revision of the previous concessions is a corollary of this policy. The new article adds the possibility of revision when is proved that users' requirements can be satisfied with less water or when a technical improvement contributes

to save resources. In this case, there's no right to any compensation, although economic support could be provided to prepare infrastructures for the new concessional conditions. Also with the intention of mobilizing water rights, water markets have been developed in several countries (California, Chile, etc.). Recently, in Spain, it is possible to exchange water rights or to create public centers for the exchange of water rights (Spanish Water Law, 1985, Art. 61bis.). Nevertheless, at the moment, we don't know any case of application of concessional revisions or exchanges of water rights.

In coherence with these models, the Hydraulic Administration should stimulate the use of more efficient technologies and/or limit the exclusive use of water. The difficulties of moving from theory to facts are evident, because we face a complex system of rights, uses and customs strongly conditioned by the persistence of previous models, while there's a growing necessity for the production of goods and services and an increasing conservationist demand.

Some authors, like López-Camacho (1997), outline the difficulties of carrying out these new policies. The substitution of traditional management for new management policies is hindered in many occasions by pressure groups that traditionally have been benefited by the policies of development of hydraulic works. In that sense, Livinsgtone and Assunçao (1993) studied the evolution of dam construction in Brazil, and they conclude that this process is influenced by engineers' lobbies, that have developed projects in areas with soils of bad quality, with a small increase of the irrigated lands. In Spain, especially up to the sixties, water policies were conditioned by the energy lobby, mainly for the design and exploitation of hydraulic infrastructures (del Moral Iriarte, 1999). After the seventies, the hydroelectric lobby lost importance, with the emergence of urban and industrial supplies and nuclear power stations. Sometimes, localization of reservoirs hinders complementarity with agrarian uses.

On the other hand, models of demand management can be "perverse", due to the fact that the economic activity, impelled by the information provided by markets, press on the resources of a territory regardless of their availability. In this case, even when they use the most efficient and saving technologies and the lowest unitary consumptions, resources saved will be used --if the markets stimulate it-- in new activities or in the amplification of present activities, and the pressure on the aquatic environments will continue, producing in many cases irreversible damages. The expansion of the agrarian activity with very efficient --technically and economically-- irrigation systems in the Spanish Southeast, is a very clear manifestation of the previous statement. Development of water saving technologies and the achievement of very low unitary consumptions has let private initiative to increase the irrigated lands so as to maximize the added value by cubic meter of the available resource.

Water, and not surface, is the restrictive factor and in consequence, resources saved will not reduce overexploitation, but will increase the agrarian production with the same or bigger pressure on the hydraulic system.

In societies with a sustained economic growth there are institutions and wide financial markets, and a bigger saving and investment capacity of most part of the population, factors that can substitute the public administration in the promotion and financing of hydraulic infrastructures, as well as in their exploitation and management. As a result of this, in this model, declarations of general interest of the nation for the financing of hydraulic works loose their meaning, except for very particular cases but never pretending to hide grants for the development of economic activities. In coherence with this model, the hydraulic administration should promote and stimulate the use of more efficient technologies and the implementation of limitations to the use of the water.

Under these circumstances, the International Conference on Water and the Environment taken place at Dublin in January of 1992, it was made evident that "scarcity and abusive use of freshwater outlines a growing and serious threat for the sustainable development and the protection of the environment. Health and human welfare, nutritious security, industrial growth and ecosystems that depend on water are in danger, unless the management of soil and water resources was carried out in the present decade in a more effective way that in the past"

1.3. Model of Sustainable Use

With this intention the Water Framework arises for the common water policy politics of the European Union. The Water Framework presents a third model of use of water, in which water is considered as an ecosocial asset, focused on conservation and improvement of water quality and aquatic environments; it's what we call the model of sustainable growth. In this new model, concessions and authorizations for the exclusive use of water should be subordinated to the objectives of quality and prices should incorporate the full recovery cost, including opportunity cost and environmental impacts costs.

The public administration forces water saving by means of authorizations and a policy of prices that limit uses and prevent and discourages deterioration -- quantitative or qualitative-- of aquatic environments and, moreover, has as their main goal, the implementation of strict standards of quality, with measures, controls and security systems to enforce their objectives, creating or becoming specialized environmental agencies.

