



Local Government Practices and Experiences in IWRM in the River Basin of the Ebro, Spain

by

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Executive Summary

In Spain, as in most European countries, the access to safe drinking water and sanitation services was guaranteed as a citizen right for everybody decades ago, under the responsibility of local governments. The key point for getting it was to take on this challenge as a very first political priority.

From the beginning of the 20th Century the Spanish Government established a general framework for dealing with water management at river basin level through *river basin authorities*.

At present, under an ambitious process of decentralisation through *Autonomous Regions*, Spain faces the challenge to integrate, under the coherence of the Water Framework Directive (WFD), water management at three administrative levels: River Basins, Autonomous Regions and Municipalities. This complex and difficult task comes from the end of 2000 (when the WFD was approved) and has its deadline on 2015. This is why, most of the projects and plans at this respect, coming from local governments, are very recent and not frequent.

Even so, the interaction and the integration of water management responsibilities among these levels has begun to be a reality in important points as:

- Riverbanks Management.
- Improving drinking water quality.
- Floods and drought prevention plans.
- Sanitation, sewage and treatment systems.

During the last decade the ecological status of rivers has improved thanks to the support of massive European funds for implementing treatment plants in order to accomplish the EU legal requirements.

The active social movement for a “New Water Culture” is pressing for a fair implementation of the WFD, with notable influence in recovering wetlands, river banks and the natural domain of rivers, changing plans and policies both at municipal and at River Basin Authority levels.

The change towards new *ecosystem and participative* approaches must be applied to the present task of elaborating new *river basin plans*, which should be ready for 2009.

Institutional transparency and citizens participation is improving the access to relevant information, enhancing participative processes and promoting dialogue and social initiatives bargaining about conflicts...

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1. Introduction and Methodology

In Spain, by tradition, from 1926, River Basin Agency (RBA), called River Basin Hydrographical Confederations (Confederaciones Hidrográficas de Cuenca), has developed water management and planning. Under the present *autonomic model* (neo-federal), these RBA, under the responsibility of the Ministry of Environment, manage the river basins covering territories from several autonomous regions (as the Ebro River Basin); river basins entirely included in an Autonomous Region are managed from *Autonomous Agencies* dependent on the respective Regional Government.

Freshwater resources have been and are considered as a public good and most uses (urban, industrial and mainly agricultural) have been, and are at present, subsidised. Until present, Local Governments have not played a significant role in the general water management and planning in Spain. Anyway local government have full responsibility for drinking water supply and sanitation services.

From 2000 a new legal framework, the WFD, is in force within the EU. From then, Spain, the same as the rest of EU member states, faces the challenge of transposing and implementing this new law that induces a new coherence, shifting:

- a) the “*resource approach*” towards a new “*ecosystem approach*” at river basin level;
- b) the traditional technocratic approach towards new participative approaches.

This new coherence induces indeed a new governance approach, which will need time to be implemented and to move forward, specially concerning local and regional government involvement.

Integrated Water Resources Management (IWRM) poses different challenges at different levels and scopes: integration of different institutions involved in water management; integration of surface water and groundwater management; integration of the different services (irrigation, hydropower, industrial and urban uses) together with flooding

and drought mitigation; integration of land and water management; integration of social, economic and environmental values involved in water management.

But going beyond the integration of the different dimensions of water as a *natural resource*, the WFD asks for assuming the challenge of managing rivers as alive ecosystems in a sustainable way. Under this perspective the traditional concept of IWRM is enlarged, given a holistic integration under the *ecosystem* coherence. River basin scope is needed, including deltas, estuaries and coastal platforms (in order to include impacts related with solid and nutrient flows), but under a profile quite different that the one traditionally assumed in Spain and worldwide, under *resource approaches*, during the XXth century.

Spanish tradition on water management has integrated the dimensions related with water as a productive natural resource, flooding risks and drought mitigation at river basin level. In short, a hydraulic integration management approach, linked with socio-economic uses of water under a technocratic profile. The WFD open new environmental and social challenges aiming the recovery of the good ecological status of ecosystems and new participative governance approaches.

The drivers that the WFD presents in order to develop the IWRM principles under a new ecosystem approach, with respect to the role that local governments can play are:

- The quality of water must affect the costs of drinking water, including treatment processes. Since water quality is affected by upstream land use and water management decisions, local governments have a stake in how these decisions are made.
- Shifting emphasis of a “soft” approach, giving back space to the rivers, in order to mitigate floods risks, affects floodplain and riverbank land use planning both, upstream as well as inside urban areas.
- The WFD requirement of recovering and conserving the good ecological status of aquatic ecosystems demands good water quality that, in turn, demands local commitments on effluent control and sanitation services.

- Additionally, the high costs involved in providing high quality sanitation services, often demand the organization of regional service providers (supra-local scope), driving institutional integration.
- Urban planning, at local level, must integrate storm-water urban runoff foresight, preventing the collapse of sanitation treatment plants and direct discharges, as well as considering the impacts on groundwater recharge.
- Finally, the basin-wide management approach will require institutional cooperation and active citizen participation in water management, in accordance with IWRM principles.

Anyway, five years (from the end of 2000, when the WFD was approved) is a short time for developing the IWRM under ecosystem approach at river basin level established by the WFD, from local, regional and even river basin authorities (where there already exist). The dead line for full enforcing the Directive is 2015. This is why there are little developed good experiences and lessons under this coherence in the Ebro River Basin (as in other European river basins). Anyway there are many lessons and experiences built in the passed by local governments, consistent with the new approach established by the WFD, even if these experiences were not designed under a IWRM at river basin level perspective. We will find also interesting reactions, plans and projects, just born in the last time at local, regional and river basin level, assuming the ecosystem IWRM proposed by the WFD.

This report analyses the present situation and the trends, looking at the near future, with special attention to the level of involvement and responsibility of Local Governments in IWRM at the Ebro River Basin.

For achieving this objective four municipalities have been chosen with respect to their location in the Ebro River Basin: Vitoria (capital of Basque Country) in the up-basin, Saragossa (capital of Aragón) and Tauste (rural municipality) in the mid-basin and Tortosa (in Catalonia) the main town of the Ebro Delta.

The selection of these municipalities is based on three criteria:

- The geographical location in the River Basin (problems, opportunities and motivation for getting involved on a IWRM approach at river basin level are quite different for local governments).
- The scope of the existing municipalities: a relatively large city, Saragossa, close to 700.000 inhabitants; a medium-sized city, Vitoria, with 230.000 inhabitants; a small city, Tortosa, with 40.000 inhabitants; and a rural municipality, Tauste, with 7.500 inhabitants.
- Pertaining to the most relevant Autonomous Region of the Ebro River Basin: Aragon (Saragossa and Tauste), Basque Country (Vitoria) and Catalonia (Tortosa).

The data sources used have been the official documents from the *Hydrological Ebro Confederation* (HEC) (Ebro River Basin Authority), the Autonomous Governments (through their *Water Agencies*) and the Town and City Councils of the selected municipalities. These documentary sources have been complemented with direct interviews in each municipality with the town councillor in charge of water services or local officials of the water operator (see annex...).

2. The Ebro River Basin: General Description

The Ebro Basin is located in the North-eastern part of the Iberian Peninsula. It is framed by three mountain ranges, the Pyrenees to the North, the Iberian Chain to the South-west, and the Catalanian Coastal Ranges to the South-east. It is the most extensive basin in Spain covering 85,362 Km², some 17.3% of Spain's surface area. It is the longest in Spain (910 Km.), and second only to the Tajo (1,007 Km.) in Iberia. Its importance is reflected in the name of Peninsula, which almost certainly comes from the river, first known as the Iber, Iberus and finally Ebro. It was first used in the 6th century BC by a Greek author in reference to the Iberians, or the people who lived along the Iberus (Ebro) river.

The Ebro rises in the Cantabrian Mountains, near the Atlantic coast, and flows eastwards across the Peninsula, forming the Ebro Depression, that separates the Pyrenees from the Iberian Chain, with the shape of a triangle.

The north bank of the river is fed first by the rivers of the Cordillera Cantábrica and then mainly by those of the Pyrenees, including the Aragón, Gállego and Cinca-Segre, as the main tributaries, and to the south generally with a lower discharge, by tributaries from the Iberian Chain, including the Oja, Iregua, Jalón and Guadalope.

The fluvial network has a larger of 12,000 Km including the main river bed (910.5 Km.). All together take the shape of a fishbone.

Although the climate at its source is Atlantic, most of the Ebro's journey is accompanied by a continental climate, under the Mediterranean dominance, with low rainfall, scorching summers and cold, dry winters. This is particularly the case of the arid expanses of central Aragon isolated by oceanic influences, particularly in a triangle formed between Pamplona (southward), Saragossa and Lleida.

As a Mediterranean river, its regime flow is very irregular and has strong annual and inter annual fluctuations. Its natural flow can fluctuate between 8,393 and 29,726 hm³/year.

During the last decades the mean flow has a clear recession trend, evolving from 18 hm³/year to 10 hm³/year. This recession has three reasons

- New irrigated land in the last 60 years, 790,000 ha which consume around 6000 hm³/year.
- Rainfalls (Precipitations) decreasing trend during 40 years: around 4%.
- Reforestations of upstream regions, due to depopulation (Pyrenees and the Iberian Mountain Chain), increasing the natural evapo-transpirations.

After travelling across the Peninsula eastwards, the Ebro empties into the Mediterranean coast - at Amposta in Tarragona Province-, where it fans out to form the Delta de Ebro covering 320 km², one of the most important Mediterranean wetlands in Europe.

<http://www.iberianature.com/material/ebro.html>

Figure 1. Ebro River Basin



The Ebro delta has grown rapidly - the historical rate of growth of the delta is demonstrated by the city of Amposta. This city was a seaport in the 4th Century, and is now located well inland from the current Ebro river mouth. The rounded form of the delta attests to the balance between sediment deposition by the Ebro River and removal of this material by wave erosion.

