



SWITCH

Sustainable Water Management in the City of the Future

**Urban Water Management: Water governance and institutional
mapping in Zaragoza, Spain.**

Maria de la Paz de San Miguel Brinquis
Delf, The Netherlands.
February 2009

Abstract

This paper introduces briefly the current situation of the urban water governance in the city of Zaragoza, Spain, a SWITCH Demo city. In order to understand it, the urban water management in Spain is explained at different levels: European, national, regional and local. The city of Zaragoza has a special characteristic in the management of the urban water cycle, because it is the municipality the one in charge of its management. While in most Spanish cities, the common situation is that the competence lies on the municipality, but it gives the water supply and sanitation services to private or public enterprises. Weak and strong point of this uncommon situation in the city of Zaragoza are presented along this document. The aim of this paper is to show the current water governance and institutional mapping of water in Zaragoza, and it can be seen as a starting point for future research activities.

Table of contents

Abstract	2
Table of contents	3
Table of figures	4
1. Introduction	6
1.1 Author's role in SWITCH-Zaragoza.....	6
1.2 The city of Zaragoza.....	6
2. Water Governance in Zaragoza	7
2.1 Government.....	7
2.1.1 <i>Spanish governance structure</i>	7
2.1.2 <i>Role of the Central State, Autonomous Region and Province in water governance</i>	8
2.1.3 <i>Role of the Local Municipality in water governance</i>	10
2.2 Civil Society.....	17
2.3 Private Sector.....	19
3. SWITCH in Zaragoza	19
3.1 Water Governance.....	20
3.2 Institutional Mapping.....	21
4. Integrated Urban Water Management in the city of Zaragoza	23
4.1 Water supply and sanitation.....	23
4.1.1 <i>Improving water supply and consumption efficiency</i>	23
4.1.2 <i>Ensure adequate water quality for drinking water as well as waste water treatment</i>	24
4.2 Improve economic efficiency.....	25
4.2.1 <i>To sustain operation and guarantee the universal access to water</i>	25
4.2.2 <i>To make research activities</i>	25
4.3 Utilise alternative water resources, including rainwater and treated water.....	25
4.4 Engage the citizens to reflect their needs and knowledge for water management.....	25
4.5 Establish and implement policies and strategies to facilitate the above activities.....	26
4.6 Management of the urban water system in an integrated way.....	26
5. Conclusions and recommendations	26
References	29

Table of figures

Figure 1: Map of the location of Zaragoza.....	7
Figure 2.1: Hierarchy of Spanish governance and its equivalent in the city of Zaragoza.....	8
Figure 2.2: Administrative division of the Ebro River Basin.....	9
Figure 2.3: Organization chart of the water governance in the city of Zaragoza.....	13
Figure 2.4: Main stakeholders of the IUWM in the city of Zaragoza.....	14
Figure 2.5: Geographical distribution of the districts of Zaragoza.....	18
Figure 3: Institutional mapping of SWITCH main actors.....	22
Figure 4: Amount of water for consumption.....	24

Abbreviations and acronyms

AES - Agency of Environment and Sustainability (Municipality of Zaragoza)

CHE - Ebro River Basin Organisation

DGA - Government of Aragon

MMA- Spanish Ministry of Natural, Rural and Marine Environment

IUWC - Integrated Urban Water Cycle

Unizar - Department of Applied Economy of the University of Zaragoza

UWC – Urban Water Cycle

UWM - Urban Water Management

WFD - Water Framework Directive

WWTP - Waste water treatment plants

1. Introduction

1.1 Author's role in SWITCH-Zaragoza

The author of this paper has been involved in the SWITCH project and Zaragoza during her MSc internship and thesis, in a time-frame of one year approximately. During the internship she worked with the Local Agenda 21 of Zaragoza Municipality, now called the Agency of Environment and Sustainability (AES). She carried out different tasks such as, facilitator tasks (e.g. communication between the SWITCH project and the city of Zaragoza), translations of documentation and in several meetings between SWITCH and Zaragoza, report writing of the situation of Zaragoza, description of the study area, the role of SWITCH in the city and the city plan, etc. The MSc thesis was about the simulation of the Total Urban Water Cycle in the SWITCH study area. Now she is involved again just for three weeks for writing this paper, one year after she finished her MSc thesis and the relationship with SWITCH-Zaragoza.