These new water policies of the European Union are defined according to several principles:

- Consideration of water as an ecosocial asset and definition of objectives in coherence with this fact

- Territorial and management principles: integral action and basin unit

- Principle of planning for the achievement of objectives

- Environmental policy linked to economic instruments and regulation and control tools

- Principle of transparency and social participation

MODELS OF SUSTAINABLE USE
Water as an ecosocial asset

Objective:

Conservation of aquatic environments and associated ecosystems

Characteristics:

- Prime attention to water quality and impacts of activities

- Water quality and conservation of aquatic environments become a restriction for the development of economic activities and for water allocation process

- Politics of saving and quality improvement

- Prices reflect shortage and impacts on the environment

- Public administration prioritizes and enforces objectives of quality

- Development of tools for control of uses and hydraulic systems

2. CASE STUDY METHODOLOGY FOR SPANISH WATERSHEDS

In order to determine the coherence or incoherence of Spanish case studies in relation to these models, it's been set up a common methodology based on the study of several aspects thorough different research actions.

2.1. Areas of knowledge

A. Local organizations and territory

- Territorial analysis: resources, demands, public institutions and water stakeholders.
- Water laws: volumes, appropriators, users, nature of law.
- Participation of local organizations on territorial decision-making process.
- Analysis of irrigated areas developed by State plans: description, cartography, finances, etc.
- Analysis of conflicts within water users associations and between them and public administration --local, regional or national.

B. Structure and management of local organizations

- Internal management: objectives, structure, economical and technical means, financial structure, conflicts resolution.
- Water distribution to users
- Analysis of irrigation systems: description, cartography, maintenance, finances.
- Water rates: rate systems, fares, public and private prices.

C. Adaptation of local organizations to changes

- Adaptation, conflicts and changes of aspects described in the preceding paragraph due to the implementation of the Spanish Water Law of 1985 and its modifications.
- Adaptation, conflicts and changes due to Hydrological Basin Plans.
- Adaptation, conflicts and changes due to Hydrological National Plan.
- Adaptation, conflicts and changes due to modernization of irrigation plan developed by Spanish National Government and Regional Governments of Andalucía and Valencia.
- Analysis of perception of future changes related to the implementation of the European Water Framework Directive, particularly focused on minimization of environmental impact of activities and the implementation of the cost-recovery principle.

2.2. Actions

So as to complete these analysis several actions should be develop. Some of them involve document compilation and review, while others require field works, meetings and interviews with farmers and water users associations. Compilation and review tasks cover:

- Bibliographic review
- Compilation and review of public administrative and technical reports
- Compilation and review of State and Regional Government plans.
- Compilation and review of technical and financial reports from water users associations.

In addition to this, researchers develop field works to examine irrigation systems --modern and historical-- and water distribution procedures, and attend monographic periodical meetings with local organizations --individually or collectively-- and water management institutions. Collected data will contribute to the implementation of GIS and database to integrate spatial, social, institutional and economical information. Work with water users associations covers the collection of several types of information:

- Historical background. Constitution, origins and historical evolution data.

- Irrigated lands. Irrigable (service area) and irrigated surface, current tendency of evolution of cultivated surface. Causes.

- Agrarian exploitations. Number and profile of members of association. Access to association. Statistical data of dimension of exploitations Name, origins and conversion factor of local measure units. Crops and predominant varieties (% approx.). Tendencies.

- Water resources. Surface water (Concessions date and volume. Diversion point --origin of resource. Average volume. Quality), ground water (Nº and name of wells. Pumping capacity. Flows extracted annually. Quality), treated sewage (Concessions date and volume. Purifying --origin of resource. Average volume. Quality). Total resources (m3/ha). Desalt plants. Control and measurement of received and delivered resources. Timing and water availability forecasting.

- Infrastructures. Canals type and state of conservation. Irrigation system: average Gravity-Sprinkling-Dripping. Dams and capacity (private & collective). Pumping stations. Others. Hydraulic heritage assessment.

- Water distribution to farmers. Periods, volumes and procedures

- Costs and prices. Type of invoicing (€/m3, €/hour, €/ha) and costs included for each type of resource. Additional costs (extraordinary invoices, professional irrigators or ditch riders)

- Statutes and organization. Conflicts resolution systems. Technician, office workers and hired services (nº people). Offices, facilities and properties of the community. Annual budget.

- Water markets, exchanges or transfers. Among associations: *(Resource type and origin, Costs, Frequency).* Among farmers *(Resource type and origin. Costs. Frequency)*