The modern delta is in intensive agricultural use for rice (around 21.000 ha. which represents 60% of agrarian surface), fruit, and vegetables. White polygonal areas to the north and south of the Ebro River are paddy fields.

<http://www.iberianature.com/material/ebro.html>

The rice crop play an important ecological role since it permits periodical flooding, that substitutes natural flooding, that maintains the ecosystems and the aquifers, impeding salty water intrusion from the sea.

The Ebro delta also hosts numerous beaches, marshes, and salt pans that provide habitat for over 300 species of birds. A large part of the delta was designated as Natural Park of the Ebro Delta (7,736 ha.) in 1983. A network of canals and irrigation ditches constructed by both agricultural and conservation groups are helping to maintain the ecologic and economic resources of the Ebro Delta. <http://www.ebre.com/delta/esp/parque/parc.htm>

In the Ebro river basin live some 2,955,238 inhabitants with a density of 33.55 inhabitants/Km². The population is concentrated in the mid of the valley. Almost half of the population is concentrated in Saragossa, Vitoria, Logroño, Pamplona, Huesca and Lleida.

Table 1. **Main data on the Ebro River Basin**

Surface area Km²	85.362	
Main Rivers	347	
Rivers length, en Km	12.000	
Inhabitants in the basin (2004)	2,955,238	
Estimated natural flow from 1940 1986, in Hm³/year	Maximum	29.726
	Average	18.217
	Minimum	8.393
Mean present total flow at the Delta	10.000 hm ³ /year	

2.1 Water uses in the Ebro River Basin

2.1.1 Urban and Industrial Demand

Urban demand, including the small industries connected to the network, is estimated 524 hm³. There are more than 6000 urban nuclei connected to supply networks in the basin. On the other hand the industrial demand in the Ebro Basin is 470 hm³, of which 258 hm³ are not supplied through urban networks but from direct abstraction mainly from aquifers. The industrial use does not include the hydropower uses. So, the total urban and industrial (without hydropower uses) demand is 782 hm³/year

2.1.2 Agricultural Demand

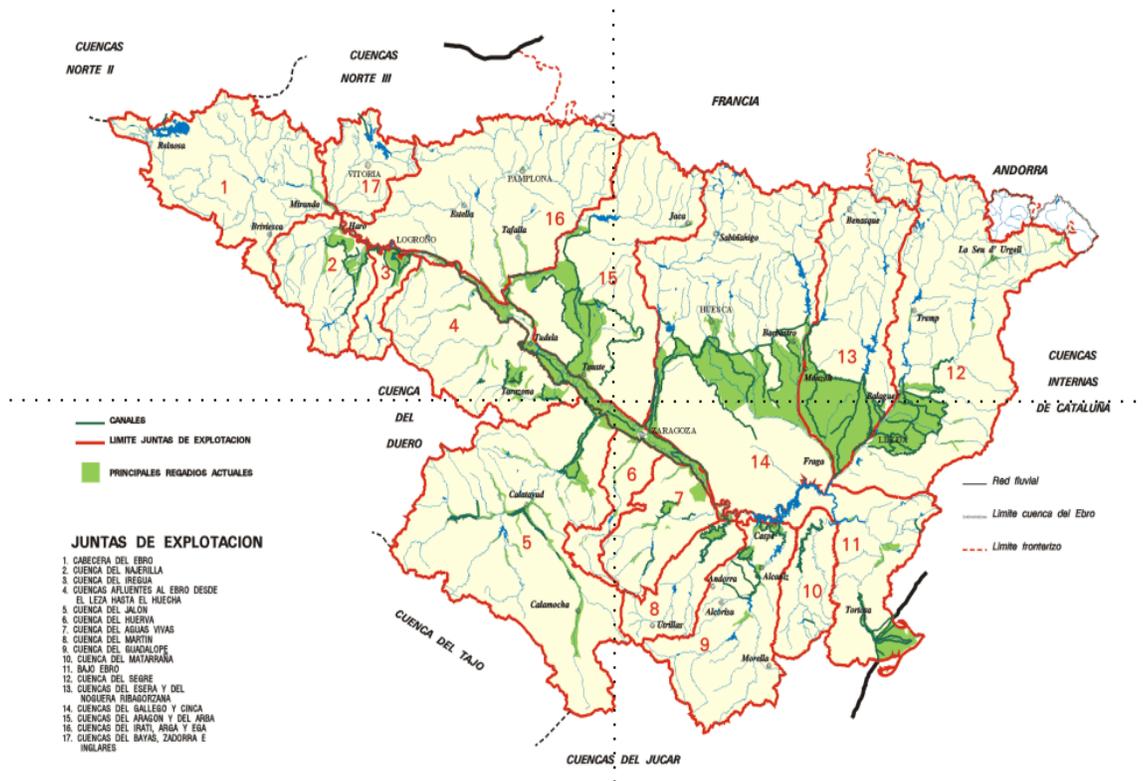
The irrigated land in the basin is estimated on 783.948 ha (concessional). It is very important to highlight that the 58% (455,381 ha) of these irrigated lands are large-scale systems, most of them (more than 350,000 ha) located in arid regions, like Monegros,

Bardenas and la Litera (the driest region in Spain, together with the South-East of the Peninsula; similar to Northern Africa).

According to the Hydrological Plan of Ebro Basin, the current demand of this irrigated area is 6,310 hm³/year, which gives a mean of about 8,000 m³/ha.

One must to highlight that the agricultural demand is nearly 90% of the total water demand in the basin.

Figure 2. Irrigated land Map in the Ebro River Basin



Groundwater

Around the Ebro River, and especially under the large flooding plain of the central Ebro River, there are affluent aquifers. There are also non-alluvial aquifers, as the one in Cariñena-Alfamen, westward from Saragossa, and another karstic one at the South of the

Pyrenees. Except the Cariñena-Alfamen aquifer, that is overexploited, the main aquifers are scarcely exploited. The traditional subsidies, concerning surface water supply, have induced a misuse of groundwater in the basin.

2-2 Main challenges with respect to sustainable IWRM at basin level

The main challenge to face in the new River Basin Hydrological Plan that must be ready for 2009 in accordance with the WFD is to reach the “*good ecological and chemical water status*” along the different rivers within the Basin, or at least the “*good chemical status*” in heavily modified water bodies. The main tasks will be:

- 1- Assessing and guarantying the environmental regime for every river stretch in order to recover the good ecological status.
- 2- Assessing and guarantying the environmental regime in the Ebro Delta, as a very sensitive and specific ecosystem, with strong links with the sustainability of coastal platform ecosystems and fisheries.
- 3- To control and progressively reduce diffuse non-point pollution, mainly coming from irrigated crops. One of the main problems is the salinity of water due to irrigation drainages (with a mean of 3,000 μ S/cm and many with 10,000 μ S/cm).
- 4- To control the over exploitation of aquifers and progressively reduce pollution of groundwater, mainly from irrigation uses.
- 5- Controlling urban sewage discharges after passing through treatment plants.
- 6- Urban storm-water drainage, in order to prevent the deterioration of water status (this one of the main cause of river pollution in the EU).
- 7- To progressively reduce discharges of priority substances and cease or phase-out discharges of the priority hazardous substances.
- 8- To contribute to mitigating the effects of floods and droughts.

The four first points deal with the main issue in the Ebro Basin regarding water management: the use of water for irrigation. At present 784,000 irrigated hectares threat the ecological status of many rivers and specially the sustainability of the Ebro Delta. But the problem become much graver when we look at the projects, included in the present Basin Hydrological Plan, for growing the irrigated areas with nearly 500,000 new hectares. This is, at present, the most conflictive point regarding the new Basin Hydrological Plan to build.

Local Governments are not involved in this kind of decisions, but Regional Governments are deeply involved, because they have competencies on agriculture and land management.

The four last points concern local Governments, because they have clear responsibilities related with them. Anyway, local governments use to get involved at a political level in the conflicts around problems as: flooded valleys and villages by big dams, new irrigation projects or threats of sustainability in the Ebro Delta. This kind of issues, linked to land management, territorial identity and collective interests, at local and regional level, have motivated the political engagement of many municipalities around these problems.

3. Institutional Framework

The Spanish Constitution organizes the State territory into Municipalities, Provinces and Autonomous Communities. All these entities enjoy growing autonomy and competences. The Autonomous Communities play a decisive element in such territorial configuration in the current Spanish institutional framework. Spain is divided into 17 Autonomous Communities giving as a result a sort of federal organisation.

According to this autonomy principle and the territorial decentralization, the State and the Autonomous Communities have competences of different level for different matters in water management.

Municipalities have the main responsibilities and competences concerning urban water supply, sanitation and land planning in urban areas around rivers.

Autonomous Governments have full responsibility for managing rivers when the river basin is completely included in the Autonomous Region. Furthermore, on the one hand their full responsibility for land planning and environment gives to them a significant implication in water management, even in the case of rivers managed by the RBA; on the other hand, their responsibility for public health gives to them also important influence on drinking water and sanitation, controlling and regulating the municipal field and responsibilities at this respect.

Finally, by long tradition, the main global water management competences are concentrated on the RBA, as Public Water Agencies at River Basin level under the responsibility of the

process derives in a trend of transposing competences from national level towards the European level.

It is particularly relevant the growing influence of the European legislation on environmental issues and especially on water issues. In 2000 The EU approved the WFD establishing a new legal framework in the field of water policy. The transposing of this WFD on Spanish legislation supposes new responsibilities at European level.

In Spain, at present fresh water resources are considered as a public good. Its management is regulated by the Water Law of 1985 (reformed at the end of the 90s). Traditionally only the surface water has been assumed under the public groundwater was considered as private domain until 1985. This new Water Law declared all the water resources under public domain, recognising the union of the natural water cycle (groundwater and surface water). But, even so, the cultural and political inertia continues to maintain, in practice, the privacy on groundwater management, very often.