The key sources of information on governance have been the different municipal departments, specially the AES, and a water documentation centre of the Municipality. Without their support, both knowledge and logistic, the development of this paper would be impossible. As Zaragoza is not working in the WP 6.1: Governance for Integrated Urban Water Management, they are not working on this topic. They are working in the WP 3.1: Demand management for optimization of urban water services, so their main objective is to reduce water consumption. The activities they are carrying out to achieve this objective are technical and social. These activities are explained with more detail in this paper.

1.2 The city of Zaragoza

The city of Zaragoza is the capital city of the autonomous region of Aragon, one of the 17 autonomous region in Spain. Aragon is situated in the North East of the Iberian Peninsula bounding in the North with France and is in the centre of the Ebro River Valley. (see figure 1). It has an extension of 47,791 km² and a population of 1,327,000 (2008 data from Zaragoza Municipality).

The city of Zaragoza has a surface of 967Km² and a population of 675.000 (2008 census estimate), ranking fifth in Spain. A high percentage of residents (90% approximately) live in apartment blocks which means that the city is compact. Because of its size and population characteristics Zaragoza is a model city for Spain, where many demonstration projects are undertaken.

Zaragoza is located in the Ebro River Catchment and its tributaries the Huerva and the Gállego rivers, and it is the most important city situated in the Ebro River Catchment. The Ebro is the second largest river in Spain (928 km) and has a total annual discharge of 19,000 million m³.

Climate conditions of Zaragoza are a transition between Mediterranean and Continental climate with an average temperature of 15°C. The Ebro River Valley at Zaragoza is a semiarid region with an average annual precipitation of 367 mm per year concentrated in 67 days, ranking the area as the driest inland region in Europe. Although Zaragoza is located in a very arid region of Spain, currently the city does not suffer water scarcity problems due to its location on the largest river of the Iberian Peninsula, the Ebro River.



Figure 1: Map of the location of Zaragoza.

2. Water governance in Zaragoza

In order to understand the current situation of the water governance in Zaragoza, first of all it is important to understand the structure of the Spanish Governance. In this section, a brief overview of the three main levels of governance -government, civil society and private sector- is shown.

2.1 Government

2.1.1 Spanish governance structure

The Spanish government is a Parliamentary Monarchy and the Spanish Constitution is the most important collection of rules and principles that governs the structure of the Spanish State. In order to organize the operation of Spain the Central State exercises three powers: legislative, executive and judiciary, established in the Constitution. It also gives institutional backing to the King as Head of State and supreme head of the Armed Forces. It is the legislative the one who elaborates and approves the laws and rules.

The State is divided in different Ministries. Each Ministry administers a specific area and is managed by a Minister. The ministers are appointed by the President of the State.

Spain is divided in seventeen autonomous regions and two autonomous cities (Ceuta and Melilla). The Constitution establishes the competence of the Central State and the autonomous regions in the different areas, such as natural resources management.

The left side of figure 2.1 shows the structure of the Spanish State, it is a multi-layered hierarchy where both, the power and legislation go from the Central State, to the autonomous region, the province and finally to the local administration. The right side of the figure shows the equivalent structure of the specific situation of the city of Zaragoza with the government institutions.