As we said before, from the beginning of the XX century, surface water has been globally managed by public agencies at basin level, the RBAs. At present, groundwater and aquifers are also under public domain, and their management is under the general responsibility of the RBAs.

3.1 Competences on water management

In Spain, as member of the EU, the new legal framework is established by the WFD. The Spanish Water Law must be reformed in the near future for implementing fairly the Directive.

In any case, the Spanish Water Law, in force from 1985, organises water management from a basin perspective, following the traditional approach working in Spain from the beginning of the XXth century.

As we said before, the general competences on water management (for both, surface water and groundwater) are assigned to the RBAs following this basin approach.

By the Constitution, the River Basins including territories from several Autonomous Regions are under the responsibility of the Central Government through the RBAs. When the territory of a river basin is entirely within an Autonomous Community, the competences have been transferred to the respective Autonomous Government. These Governments have organised *Autonomous Water Agencies* for dealing with these responsibilities (as the *Catalan Water Agency* or the *Andalousian Water Agency*).

The general planning at basin level is a responsibility of the respective River Basin Authority (RBA or Autonomous Water Agency). Most of the big hydraulic infrastructures are public and are managed by these River Basin Authorities.

All kind of water uses are managed under a concession system. The River Basin Authorities give the concessions for urban and industrial supply and for irrigation or any other use (recreational, environmental, ...). In fact, in most of the cases the *raw water supply*, for urban water, is managed by the RBA (or the Autonomous Water Agency) of the respective basin.

Anyway, under this general river basin framework, the urban water supply and sanitation services have been traditionally under the responsibility of the municipalities. Each municipality is integrated at basin level in two ways: on the one hand through the water concession, given by the RBA (or the Autonomous Water Agency) and, on the other hand, through the sewer permit given and controlled also by the River Basin Authority.

Another element that gives a reason for integrating the local competences with the responsibilities of the RBA (or the Autonomous Water Agency) at basin level deals with river-banks management in the urban areas. Both institutions have in this case crossed responsibilities that must be integrated.

During the last decades, different competences on public health, environment and territory planning, with relevant implications on water management, have been transferred from central government to Autonomous Regional Governments.

The legal pressure from the EU with respect to urban sanitation services (compliance) has dealt to financial and management capacity problems for many municipalities. In many

regions (as in Aragon and Catalonia) the *Regional Autonomous Governments* have organised new regional institutions that are helping the municipalities in order to accomplish the European Laws, investing in new sanitation plants, and even assuming global responsibilities on managing this service at regional level. In the case of the Autonomous Community of Aragon, the Aragon's Water Institute (AWI) ("Instituto Aragonés del Agua"), depending on the Autonomous Government, has assumed competences in developing and managing urban sanitation systems, in accordance with the municipalities.

3.2 Economic and Financial Framework

Within the Ebro River Basin, the bulk water supply depends on the Ebro River Basin Agency (*Confederación Hidrográfica del Ebro* or CHE) that receives the payments for recovering partially the investments in dams and general flow regulation infrastructures ("canon") and for recovering investments in canals and raw water distribution ("tarifa"), from the municipalities.

The municipalities charge these costs and the costs for water depuration, urban distribution and sanitation to the citizens. Each municipality is free on designing its own tariff system at local level. Generally these tariffs do not recover the full costs. These full costs, if we consider all the investments needed for accomplishing the WFD, would need around 3 €/m³ by mean. At present the tariffs are growing, but even so they use to be under 1 €/m³ (mean value). The tariff system is organised generally by block increasing rates. Generally, these tariffs are rather insufficient for modernising and to maintaining fairly the urban networks.

The new massive investments on new sanitation systems, even counting on strong financial support from the UE, are increasing the tariffs. These new technical and financial requirements have induced an active involvement of most of the Autonomous Government in sanitation services, assuming this competence that until present was municipal. In Aragon, Catalonia, Basque Country and other regions, the Autonomous Governments have implemented new sanitation tariffs, complementing the municipal responsibilities.

3.3 Participative approach: Water National Council and Water River Basin Councils.

The 1985 Water Law created two new different consultative bodies: the Water National Council and the Water River Basin Councils. Both are a first approach to institutionalizing citizens' participation and inter institutional integration.

The Water National Council must integrate this participation at national level, especially in order to discuss and to approve the National Hydrological Plan (NHP) that, by law, must be built.

The Water Basin Councils must integrate the participation of the different governmental levels (local, regional and national) with stakeholders' representatives (farmers, irrigators, hydropower companies, universities and ecological organisations) at basin level in order to discuss and assess the Basin Water Plans.

Anyway, unfortunately, these new institutional bodies never really worked fine with respect to enhance public and citizens participation, until present. Even being created for this purpose, there was never real political willingness to develop the public debate on crucial issues. This is why the new Government has assumed the commitment on reforming the Water Law, among others aspects, on enhancing a real public involvement, especially through these Water Basin Councils. *

4. The Challenge of Integrating Regional, Local and Citizens' Participation within the River Basin.

The CHE was the first basin authority created in the world in 1926. This model has been extended within short times on the rest of the river basins in the country. *

Figure 4. **Autonomous Regions in the Ebro River Basin**



With the WFD, the principle of river basin management has become the basis of water management and planning in EU (EC, 2000).

However this approach implies deep reforms also in Spain. The Spanish tradition, even assuming the basin approach, was built on the logic of *resource management* and not on the coherence of *ecosystem approach*. The new main goal of the WFD is now to recover and to conserve the good ecological status of aquatic ecosystems, including estuaries, deltas and coastal ecosystems.

The Ebro River Basin includes territories from nine different Autonomous Regions: Cantabria, Basque Country, Navarre, Rioja, Castilla-Leon, Castilla-La Mancha, Aragón, Valencia and Catalonia. Under the decentralisation trend on the way, the integration of regional and local competences at basin level is today a challenge, concerning the next revision of the Ebro Basin Hydrological Plan, which must be done before 2009, according with the WFD. Public participation and institutional (local and regional) integration are key issues.

4.1 New Projects on the way in the Ebro River Basin

An important change on the way is referred to the new management and planning approach to implement. Even having a long tradition on water management at basin level, the traditional “resource approach” must shift toward a new “ecosystem approach”.

A promising project to this respect is the one asked by the CHE to the Foundation for a New Water Culture (FNWC) in order to design and to promote a “*Fluvial Natural Park*” along the Mid-Ebro course. This project foresees:

- 1- A technical redefinition of free space for the river, recovering riverbanks, meanders and riparian forests;
- 2- A social strategy through a wide volunteers project on the way called “*Voluntarríos*” (“*Volunteerivers*”) , involving several thousand of people, specially young people, along the river;
- 3- An institutional and political strategy networking municipalities interested on the project together with Regional Autonomous Governments involved.

The project has the next main goals:

- 1- Recovering the Good Ecological Status of the river and riverbanks;
- 2- Improving capacities for dealing with floods risk downstream;
- 3- Sharing and integrating local and regional responsibilities on the precedent tasks;
- 4- Citizens’ involvement and empowerment with respect to a new integrated water management approach under ecosystem coherence.

The EXPO-2008 that will be held in Saragossa, devoted to “*Water and sustainability*” will sponsor, together with the CHE, this project, integrating global responsibilities of the CHE together with local responsibilities from municipalities, scientific know-how, from the FNWC, and active social participation from “*Voluntarríos*”.

4.2 Participatory dynamics for solving conflicts and new governance approach

The NHP adopted by the precedent Spanish government has been highly controversial. This Plan projected to build more than of 120 new dams and huge transfers (1,050 hm³ per year) from the Ebro River to the south-east of Spain and even another one from the Rhône River to Barcelona.

Some of the main dams and specially the transfer of the Ebro River raised very acute conflicts in Spain for the former Government. The social, environmental and even economic contradictions of these projects motivated the active opposition of all environmental groups and many other NGOs, as well as numerous academics, scientists, unions and political parties. This opposition, together with the strong contradictions with the new WFD, blocked the European funding. (The EU was supposed to finance 40% or more of this project)

After the last elections, the new Government decided to modify the NHP rejecting the projected inter-basin transfers and assuming a more consequent transposition of the WFD. Even so, other conflicts continue active in the Ebro Basin around several big dams projected in order to extend more than 300.000 ha of new irrigations. This new growth of irrigated lands raises economic problems (it is not profitable, even from a long term perspective), induces grave political contradictions with respect to the European policies (environmental and agrarian), and creates grave social conflicts with the people affected by the new projected big dams.

The present Government is dealing with these conflicts opening a social dialog among the different parts. The “*Water Commission*” (“Comisión del Agua”) in Aragon is a good experience without precedents in Spain, based on social dialogue, in order to solve these conflicts. During the last two years, this wide commission, involving farmers representatives (Comunidades de Regantes), municipalities and people affected by large dams, ecologist NGOs, Trade Unions, the CHE and the Government of Aragon, with the contribution of different Academic Foundations (as the FNWC) are working on this difficult task with relatively good results.

Beyond the main conflicts on the way, at river basin level the implementation of the WFD is inducing a new and complex participative approach. Under this new approach, the President of the CHE has convoked the representatives of the different actors: farmers, trade unions, environmentalists, hydropower companies, employer’s organisations, public and private operators, affected people by big dams, universities and research institutions involved in water management, municipalities and regional governments. These meetings aim to implement a pro-active public participation at river basin level in order to redesign and draft the new Ebro River Basin Hydrological Plan (ERBHP).

5. Local Government involvement in water management: case studies.

5.1 Tauste Municipality

Tauste is a municipality of the Aragon Autonomous Community with 7,520 inhabitants. It is located in the midstream Basin, closed to the Ebro riverbank and 42 Km. from Saragossa, with an altitude of 267 m above sea level. It has a dry and continental climate with a precipitation average between 275 and 350 mm/year.

The municipality is divided into three nucleuses of which two are rural of 300 inhabitants each one, located 7 km from the main urban nucleus.

During its history, agriculture and livestock ruled the livelihood of Tauste. Today the service sector and small industries have began to gain an important share of its economy. Available Gross Income per capita is €11,371.64 per year and not far with respect to the Available Gross Income per capita 13,598.77 for Saragossa, the Aragon capital.

The data have been gathered mainly from the Aragonese Statistical Institute and the documentation provided by the Tauste Town Council (Instituto Aragonés de Estadística-2002. and Tauste Municipal Register - <http://www.dpz.es/municipios/fichamuni.asp>)

5.1.1 Urban water services

5.1.1.1 Bulk Water Supply

Tauste municipality receives its bulk water from the CHE, through the canals for irrigation coming from Yesa Reservoir. In that way the municipality shares the irrigation canal system used by the Bardenas Irrigation District (BID) for obtaining its provision of drinking water. This shared use between Tauste municipality and the BID, under the responsibility of the CHE, quite frequent for rural areas in the Ebro Valley, gives an example of integrated management at regional level with respect to bulk water supply.

5.1.1.2 Domiciliary Supply

On the other hand, water management within the town, urban reservoirs, water treatment and drinking water distribution through the network are competences of the local government, managed through a concession contract with the company GESTAGUA. The distribution network covers and guarantee water supply for all the population.

The AWI, dependent on the regional government, has the responsibility of controlling water quality supplying. Almost 70% of the industrial use comes from the urban network and the rest is obtained from direct abstractions in the canals of the BID.

5.1.1.3 Sanitation and Treatment

Sanitation and wastewater management is regulated by the AWI. A company, IDECONSA, contracted by the municipality, and under the supervision of the AWI, manages the sanitation system. All the population is connected to the sewage system.

All the industries are connected on the sewage network and the local government has the responsibility of controlling industrial discharges into the sewage system concerning to the dangerous substances.

5.1.2 Water Use in Agriculture

The Bardenas system of irrigated land includes almost 100,000 ha. belonging to several municipalities including Tauste, with 14,300 ha. The traditional orchard and the old irrigated district (Bardenas I) are irrigated by gravity and the new irrigated lands (Bardenas II) by sprinkler. The main irrigated crops in Tauste are:

- Alfalfa (40%), consuming 9000 m³/ha
- Winter cereals: Wheat & barley (25%), consuming 5000-6000 m³/ha
- Maize (15%), consuming 8000-9000 m³/ha
- Vegetables: 5000-6000 m³/ha, consuming around 7000 m³/ha.

The CHE has the responsibility of managing the water for irrigation (coming from the Yesa Reservoir) and of maintaining the main canals network. The BID is responsible for irrigation water management within the secondary network. Anyway, the council is responsible for managing and allocating the existing agricultural common land.

5.1.3 Recreational Uses of Water, Navigation & Others

There are two water recreation activities: public swimming pools (owned by the municipality) and fishing. 4 swimming pools: 3 for summer and 1 for winter. The river is less used than years ago for fishing and is not suitable for swimming.

5.1.4 Environment

The CHE is the responsible for recovering and conserving the good ecological status of water bodies including riverbanks and wetlands. Anyway, in the urban area, the urban planning competences of the municipality works for coordination with the CHE and integration management of urban riverbanks and other fluvial areas.

Riverbanks, wetlands and the historical canal represent important environmental values, services & heritage for this council. Even so, the fact of having shared responsibilities with the CHE and even with the Aragonese Government, leads to contradictions and lack of attention from the local government to this respect.

In the General Urban Plan, the council takes measures to protect the aquatic ecosystem preventing actions that might degrade and have negative repercussions in the good ecological status of waters and riparian zones. These formal measures reflect the growing consciousness on environmental issues. Unfortunately, until present, this is more formal than real. In fact there is little attention, in practice, to the environmental values.

5.1.5 Prevention and mitigation of floods and drought risks.

The Regional Delegation of Central Government coordinates the general citizens' protection with respect to catastrophe risks. In practice, the urban nucleus protection from floods is supervised by a service of "Civil Protection", depending on the Regional Delegation of Central Government. Anyway, the CHE is in charge of managing the existing dams in order to prevent floods.

Recently, the CHE has approved a plan at river basin level for dealing with drought risks. In this plan the different municipalities must coordinate their responsibilities with the CHE, the Aragonese Government and the BID. The fact of counting on large-scale irrigation schemes, as the BID, gives to Tauste a high level of guaranty with respect to drinking water supply, because drinking water is always a priority before irrigation uses.

5.1.6 Tariff System

All the citizens have meters in their houses. The tariff charged by the council per cubic meter of drinking water, for covering the supply service, is 0.42 €/m³.

The treatment plant, financed by the AWI, and the sanitation service are paid through a regional *sanitation tax* per consumed cubic meter: 0.44€/m³ + fix share of 10.98€/quarterly. The council charges the tariff to the users, including the *sanitation tax*, and transfers this tax to the AWI. But, in fact, accomplishing the compromises with the AWI, the Town Council is free for deciding the tariff system, without any supervision or specific regulation from other institutions.

There is no available data on leakage in the urban network of Tauste. Through the direct questionnaire to the Council we didn't obtain any estimation on it. Anyway, the percentage of leakage in similar towns varies in Spain from 20% to 40%. Another frequent problem in similar towns is the bad efficiency of sanitation systems. In fact, there is little control and regulation on this kind of problems. In short, even recovering the cost of supply and

sanitation services, under the responsibility of the Town Council, through tariff and taxes (less than 1€/m³), the real cost of a good and efficient service would be higher.

5.1.7 Social Participation & Governance

There is a regional conflict on increasing the Yesa Reservoir capacity for new irrigated land and for providing more drinking water supply to Saragossa. Tauste and the BID are imbedded in this conflict with Saragossa and with the affected population flooded by the capacity increasing of Yesa Reservoir. At present, the Aragonese Parliament has organised a negotiation process, around this conflict and other similar ones within the Region. The BID is strongly involved in this process, but not so much the Town Council.

There is a significant environmental problem from the surplus of pig manure produced by 120 porcine exploitations. In that point, the CHE (with full responsibility in preventing the pollution of rivers) receives poor cooperation from the Town Council.

There is no specific educative programs and training from the Town Council on preserving the aquatic ecosystem and riverbanks.

People can participate in the periodic council meetings. Beyond this opportunity, the citizens use to participate in the council decisions through Neighbours Associations and through the local farmers association of the BID.

<http://www.pueblos-espana.org/aragon/Saragossa/tauste/Mapa-Zoom/>

5.2 Saragossa Municipality

Saragossa, like Tauste, is located in the middle Ebro River Basin, at the confluence of the Ebro River with its tributaries, the Gallego, coming from the north (left-side) and the Huerva, coming from the south (right-side). It is in the centre of the Aragon Region in the middle of the great Depression of the Ebro Valley. The city is 199 metres above sea level,

and constitutes a crossroads between Madrid, Barcelona, Valencia and Bilbao, all of them about 300 kilometres from Saragossa.

Saragossa is the capital of the Autonomous Community of Aragon. Its population is close to 700.000 inhabitants (more than 50% of the Aragon population), ranking as the fifth-largest city in Spain (INE, 2005 revised) and the largest of the Ebro Basin. The municipality has under its responsibility the control of 1,063 Km².

Saragossa enjoys three rivers (Ebro, Gállego and Huerva), an historic canal, the “Imperial Canal” (built on the XVIIIth century), and an important groundwater alluvial aquifer along the Ebro axe, specially where the Gallego River meets the Ebro River, under the alluvial terrasse system.

It is important to highlight that Autonomous Community of Aragon (with 47,719.2 Km² and 1,269,027 inhabitants) is located almost entirely within the Ebro Basin.

5.2.1 Urban Water Services

We will analyse the different segments of the urban water cycle that implies the provision of urban services: bulk water (raw water) supply, drinking water supply and sewage sanitation.

5.2.1.1 Bulk water Supply

The main source of Saragossa water provision is the Imperial Canal, fed by the Ebro River 80 Km upstream from Saragossa. It was built at the end of XVIIIth century, as one of the first modern big hydraulic infrastructure in Spain. This canal was waterproofed with clay and is today a naturalised water way with a powerful self depuration natural capacity that improves the quality of water.

An alternative source, with a worse water quality, consists on abstracting water directly from the Ebro River. This option is only used when the CHE cuts the provision through the Imperial Canal for maintenance and cleaning operations. The water supply for Saragossa have been traditionally secured and regulated by the “Ebro Dam”, far away more

than 300 km upstream, close to the sources of the Ebro River. Recently a new system is in the way to be implemented, based on a new reservoir, “La Loteta”, fed through the BID system with flows coming from “Yesa Reservoir” (with better water quality, and alternatively from the Imperial Canal when Yesa has not enough water (drought)

Under its general competence for planning and managing the River Basin, the CHE has the control on the Imperial Canal, the “Ebro Reservoir”, “La Loteta Reservoir” and “Yesa Reservoir”. In short, bulk water supply for Saragossa depends on the CHE through a concession given to the municipality of Saragossa.

We must take into account that the Ebro Depression was in time the bottom of a sea. This is why there are plenty of salts in the geology and the soils of the Ebro Basin. After draining thousand of square kilometres of salty land, receiving urban&industrial discharges (only partially treated), and especially brackish water, from irrigation drainage, the result is a poor water quality. Another important factor is the large fluctuations of the Ebro River. In dry periods, with low water flow, salts and pollutants concentration increase significantly.

This problem, together with the need of increasing supply guaranty, foreseeing possible collapses of the Imperial Canal, motivated the new project on the way for supplying new resources to *Saragossa and The Ebro Corridor*.

This plan is based on two main elements:

- 1- La Loteta Reservoir, beside the Imperial Canal (in order to stock water in winter of better quality) and a pipeline network from la Loteta to Saragossa and other towns in the area;
- 2- Water transfer from Yesa Reservoir, in the Pyrenees, using the irrigation canals of the BID and linking this system with la Loteta Reservoir.