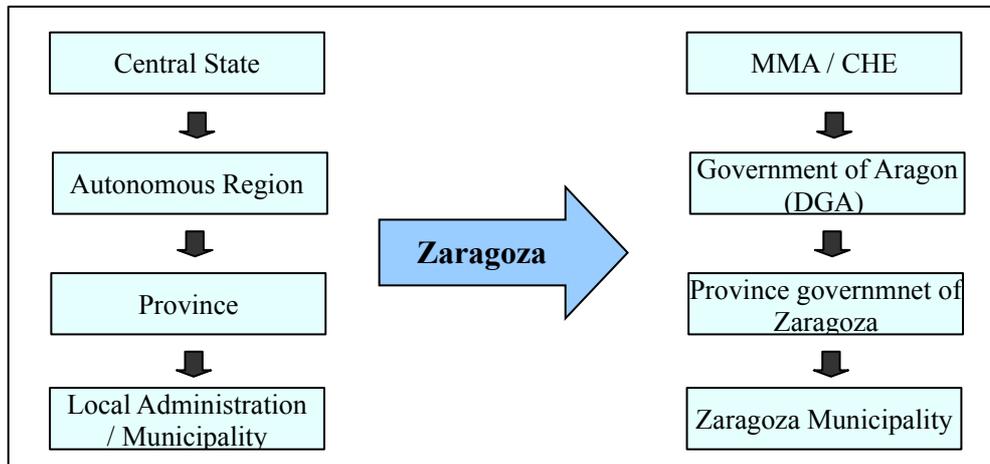


Figure 2.1: Hierarchy of Spanish governance and its equivalent in the city of Zaragoza

It is important to mention that although the European Community is not included in this chart, all the Spanish legislation includes the European Directives when it is appropriate, or they are in the way of include it.

2.1.2 The role of the Central State, Autonomous Region and Province in water governance

There are two relevant articles in the Spanish Constitution, 148 and 149, where competences about the management of natural water resources are established. These competence change regarding to the extension of a river basin; if it covers one autonomous region or more.

The Ebro River flows trough nine different autonomous regions (Figure 2.2), for that reason the situation of Zaragoza is described in the article 149.22. This article states that the Central State has the exclusive competence in the legislation, planning and concessions of hydraulic resources when the waters flow trough more than one autonomous region.

The Spanish national water law (*Real Decreto Legislativo 1/01, de 20 de julio, por el que se aprueba el Texto Refundido de la Ley de Aguas*), has the object of regulating the public water resources and establishing the competence of the Central State. This regulation designs the competent authority who is responsible for preparing the river basin management plans, to guarantee a good ecological water quality and to report the river basin state to both levels, national and European. This is established as one of the main objectives of the European Water Framework Directive (WFD).

According to this regulation, the competent authorities in Spain are the “confederaciones hidrográficas”, which are the same than the river basin organisations. They depend on the Ministry of Natural, Rural and Marine Environment (MMA) and are responsible of each river basin. There is one river basin organisation per each river that flows through more than one autonomous region. They have the power to give concessions to catch water and authorisations for treated waste water discharge into a water body. Furthermore they must elaborate the river basin management plan where some objectives, such as water quality and water use priorities, are included.

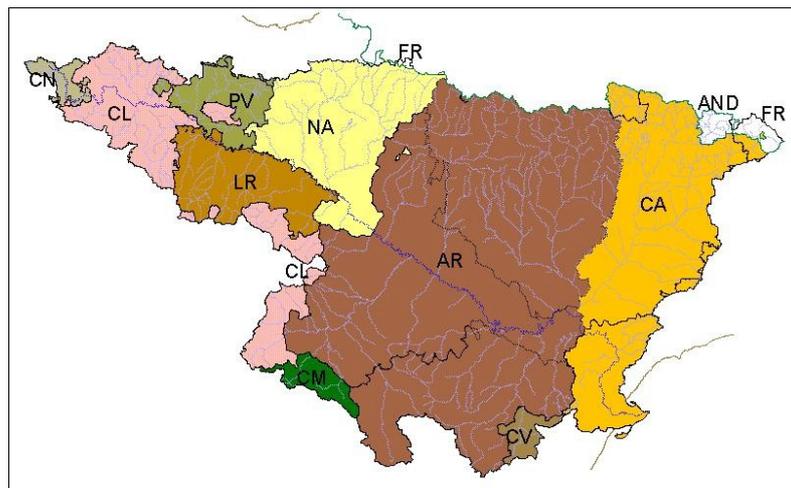


Figure 2.2: Administrative division of the Ebro River Basin.

Given the fact that in the Autonomous Region of Aragon the river basin is shared with other eight regions, its competence in the natural water resources is limited. It is the Ebro River Basin Organisation, “Confederación Hidrográfica del Ebro” (CHE) the institution that has the competence of regulating and managing the Ebro river basin. For example, there has been a huge investment and effort to restore and accommodate Ebro river basin in the city of Zaragoza. The project and action plans are undertaken by an agreement between the Municipality of Zaragoza and the MMA through the CHE. Other important stakeholders of this project are the Government of Aragon, the Province Government of Zaragoza, and the Expoagua 2008 S.A. society – the institution in charge of the development and management of the International Exposition that took place in the summer of 2008 in Zaragoza: “EXPO 2008, Water and Sustainable Development-”. The project elaboration was made by the Department of Infrastructures of the Municipality of Zaragoza, with the collaboration of the other institutions. After a process of public information, the project was modify and approved by the Municipality. The next step was the review, modification, if needed, and approval of the project by the CHE, in representation of the MMA. The CHE sent the Municipality the final version of the project to keep it up to data. However, the CHE is the organisation in charge of the management, implementation and financing of the project.

At the regional level, there is a law that establishes the competence of the autonomous region and the province government. (*Ley 6/2001, de 17 de mayo, de Ordenación y Participación en la Gestión del Agua en Aragón*). The last one, has more competence within small villages and towns, so it is not of the interest of this paper that is focussed in the city of Zaragoza.

Given the fact that the Ebro River flows through nine autonomous regions, the Government of Aragón, does not have too much competence in water issues in the city of Zaragoza. It has competence in the urban water cycle of small cities and villages. One of its tasks is to guarantee the treatment of waste water in these rural areas. With this aim, a sanitation plan was developed by the Government of Aragón, but funds to build new waste water treatment plants (WWTP) in small villages are needed. It has negotiated with the city of Zaragoza the possibility of obtaining funds from the Municipality, but Zaragoza is still paying its own WWTP. They have agreed that once it is paid, they will help in the funding of the sanitation plan of rural areas.

The Government of Aragón has the power to legislate issues of its competence. For example, it has legislated the pollutant and quality standards of industrial treated waste water that a municipal sewer system can collect. In Zaragoza, this standards were legislated within a local rule and as they are quite similar to the ones that the DGA has established in its regulation, these standards are not going to be included in the new municipal water regulation that is currently in developing process. Another competence of the DGA regarding to water is the Integral Environmental Authorisation -aims the protection of the environment and public health- that big industries need in order to performance their activities. This authorisations have to guarantee that the industrial activity is respectful with the environment, according to the legislation, including water management. The Government of Aragón is the one who approve this authorisations.

2.1.3. The role of the Local Municipality in water governance

Once a brief overview of the national legislation was been presented, it is important to focus in the local level. The law that regulates the local regimen (*Ley 7/1985, de 2 de abril, Reguladora de las Bases del Régimen Local*) establishes the competence of the municipalities. Articles 25 and 26 state that municipalities have competence on drinking water supply, street lighting, solid waste collection and treatment, street cleaning, sewer systems and waste water collection and treatment. So it is the municipality the one who has competence in the urban water management (UWM). In most Spanish cities, public enterprises are in charge of the management of the urban water cycle. The city of Zaragoza is a special exemption because it is the municipality itself the one who manages the UWM. This is a very important factor to have in mind in order to understand the situation of thos SWITCH Demo city, described in this paper. Obviously, interests and priorities change when the UWM is managed by a local administration or a public or private enterprise.

Another important issue is that the water for drinking water supply is caught from the Ebro river and also the treated waste water is discharged into the river. As said before, by national law, the CHE has the competence of managing the Ebro river. For that reason, the CHE has authorised the Municipality to catch water from the canal, called “Canal Imperial” or directly from the river if necessary, to supply drinking water to the city. It is as well the CHE the institution who authorised the Municipality the discharge of the treated waste water from the WWTP . The CHE also is the responsible of controlling the industries that do not discharge its waste water into the sewer system, previously treated by the industry, but to the Ebro river. The CHE also establishes the pollution control parameters and limits the treated water water discharge to guarantee the objectives of the river basin plan. Once the Municipality catches the water, until it is discharged again into the river, it has all the competence of the integral urban water cycle (IUWC). As said before, the CHE has the competence of all the works and restoration activities that are undertaken in the Ebro river basin.