The construction of a bigger reservoir in Yesa (from 400 hm³/year to 1400 hm³/year) is at present one of the most conflictive projects all over the Ebro Basin, because of the important

impacts on the people living in villages that would be flooded. For these reason and other ecological impacts, the project is taken on courts and under social conflict.

In respect to this project some controversies arise due to technical and economic reasons: the amount of water projected to be transferred is overestimated - 130 hm³/year, nearly double of the present need of water in Saragossa-; furthermore, the transfer from Yesa is more expensive than others alternatives (nano-filtration of water from the Imperial Canal or from the aquifers)...

All these reasons and arguments, among others, were presented by the FNWC in Brussels, denouncing at the same time the level of leakage of the urban network (more than 35% in the 90's). This assessment from the FNWC led the European Commission to condition the European funds for this project to modernise and improve the urban network before.

5.2.1.2 Drinking Water Supply Service

The drinking water supply service, in Saragossa, as in the rest of Spain is the competence of the municipality. In the case of Saragossa, a Department of the City Council directly manages this responsibility.

Five years ago, the precedent Mayor decided to privatise the water services giving a concession to a private company, but the massive opposition of the population forced the failure of this option. After the last elections, the new Local Government assumed the commitment of guarantying a public management of these services. At present, the City Council is preparing the creation of a public company owned 100% by the municipality for managing these services in a more efficient way.

The Drinking Water quality control is a municipal responsibility, through the Municipal Institute of Public Health, (Instituto Municipal de la Salud Pública). Even so, the regulation, control and inspection functions, taking care of public health, correspond in the last analysis to the AWI.

Treatment plants and Urban Reservoirs: Water is treated at the Casablanca treatment plant, constructed at the beginning of twentieth century. This plant is located on the left side bank of the Imperial Canal, together with the principal water urban reservoir for Saragossa. Its capacity is 180.000 m³. Another two important reservoirs are the Pignatilli Reservoir, with 82.000 m³ and 100-125 years old; and the Valdespartera reservoir, with 50.000 m³ and 30 years old. There are other reservoirs in the city but with less capacity (<15.000 m³).

Chlorination: There are two reasons for forcing a high level of chlorination before injecting the water through the urban network: the age and bad maintenance of part of the network and the long distance to some of the urban nuclei to be supplied from the Casablanca treatment plant. The long time that water must go along these pipes demands this high level of chlorine. This intensive chlorination together with the relatively important content on organic substances in the water, gives proportions of substances as Trihalomethan in the extremes of the network distribution (Casetas, Malpica, la Cartuja districts ...), even above the maximum level accepted by WFD.

The solution to this problem proposed by the municipality is the construction of different new chlorination stations, nearer the users, in order to reduce the chlorine concentration in the network.

Water Distribution Network: Saragossa city has a huge distribution drinking water network with a length of more than 1,025 Km, more than 90 years old. Along the network, the distribution pressure use to vary between 2 and 4.5 bar, with a maximum value of 8 bar.

The urban drinking water network covers all urban nuclei in the municipality and 100% of the population. There are individual meters in all the houses with a proportion of 2.3 persons/water meter.

The total amount of water abstracted from the Imperial Canal and the Ebro River per year is 80 hm³/year (2000).

Ten years ago, the proportion of uncontrolled (not passing through meters) was 50% of total water in the network and the level of leakage was estimated around 35%. In 2000, under the pressure of the European Commission (conditioning European Funds) and after making efforts for improving the network, the leakage has been reduced to 25%.

5.2.1.3 Sewage and Sanitation Service

The sanitation system is based on two plants: The Almozara plant, starting since 1991, for 150,000 habitants, and the second one, the Cartuja Plant, starting since 1996, with a capacity for 1,000,000 habitants. Saragossa Municipality at present treats almost 97% of the wastewater and the sewer system covers around 97% of the population.

The control of the treated wastewater is managed by *the Municipal Environment Service* (El Servicio de Medioambiente del Ayuntamiento), with the collaboration of the *Municipal Institute of Public Health*.

In the case of wastewater from industries, according to the level of treatment assumed by the company and the quality of the discharges, the bill amount can be reduced. This is one of the measures for inducing good practices in the industry.

The inspection functions on the sanitation services are responsibility of the AWI, but the final responsibility for controlling the wastewater discharges and ensuring the good status of rivers and aquatic ecosystems is of the CHE.

The Saragossa municipality imposes a specific *sanitation tariff* (tarifa de saneamiento) since the wastewater treatment plant was constructed under the responsibility of the municipality. In this tariff is included the “treated wastewater discharge tax” paid by the municipality to the CHE. This is why the sanitation service has a special situation in Saragossa with respect to the rest of municipalities in the Region.

Regardless that the sanitation service is a municipal competence, the Aragonese Government has promoted a *Depuration and Sanitation Aragonese Plan* (Plan Aragónés de

Saneamiento y Depuración). Conscious of the limited financial capacity of most municipalities, the Regional Government is developing a regional sanitation system, based on the construction of 171 wastewater treatment plants, with a budget of €1000 millions, including the construction and the exploitation during 20 years. When the Plan will be fully accomplished, Aragon will treat 90% of all the wastewater. In 2005, the IWA has adjudicated already 90 projects with a cost of €450 millions. The municipalities have to contribute with the land for the plants and the financial costs are distributed among all the citizens of Aragon by paying the same sanitation tax in all the municipalities independently of their size. The management of this tax is a responsibility of the AWI. There are two types of tariffs: one for domestic uses, with a fixed charge of €3.66 per cubic meter, and another for industrial uses, with a fixed charge of €14.43 per cubic meter. In both cases there is also a variable component. depending on the quality of the discharge.

The Saragossa Municipality is a special case and doesn't pay at present the *discharge tax* imposed by the Aragonese Government in the Region, because the treatment wastewater plant in Saragossa was already constructed when the *Depuration and Sanitation Aragonese Plan* was launched. Now the Regional Government and the Saragossa City Council are negotiating the future at this respect.

5.2.1.4 Tariff System in Saragossa

Recently, Saragossa municipality introduced new tariffs for drinking water and sanitation system services based on the following criteria:

- ***Sufficient financial funds*** (Cost-based pricing): the domestic tariffs should accomplish the service cost recovery approach.

- ***Equity***:
 - Equitable Costs allocation between users
 - Different tariffs for domestic uses and for industry, commerce, ...
 - Ensure the universal access to safe drinking water: as a human right, affordability should not prevent people from realizing this right.

- The tariff system must be based on marginal pricing: the price must equal the cost of producing the last unit (cubic meter) of the service.
- **Efficiency:**
 - Efficient pricing should stimulate consumers' rational behaviour and thus motivating the resources allocation efficiency
 - Given significant fixed costs and a decreasing marginal cost, it is necessary to include a fixed share which ensure cost recovery principle
 - Moreover, there exist a progressive pricing system (Progressive tariff), which ensure water access to all consumers for a basic consumption.
- **Transparency:**
 - The tariff must be clear: explaining the different concepts involved and the period of time.
 - The water tariff doesn't cover any more other services (as before) and must be devoted to cover water services cost.
- **Savings:**
 - Increasing block pricing in order to induce efficient use and saving

The pricing system of Saragossa, based on increasing block-rate structure, establishes three different tariffs dividing water consumption into three blocks (see table 2):

- The first block is estimated at $6\text{m}^3/\text{household}/\text{mont}$. It represents the basic consumption per household ($3.5\text{m}^3/\text{household}/\text{month}$) plus the standard consumption of one person ($2.5\text{m}^3/\text{person}/\text{month}$).
- The second block is equivalent to the accumulative standard consumption of five persons, which means $12.5\text{m}^3/\text{household}/\text{month}$.
- The third block includes the over consumptions which are setting by a high price that incentives the water saving and its efficient use.
- Households composed by more than six persons can demand the application of a special tariff per capita.

Table 2. Domestic Uses Tariff in Saragossa

Block	Block Amplitude Consumption	2005 Variable share		
		Supplying Price	Sanitation Price	Total Rate
1	From 0 to 0.2 m ³ /day (6 m ³ /month)	0.133	0.154	0.287
2	From 0.2 to 0.616 m ³ /day (12.5 m ³ /month)	0.319	0.370	0.689
3	More than 0.616 m ³ /day (>18 m ³ /month)	0.638	0.739	1.377

Table 3. Non-Domestic Uses Tariff in Saragossa

Block	Block Amplitude Consumption	2005 Variable share		
		Supplying Price	Sanitation Price	Total Rate
1	From 0 to 0.2 m ³ /day (6 m ³ /month)	0.319	0.370	0.689
2	From 0.2 to 0.616 m ³ /day (12 m ³ /month)	0.319	0.370	0.689
3	More than 0.616 m ³ /day (>18 m ³ /month)	0.798	0.924	1.722

The consumption blocks are established in order to:

- Preventing any penalty for households with less than six persons, if they maintain the “standard consumption” (2.5 m³/person/month)
- Guarantying a reduced price for the first consumption block, for ensuring the universal access to a basic water supply; an adjusted price for the second block; and a penalty price for the third consumption block.
- A progressive price from 0.133 to 0.798.
- There is a special tariff for retired, unemployed and low income
- There is a water saving prize for the users who reduce their consumption, at least, 10% along two consecutive years.
- For non-domestic uses, the price of the second consumption block is equal to the domestic tariff.
- The third block is slightly higher for non-domestic users.

Even recognising good progresses on pricing policy related with water services, there are several things that must be criticised:

- The tariff system doesn't include the full cost required for guarantying a good maintenance and modernising the urban network (25% leakage).