Figure 2.3. shows the structure of the water governance within the Municipality of Zaragoza. The organization chart of the whole Municipality is very complex, for this reason only the main actors in UWM are shown in the figure. The boxes in bold represents the departments, services or areas that undertake different activities in the integrated urban water cycle.

In local administrations, the most important decisions are taken by politicians (mayor, counsellors and councillors), then they communicate to the different head areas and so forth. And the same process is followed in the IUWC.

The decision making and the governance structure in the Municipality of Zaragoza related with urban water, is established by local regulations and is the following:

1. Mayor of Zaragoza and Municipal Board (institution made up by politicians). They have the power to approve significant urban planning projects, such as the plan that describes the sewage network of the whole city.
2. Government of Zaragoza (institution where some of the competences of the other two institutions are delegated, smaller than the Municipal Board).
3. Counsellor of Urban Planning, Housing, Architecture and Environment. Functions: i) has the power of making decisions of the department and approving projects about works in the urban water infrastructures; ii) hires works of a maximum budget of 1,500,000 Euro and iii) -starts disciplinary procedures regarding to the infraction of municipal rules or regulations. If the decision affects to another department, the decision is taken but the involved counsellors, for example, the Counsellor of Infrastructures and Public Participation.

4. Councillor of Environment and Sustainability. Functions: i) authorises the waste water discharges to the public network; ii) starts disciplinary procedures when local environmental rules are broken, iii) has the power to hire works, activities, etc. up to a budget of 150,000 Euro; iv) arranges the issues related with the environment. If the decision affects to another department, the decision is taken but the involved councillors, for example, the Councillor of the Area of Infrastructures and Public Participation.

Regarding to the funding, the money that is obtained from the different taxes and projects, such as SWITCH, goes to a same organism, to a “common box”. Every year a each department presents a budget, the final budget is done according to the priorities of the city, and then it is given to the different areas. The Agency of Environment and Sustainability has to include every year in their budget the activities that are undertook under the SWITCH project, and wait until the General Secretariat approved the annual budget and they receive it.