- The invested European funds are considered as subsidies and are not recovered through the present tariff.
- The relatively high fixed basic rate induces higher prices per consumed cubic meter for users with lower consumption.
- The links between tariff and number of persons per household is insufficient. It is necessary to link the tariff system with the *Municipal Register*, as in Belgium.

5.2.2 Social participation and governance

Saragossa has participated very actively (400.000 persons participating in huge demonstrations) in the conflict around the Ebro Transfer Project, promoted by the precedent Government. This deep involvement of the majority of the population is a clear reference of the social sensitivity on water issues.

Another conflict rose against the privatisation on water services promoted by the precedent local government. The project finally failed due to the massive reaction leded by trade unions, district associations, ecologists and other citizens' organisations. However, from then, there is a lack of debate on what should be the best approach for managing these services.

Saragossa is involved in the regional conflict around the projected Yesa Reservoir increasing capacity. In that conflictive case, the municipality eludes a transparent and public debate, hiding the ecologic and social problems and contradictions derived from this project. In fact Saragossa will receive, in the near future, water from the new and bigger Yesa Reservoir, instead of developing other alternatives more economic and with less social and environmental impacts (nano-filtration of the water from the *Imperial Canal*, among others).

Despite the mentioned contradictions, the City Hall has opened some spaces for public debate and participation through the collaboration with the FNWC ("*Seminar on perspectives for improving public management of water services*") and the EDF ("*Saragossa Water Saving City*").

Furthermore, during the last year, several initiatives and projects, around the *International Expo-2008*, have motivated in Saragossa spaces of citizens participation. Two examples could be mentioned: the “*Expo Observatory*” and the “*Riverbank Plan*”. The “*Expo Observatory*” follows the projects promoted by the Expo, with the participation of environmentalists, trade unions, resident associations, academic foundations (as the FNWC and the EDF),... Around the “*Riverbank Plan*” an active dialog among the municipality, the CHE and a wide citizens commission is working actively with good results.

5.2.3 Good Practices and Projects

5.2.3.1 The Plan for improving the urban network

On March 2000 the City Council decided:

- The adhesion to the Aalborg letter on sustainable cities
- The adhesion to the Hannover Declaration of 2000 February
- The implementation of the 10 European Common sustainable Indicators
- A Plan for implementing the Agenda 21, adopted by more than 178 Governments at the UUNN Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992.

On the same line, and under the social pressure against increasing the capacity of Yesa Reservoir, the critical reports of the FNWC (with respect to the leaking water level of the network), on March 2001 the European Community gave Cohesion Funds for the project: *Water Supply to Saragossa and the Ebro Corridor* but under the condition of improving the urban network.

In order to accomplish this condition, the Saragossa City Council launched the *Improving Water Management and Quality of Water Supply Project* (Plan de Mejora de la Gestión y Calidad del Abastecimiento de Agua), With two main objectives:

- 1) To renew the urban drinking water network, in order to reach a leaking level less than 15% for 2008
- 2) To reduce the hyper-coloration problem.

5.2.2.2 “Saragossa Water Saving City” Project

Together with the Regional Government and other public and private entities, the Saragossa City Council signed in 1999 an agreement with the *Ecology and Development Foundation* (EDF): the “*Saragossa Water Saving City Project: 50 Good Practices*”.

The main objective of this programme was stimulating efficient water use and management within the city, through 50 good practices:

- 1- Introducing the best available technologies in gardening and parks, public building and industry, as good practice becoming references and models for other sectors.
- 2- Extensive information to professionals and institutions, advising them of the possible available technology in the market and the technical knowledge on these technologies. Giving support to the most dynamic minority of each sector the objective was to enhance the leadership on promoting efficient use.
- 3- Prompting emergent enterprises linked to water industry efficiency.
- 4- Sensitise the society on the importance of saving water improving the efficiency.

This project has been awarded in 1998 and 2002 by the *Dubai International Award for Best Practices to Improve the Living Environment*, a biennial environmental award established in 1995 by the Municipality of Dubai (United Arab Emirates).

Box 1.

Saragossa, the Water-saving City - Spain
Summary
The project aims to resolve water shortage problems using a cheaper, more ecological approach, avoiding confrontation, by increasing efficiency in use. The project hopes to offer a pattern to follow to the over 9,000 Spanish towns that squander more than 1,500 Hm ³ of water per year.

In 1997, the collective challenge in Saragossa was saving 1 million cubic metres of water per year. In fact, 1.176 million cubic metres were saved.

At present, the project is working on two objectives:

1. To establish 50 Best Practices for efficient water use in the city and expanding the experience by imitation. The Royo Villanova Hospital is a perfect example to copy, with a consumption of 382 litres per bed per day, one of the best ratios in the world.

2. To bring about a civic consensus on the water price as a stimulus for efficient use. A Municipal Committee has been set up for this purpose, consisting of employers, consumers, and the EDF.

Today Saragossa has the lowest household consumption ratio per inhabitant per day in Spain: 96 litres. In addition, there have been changes in official policy: the Saragossa City Council is planning to reduce the total city consumption from today's figure of 80 Hm³ to 65 Hm³.

http://www.bestpractices.org/database/bp_display_best_practice.php?best_practice_id=2045

5.2.3.3 Special Plan for Protection, Conservation and Improvement of the “Juslibol Galacho” Wetland.

This plan includes, beyond the wetland, the area surrounding the Ebro River and its riverbanks: scrape and steppe, Irrigated land and urban areas. The scope of this plan is classified as a special non-urban land in the *Saragossa General Urban Plan*.

The Juslibol Galacho is a former meander of Ebro River, set aside from the present riverbed, after the historical flooding on January 2 of 1961, when the Ebro River flow reaches 4,130 m³/s. It is situated in the Saragossa municipality boundaries, 5 km from the centre of the city. At present, it is a natural reserve for birds and fishes.

The protected area by this Plan, belonging to the Saragossa municipality, has a surface area of 113.3 km². It is included in the projects list of the Man and Biosphere programme since 1990.

The Plan is based on several goals:

- 1- To protect the space preventing any urban development.
- 2- To organise a special municipal surveillance.

- 3- To follow the evolution of the “Galacho” through a scientific programme.
- 4- Controlling public access and creating an Information Centre for Visitors.
- 5- Developing an Educational Program for Schools.

5.2.3.4 The International EXPO-2008

The next international EXPO will be held in Saragossa under the lemma “*Water and Sustainability*”. This is one of the results of the active citizens mobilisation around water issues. Obviously the City Council is deeply involved in this project. The Expo has been, in fact, a key issue in order to open public debates and citizen’s participation around many problems related with the river and water management, with contradictory results. In short, the Expo is accelerating the transition process from the traditional technocratic approach towards new participative approaches.

One of the most positive projects activated by the Expo-2008 is the “Riverbanks’ Plan”, which projects the recuperation of more than 40 km of riverbanks along the Ebro River, the Gallego River, the Huerva River and the Imperial Canal, within the territory of Saragossa Municipality, with active public participation.

5.3 Vitoria Municipality

Vitoria (Gasteiz in Basque) is the political capital of the Basque Country and home to the Autonomous Government and the Basque Parliament. It has a population of 229,000 inhabitants (1/1/2006), most of them, 98%, living in the urban area. It is located on the Mediterranean slope of the Basque Country, in the Ebro River Basin, at 525 m above the sea level. It has a transition Atlantic-Mediterranean climate with an average annual rainfall around 828 mm. Vitoria is located in the riverside of the Zadorra River, a tributary of the Ebro River.

A part of the Basque Country is within the Ebro River Basin, where the management of rivers is under the responsibility of the CHE (depending on the Central Government); the

Atlantic slope, drained by several rivers, is managed under the responsibility of the *Northern Hydrographical Confederation* (NHC).

The *Basque Country Autonomous Community* (BCAC) has full competences on public health, environment and land management; but also competences directly related with water management:

- Scheduling, approval, execution and exploitation of hydraulic projects in the BCAC.
- Conferring Economic aids to local governments and other local entities for carrying out water projects.

Within the Basque Country there are three provinces, Alava, Guipuzcoa and Vizcaya, with their one “Foral Deputations”. Vitoria is located in Alava. These “Foral” institutions have strong financial capacities and use to promote water projects through the following competences:

- Drafting and approving the *Services and Public Works Foral Plan*.
- Developing Public Works.
- Legal, technical and economic advising and collaboration with municipalities with respect to water services under local responsibility.

5.3.1 Urban Water Services

5.3.1.1 Bulk water supply

The municipalities are competent on urban water supply and sanitation services. The water source for Vitoria is the Zadorra River through the Zadorra Hydraulic System (built more than 50 years ago) based on two reservoirs: the Ullibarri-Gamboa Reservoir, with a capacity of 148 hm³ (fed by the Zadorra River, the Barrundia River and the Alegría River); and the Urrianaga Reservoir, with almost half capacity of the previous one (fed by the Santa

Engracia River and the Urkiola River). This system supplies 90% of the water used by Vitoria City; the rest comes from wells.

The Zadorra Hydraulic System, with both reservoirs, has the next objectives:

- Supplying water to Vitoria.
- Controlling and managing floods risk in the area of Vitoria.
- Supplying drinking and industrial water to almost 34 municipalities in Vizcaya, and specially Bilbao (*Bilbao Water Consortium*), through the *Inter-basin Transfer System Zadorra-Bilbao*.
- Hydropower production.

The hole population (in Vitoria and Bilbao) supplied by these two reservoirs represents 43% of the BCAC population.

The complex multipurpose management of the *Zadorra Hydraulic System* is under the full competence of the CHE, but the provision from the Reservoirs is managed by the municipality.

5.3.1.2 Drinking water supply

The municipal responsibility of the City Council with respect to drinking water supply is carried out by a public concessional consortium called AMVISA, (Agua Municipales de Vitoria, S.A.), which manages both, bulk water (in collaboration with the CHE) and domiciliary water supply. The concession given by the CHE for supplying Vitoria is 33.88 hm³/year. Water quality control is also responsibility of AMVISA. Water network distribution covers 99% of the population (1% has self-supply from wells). Most industrial uses are obtained from the urban water network.