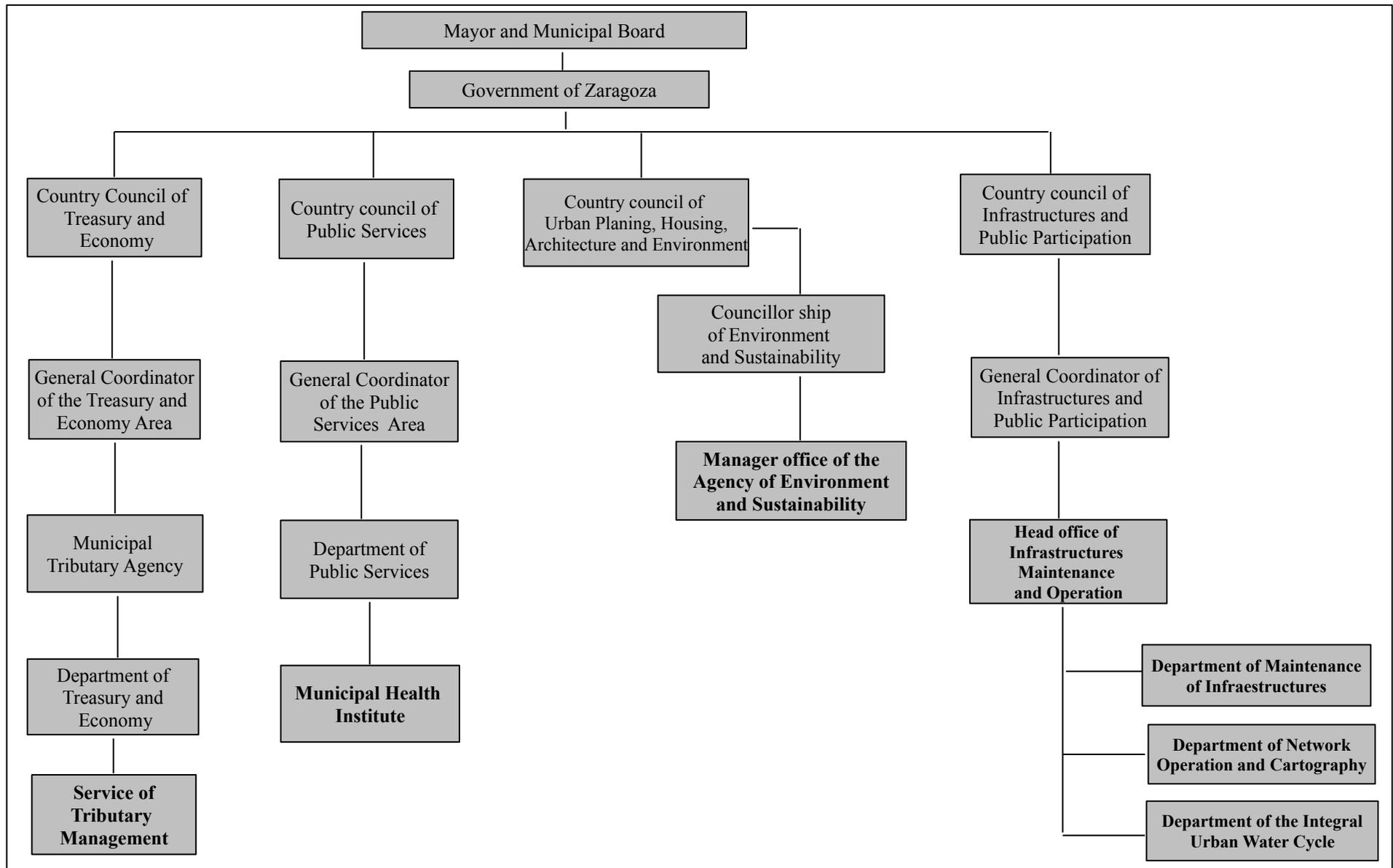


Figure 2.3: Organization chart of the water governance in the city of Zaragoza

To go deeper in the IUWM of the city of Zaragoza it is important to clarify the different municipal departments, their activities and tasks within the IUWC. The structure of the Municipality of Zaragoza is quite complex, for that reason only the stakeholders involved in the IUWC are shown in figure 2.4.

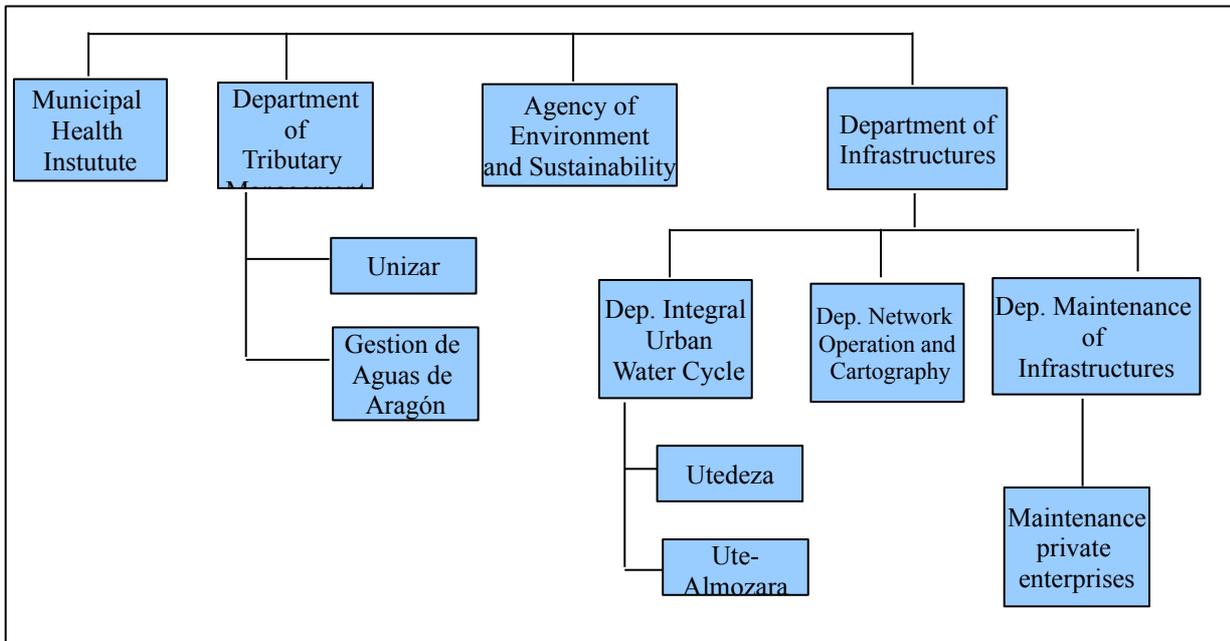


Figure 2.4: Main stakeholders of the IUWM in the city of Zaragoza

On one hand, figure 2.3 shows the political structure of the IUWC to indicate the power of the different stakeholders in the decision making process. On the other hand figure 2.4 shows a more technical and operative structure of the municipal, and private sector actors within the IUWM. The following paragraphs explain the functions of each department in the urban water cycle.

The Municipal Health Institute, a Department of the Country Council of Public Services, is the responsible of the analytic control of the water quality in the water supply network. It also is in charge of the control of the treated waste water discharges.

Within the Country Council of Treasury and Economy and under the Municipal Tributary Agency, the Department of Tributary Management is in charge of the modification of the water taxes. They revise every year the water taxes in order to adjust them to the WFD commitment, which says that users have to pay the total cost of the IUWM. Furthermore, this department manages the charge of the water taxes and urban solid waste taxes. The Department of Applied Economy of the University of Zaragoza (Unizar) collaborates with this municipal department in the elaboration and modification of water taxes. Another task of the Department of Tributary Management is to hire by a process of public tender, the companies related with water meters installation, readings, and maintenance. This department together with the department of infrastructures, elaborate the term

and conditions of the public tender. There are two main private companies: Gestión de Aguas de Aragón and Contazara. The first one is the contractor that carries out the supply, installation and maintenance of water meters in the city of Zaragoza, and it also support the water supply and sanitation service by reading the water meters, installation inspections and the on-line and telephonic registrations and cancellations of the service.

Within the Country Council of Infrastructures and Public Participation there are three departments related with the IUWM, framed in the Head Office of Infrastructures Maintenance and Operation. These departments are: i) the Department of Maintenance of Infrastructures, ii) the Department of Networks Operation and Cartography, and iii) the Department of the Integral Urban Water Cycle. The Department of Maintenance of Infrastructures carries out activities of network maintenance with both, civil servants and private enterprises. The Department of Networks Operation and Cartography are in charge, within other activities, of the study of the hydrological balance of the IUWC and they have a software that controls the network – that is in the starting stage - . This is the department of the Infrastructure Area, that is working in the SWITCH project. The Department of the Integral Urban Water Cycle is in charge of the service of water supply and sanitation. The drinking water plant is managed directly by municipal technicians, civil servants. Although the competence of sanitation and the property of the waste water treatment plants belongs to the Municipality, the management is given to privates enterprises, by public tender. There are two WWTP in Zaragoza. The Municipality establishes different specifications for awarding the contract of the operation and maintenance of the two WWTP. Furthermore, this department is also in charge of the supervision of the privates enterprises that manage the two WWTP. Nowadays, it is Utedeza (Veolia group) the one who operates the WWTP of “La Cartuja”; and UTE – Almozara operates the WWTP of “La Almozara”. Everyday a municipal technician visit the WWTP to check that they work correctly.

A good example to understand the power relationship between the different organisms involved in the management of the IUWC is the following: the CHE established the levels of phosphates and sulphates that are permitted in the treated waste water discharges it into the river. The WWTP of “La Almozara” does not have a final treatment to eliminate phosphates, and the CHE has established the need of including it. The CHE has communicated the decision directly to the Municipality and it has to communicate UTE-Almozara that they have to install this final treatment.