The drinking water urban network has a high efficiency level: more than 86%, in fact one of the best in Spain.

5.3.1.3 Sewage and Sanitation Service.

Sewerage and sanitation system is under municipal competence, but managed by AMVISA. The service covers 100% of the population. The drainage and sewerage system is a unitary or combined system (wastewater joint to runoffs) (as in the rest of Spain). Anyway, in the new districts it is segregated system with a specific treatment for runoffs.

This unitary system, integrating even natural secondary water-courses under the city, gives big troubles due to the collapse of the treatment plant with storm water. In fact, when the drainage of storm water collapses the capacity of the treatment plant a by-pass derives the whole urban discharge and drainage flow directly to the Zadorra River, with grave ecological impacts.

Until present, unfortunately, all the industries are connected on the sanitation system, reducing the efficiency of the treatment plant. The responsibility of industrial discharges control on sewage system is municipal, through the *Municipal Department of Environment*. There is a systematic inspection, maintenance and control on the installations of the sanitation system.

5.3.1.4 Tariff System

In accordance with official data (given through direct questionnaire) the financial costs of the wastewater treatment plant are entirely covered but the municipality subsidizes the sewerage system and the drinking water supply.

In accordance to the following tables published by AMVISA, the tariffs have an increasing block rate structure and on the other hand there are different tariffs for different uses. In fact, the municipality offers not only domestic drinking water, but also hot water from the aquifer for domestic use.

Table 4. *Water tariffs in Vitoria*

Concept:	Cold Water service for Domestic Use		
	- First 20 m ³		0,20
	- From 21m ³ to 115 m ³		0,35
	- From 116 m ³		0,58 €/m ³
	- Treated wastewater		0,15 €/m ³

Concept:	Hot water service and Complementary Services for Domestic use		
Tariffs:		Consumption/use	Treated wastewater
	All uses paid by m ³	0,30 €/m ³	0,15 €/m ³

Concept:	Services for centres dependent on Central, Autonomous and Local Administration		
Tariff:		Consumption/use	Treated wastewater
	All uses paid by m ³	0,40 €/m ³	0,17 €/m ³
Concept:	Services for industries and commercial centres		
Tariff:		Consumption/use	Treated wastewater
	All uses paid by m ³	0,58 €/m ³	0,35 €/m ³

<http://www.amvisa.org/es/html/>

5.3.2 Irrigation uses

AMVISA does a wastewater tertiary treatment, but then, a part of the returns are regenerated by TYTSA, obtaining a water quality suitable for trout. This company works under concession contract, in order to regenerate the water that is reused for irrigating 4,000 ha. The cost of this regeneration process, around 0,15 €/m³, is fully paid by the farmers.

5.3.3 Social participation and governance

Vitoria has a long tradition on citizen's participation. This tradition has emerged with respect to water issues with the "Vitoria Water Table", where all kind of citizen organisations are involved. This initiative is recognised by the City Hall as one of its main citizen participation references in order to obtain criticisms and alternatives. In fact, most of the good practices explained latter came from the "Vitoria Water Table".

The main conflict under discussion is around the way to manage the *Zadorra Hydraulic System*, where Vitoria interests are in contradiction with hydropower production and with the water concession owned by *Bilbao Water Consortium*. Until present, the political difficulties and differences between the *Vitoria City Council* (governed by the Popular Party), on one side, and the *Autonomous Basque Government* (presided by the Basque Nationalist Party) and the CHE, dependent on the Central Government (Socialist Party), on the other side, have blocked any possible solution. In that case, the extremely difficult political situation of the Basque Country is the main obstacle for achieving the inter-institutional integration.

5.3.4 Good Practices and Projects

5.3.4.1 Vitoria Integral Water Saving Plan: 2004-2008

Vitoria is a pioneer city in implementing projects and programmes for improving the environment. Its drinking water distribution network is one of the most efficient in Spain: 85.94%. This high efficiency is the result of efforts along 20 years. These efforts led to saving 32% of the total water that fed the urban system.

A new plan is on the way on water saving, following at the origin the general framework of the Agenda 21. The main objective of this plan is to promote the water saving among the different institutions involved in water management & distribution and users in the urban region. A key issue of the plan is the citizens' participation.

The main points of this program are:

- To prevent domestic demand growth.
- To reduce the current uses public institutions.
- To improve efficiency at the Industrial-Commercial sector
- To reduce the bulk water supply below 25 hm³/year
- To maintain the network efficiency at the level of the last three years (85%)

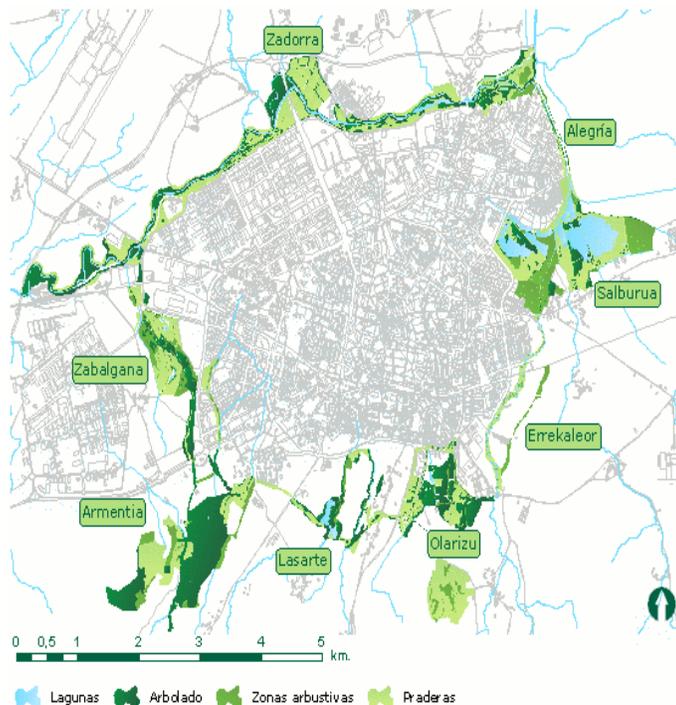
- To analyse and assess the substitution of drinking water by regenerate water for industrial uses, street cleaning, gardens and landscape irrigation.

5.3.4.2 The “Green Belt” around Vitoria

The “Green Belt” is a natural space protected in order to provide environmental functions and services around Vitoria. Less than a decade ago, the periphery of the city was abandoned and degraded. The project aims to restore the Vitoria urban periphery, both from ecological and social point of view. One of the aspects of this restoration process deals with sources, streams and wetlands, as *Salburía Wetland* and the left-side riverbank of the Zadorra River.

The *Dubai International Award for Best Practices to Improve the Living Environment* selected the “Green Belt” around Vitoria in 2000 and 2004 as Best Practice case.

Figure 5. *The Green Belt around Vitoria*



<http://www.bestpractices.org/database/index.php>

http://www.bestpractices.org/database/bp_display_best_practice.php?best_practice_id=1868

5.3.4.3 *Special Plan for Preventing Floods.*

As we said before, one of the objectives of the Zadorra hydraulic system is to prevent and manage floods risk in Vitoria. Even so, floods still produce hard damages in the city and specially in the industrial area. Paradoxically the main damages came after building the Ullibarri and Gamboa Dams. When these dams were built, counting on their theoretical flooding control, the domain of the river was occupied by an industrial area. This irresponsible occupation is in fact the real root of the problem. The other key issue is the complex multipurpose management of both reservoirs, with priority to the concession to the *Bilbao Water Consortium* and to the hydropower concession to *Iberdrola* (interested in preserving a high water level in the reservoirs in order to maximise the hydropower productivity).

The main objective of this plan is to prevent floods in the urban area of Vitoria. Three projects has been already carried out:

- 1- Transforming a section of the Zadorra riverbanks (more than 1 Km.) in a big natural park integrated in the *Green Belt*, as a leisure area and at the same time as a flooding space to the river.
- 2- Driving the southern streams away from the sewage system and deriving these flows to the *Salburía Wetland*. In that way this wetland has been recovered and integrated in the *Green Belt*.
- 3- Building an artificial canal, parallel to the riverbed, enlarging the draining capacity. This Plan was promoted by the Ministry of Environment through the public company *Aguas de la Cuenca del Ebro, S.A. (ACESA)*, employing European Cohesion Funds (85% of investment) and with the contribution of the Vitoria Municipality.

The third initiative is in fact the most expensive and the less effective, because it displaces floods problem downstream. The most effective solution, based on giving back to the river a part, at least, of the river public domain occupied by the industrial area, continue under debate and negotiation.

5.4 Tortosa Municipality

Tortosa is the capital of the Low Ebro, in Catalonia (Tarragona province). It is located at the beginning of the Ebro Delta, 12 metres above the sea. Tortosa has a population of around 36,430 inhabitants (31 December 2005). More than 87% of this population lives in the main urban nuclei and 13% in rural areas.

The Tortosa municipality has full competence on the drinking water supply and sanitation services. The rest of main water management competences correspond to the CHE and the *Catalane Water Agency (CWA)* (Agencia Catalana de l'Aigua-ACA), which is the water authority depending on the Autonomous Government of Catalonia (the Generalitat).

The relationship of the municipality with both, the CHE and the CWA, responds mainly on the necessity of coordination in matters as bulk water supply, urban planning, urban riverbank management and floods risk prevention. With respect to sewage and sanitation service, the huge investments done in order to accomplish the European legislation led to transfer municipal competences in Catalonia to the *Generalitat* (Autonomous Regional Government) through the CWA.

5.4.1 Urban water services

The Town Hall of Tortosa manages its competences on urban water and sanitation services through the *Municipal Company of Public Services, S.L.* (MCPSSL) (Empresa Municipal de Serveis Públics, S.L.), owned by the municipality.

5.4.1.1 Bulk water supply

Drinking water is entirely supplied from wells, fed from the *Ports de Beceits aquifer*, and managed by the MCPSSL. This source gives water of excellent quality, much better than

the one used for irrigation, derived from the Ebro River. 10% of the population obtains the water from direct abstraction from the aquifer and not from the urban network.

5.4.1.2 Drinking water supply

The whole urban water supplying cycle - water abstraction, purification & chlorination, transport to the urban nuclei and domiciliary distribution - is absolutely a municipal competence, managed by the MCPSSL.

The water quality on the tap is supervised and controlled by the *Public Health Agency* (Servei Territorial de Salut de les Terres de L'Ebre), depending on the *Generalitat* (Autonomous Regional Government).

The urban network supplies drinking water to 100% of the population living in the urban nuclei, Counting on the rural population living around the town, the urban network supply drinking water just to 90% of households.

5.4.1.3 Sewage and Sanitation System

The sewage system is unitary (common for wastewater and runoffs). It provides sanitation service for 87.4% of the population. This is, in fact, the percentage of population living in the urban nuclei.

The *Municipal Maintenance Equipment* currently carries out the maintenance of the sewerage network. The extension of the sewerage network, due to urban growth, has been controlled by the *Urban Planning Department* of the municipality.

In fact, until present, the sanitation service has been managed directly by the municipality; even though, it is foresight that the MCPSSL will carry out the service in the near future. Until present, municipal sewage network maintenance is limited to fix damages.

When the service is transferred to the MCPSSL, a new approach will be assumed, based on inspection, control and preventive maintenance.

The municipality, together with other municipalities around Tortosa, delegates the competence for wastewater treatment plants, which mean its exploitation and discharges control, to the *Low Ebro County Council* (Consell Comarcal del Baix Ebre), under the supervision and control of the CWA.

5.4.1.4 Tariff System

Tariffs for drinking water supply and sanitation are municipal responsibility. Drinking water tariff structure is based on increasing block rate approach. On the other hand, there are different tariff for each type of use and for special zones that require special and complementary considerations:

- Industry
- Hospitals
- General domestic users
- Specific residential districts, with expensive pumping needs that are included in a specific tariff.

In any case, the tariffs designed by the municipality have are based on an increasing block rate structure and must be approved by the *Catalonian Price Commission* (Comissió de Preus de Catalunya), depending on the Generaliat, that controls and regulates urban water services at regional level.

In accordance to the applied tariff, the amount received from subscribed users covers the drinking water supply costs, managed by the MCPSSL.

As we said before, the competence for wastewater treatment plant exploitation and maintenance corresponds at present to the CWA. The cost of this service is partially recovered through the *discharge tax* collected together with the drinking supply water tariff

by the municipality and then transferred to the CWA. At present, the deficit caused for not recovering the full financial costs of the massive investment in building new treatment plants is one of the main financial problems of the Catalane Government. This why, in the near future, the *Generalitat* will give back to the municipalities the full responsibility for managing the sanitation system.

With respect to the industries, some of them have their own wastewater treatment service and are not connected to the sewage network. Each industry must declare to the CWA the discharge volume and its composition in order to calculate the *tax discharge* to pay. The *Low Ebro County Council* is in charge of controlling the effective discharges under the supervision of the CWA.

The mean cost paid by the different users in the municipality is around 0,75 €/m³, including the *tax discharge* imposed by the CWA.

5.4.2 Flooding Risks

With respect to flooding risks, the Ebro River Basin regulation is a responsibility of the CHE, which must control the river flow (specially from the Mequinenza Reservoir and the Ribaraja Reservoir) and alert the municipality, activating the emergency plan, in case of possible floods.

The responsibility of the CHE, in order to manage risks through hydraulic infrastructures, must be coordinate with the competences of the *Generalitat* with respect to emergency plans for guarantying citizens' safety. Local Governments are key pieces in these plans.

5.4.3 Irrigation uses

Tortosa is the capital of an important irrigation district: the *Ebro Delta Irrigation District* (EDID), with around 20.000 ha, with two main sectors served by two canals, one on the left-side of the river and the other on the right side.

The EDID receives its concession rights from the CHE, but has a deep involvement on land management in the Ebro Delta. In fact the network of the EDID is used not only for irrigating rice crops but also for maintaining under control the salinity through artificial and controlled and massive floods. This strategy, together with others related with the use of the canals' network for draining and deriving flows from the riverbed in case of floods risk, are usually coordinated among the CHE, the CWA, the municipalities and the EDID.

5.4.4 Good practices and projects

The Town Hall of Tortosa has assumed a very active attitude with respect to the river conservation and has assumed practical commitments in order to save water, to improve the efficiency and to promote the education for the *“new water culture”*.

5.4.3.1 The “Water House”.

This is an emblematic project built through an agreement between the municipality of Tortosa and the FNWC. This project is based on the former railway station recovered as the site of different kind of activities related with water management:

- Cultural activities, conferences, exhibitions, ...
- Public discussion and citizens participation in water management policy at municipal level.
- Coordination of an educational programme developed in the schools of the county.
- Program for assessing, modernising and optimising urban networks and saving water in public institutions in the county.
- Program for saving water in domestic uses, through citizens' education.

5.4.3.2 Other programs and activities

During the last years, Tortosa is homing all kind of events and activities related with the social movement for a *“New Water Culture”* :

- In 2004 the Iberian Congress on Water Management and Planning, organised by the FNWC with the participation of 70 Spanish and Portuguese Universities.
- The yearly International River Film Festival.
- In 2005 the Ebro River Basin Assembly of Municipalities: in order to sign a municipal commitment for developing the New Water Culture.

Conclusions

1. Spain has a large and rich tradition on river management at river basin level, since 1926, through *River Basin Authorities* (“Confederaciones Hidrográficas de Cuenca”) under the responsibility of the Central Government, but with a scarce involvement of local governments, and based on a *resource management approach*. The task of shifting from this traditional approach to the present *ecosystem approach* established by the WFD, and from the traditional *technocratic* management approach to new approaches based on *pro-active citizen participation*, following the *Aarhus Conference* agreements, has already forced interesting institutional reforms in these *River Basin Authorities*, based on creating River-Basin Councils (at present under a reform process):
 - more and more opened to public participation, with special emphasis referring environmental NGOs;
 - with deeper involvement of local and regional governments.
2. There is also a large tradition in water supply and sanitation services under municipal responsibility with a basic lesson to learn: the access to *safe drinking water and sanitation services* for everybody has been achieved under public management approaches, by recognising it as a citizens right and assuming from local governments a very first priority on it.
3. The Spanish experience on decentralizing responsibilities on public health and land management, among other important questions, gives the opportunity of building institutions and responsibilities on water management (related to both land

management and public health) at medium-size territory level, between local governments and river basin authorities. This an opportunity for giving support to the municipalities at regional level (economies of scale for public services) and for linking local responsibilities at regional level under the river basin perspective. This is in fact a practical challenge for building a Public-Public-Partnership experience on the way.

4. Local Governments have no tradition on participating in planning and management at river basin level; but there exist a long tradition on working together with “River Basin Authorities” with respect to bulk water supply services (generally managed by the River Basin Authorities) and discharge concessions. From this experience, and having at present a representation on the *River Basin Council* (as an advice body), municipalities are being integrated on *water planning and management at basin level* mainly through this tradition and experience (supply concession + bulk water supply + discharge concession + new environmental requirement from WFD).
5. The decentralisation process at regional level is resulting in higher and progressively effective municipal integration at regional level for developing, under the subsidiary principle:
 - efforts and investments on sanitation and sewage treatment systems, through regional institutions or public companies with regional scope, providing economies of scale for this kind of services;
 - draught prevention under a broader perspective (regional), halfway between local and river basin level.
6. The integration of the Autonomous Governments (with growing competencies) under the *ecosystem approach*, but under the control of *River Basin Authorities* is feeding active debates and rising also negative trends. In this case the progressive decentralisation process on the way in Spain risks to erode and degrade the river basin framework coherence for *planning and managing water* under the *ecosystem approach* required by the WFD
7. Anyway the interaction among *River Basin Authorities*, *Autonomous Governments* and *Municipalities* has begun to be a reality in important points as:
 - Riverbanks Management.
 - Improving drinking water quality.

- Flood and drought prevention plans.
 - Sanitation, sewage and treatment systems.
8. During the last decade the ecological status of rivers is improving thanks to the effort done on new treatment plants, counting on massive European funds and the implementation of new legal European requirements. *European Cohesion Policies* for helping the poorest countries within the EU have been effective on this point, but need now to be followed with respect to maintenance and right management of these treatment plants (frequently inefficient at present), asking for strict responsibilities through the respective Member State Governments
 9. The change towards new *ecosystem and participative* approaches is being applied, with plenty of contradictions and difficulties, to the present task of elaborating new *river basin plans*, which should be ready for 2009. A new and complex participative approach is on the way. At the beginning of the process all the different actors (farmers, trade unions, ecologist movement, hydropower companies, employer's organisations, public and private operators, affected people (by big dams) organisation, universities and research institutions involved in water management, municipalities and regional governments) have been convoked by the *River Basin Authority* in order to discuss the way of implementing a pro-active public participation model at basin level.
 10. Institutional transparency and citizens participation is improving: Webs, easier access to relevant information, participative processes, dialogue and social initiatives bargaining about conflicts... During the last two years a process of dialogue and negotiation is open on the different and acute conflicts on big dams in the region of Aragon with good results. The process as been organised through an *intermediation strategy* and count on the collaboration of the University in order to look for new technical alternatives.
 11. Even the Ebro River Basin is Spanish (except a minimal territory of the basin in Andorra), it is relevant to underline that Spain and Portugal signed some years ago a Convention (the Albufeira Convention) in order to collaborate in managing and designing *integrated plans for shared river basins* between both countries. New transnational river basin plans should be drawn up in the near future according with the WFD.

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