Finally, there is another important actor in the UWM in Zaragoza, the Manager Office of the Agency of Environment and Sustainability -known in the past as the Local Agenda 21-. This actor depends on the Councillor ship of Environment and Sustainability, which depends on the Country Council of Urban Planning, Housing, Architecture and Environment. This is a complex structure,

within the Management Area of the AES there are four sections i) control of pollution, ii) control of atmospheric pollution , iii) environmental education and iv) the administrative and legal section; and two services that depends on the Management Area: a) the service of mountains, and environment preservation; and b) the service of parks and green areas. The first service has a section that evaluates the natural environment and the state of the river and if there are illegal waste water discharges; and the second one is in charge of a good water management in gardening of green areas, within other tasks. Anyway, for the scope of this paper, the most important sections are the control of pollution -where industrial treated waste water discharges into the municipal sewer system is controlled-, and the environment education section – responsible of public information, public participation, environmental education and awareness -. It is also important to mention that the AES is the one that gives guidance to all the projects of sustainability and environmental quality. It also promotes policies of efficient water use, define environmental objectives, establishes environmental indicators,

It is also of the competence of the municipality to legislate on issues of local interest. Regarding to water issues, the Municipality of Zaragoza is developing a new water regulation that has not been approved yet. The AES coordinates the elaboration of this new municipal regulation, and other departments, such as the Department of Treasury or the Department of Infrastructures, collaborate in its elaboration.

The aim of this regulation is to gather in the same text all the municipal regulation related with the integrated urban water cycle, preserving the innovative spirit of the previous regulations. Furthermore, it includes a new spirit of sustainability and environment protection through water efficient use, sustainable water uses and the citizen's right of been informed. The objectives of the new water regulation are: i) to guarantee the access to the services of the IUWC with optimal conditions of quality and quantity as regulated in the current legislation; ii) to guarantee the sustainability of the IUWC; iii) to manage the economic aspects in order to guarantee a good operation of the IUWC; iv) to promote the implementation of new technologies to reduce water consumption and to encourage a rational water use within the different users; v) to establish the conditions of the water supply and sanitation services; vi) to establish urban planning and architectonic criteria to guarantee a efficient water use in the urban plans; vii) to regulate the needed actions to control the industry and commercial treated waste water discharge into a water body, viii) to encourage citizens awareness about efficient water use; ix) to assure the right of the citizens of free information and encourage public participation. This regulation will be applied in the Zaragoza municipal district.

It is a very complete regulation, because it includes the main aspects of sustainable urban water management: i) guarantee the access to the water services, ii) guarantee water quality, iii) promote the principle of sustainability and efficiency in the management of the water resources and urban infrastructures, iv) control of the waste water, v) integrate urban planning and water and vi) encourage public information and participation.

2.2. Civil society

The city of Zaragoza knows the importance of the public participation in order to improve the IUWM. To achieve a good public participation it is important to provide information to the citizens. The Municipality has several ways of access to the information and mechanisms of public participation. The public participation and information is regulated by local regulation.

Within the municipal web site there is a section which contains information regarding to the environment, such as news, legislation, projects, action plans, etc. There is another section for public suggestions and complains via email. In addition, the addresses of the different departments are in this web site, so the citizens can go there to ask for information (e.g. the AES).

In order to encourage public information and participation, the Municipality has created a library called “Centre of Water and Environment Documentation”. This library offers reports, documentation, books, etc. related with water and environmental issues and it is also a place for meetings and discussions. There is also a web site where information can be searched. Furthermore, this centre has several computers with free internet access that facilitate the search of information for those people who do not have access to internet.

The city of Zaragoza has institutions in charge of the encouragement of public participation. The Municipality created the “Consejo 21” where specific issues that have an impact in the environment are dealt. This is formed by several citizen’s associations, public administrations, municipal committees, institutions that represents the civil society, such as NGOs etc. It is leaded by the environment councillor and presided by the counsellor of urban planning. There are five commissions and one of them is the Water Commission, with 32 members . The members are from the municipality, NGOs, consumer and neighbourhood associations, association of environmental auditors of Aragon, several professional organizations, political groups and trade unions. The Water Commission is the organism in charge of the discussion of important water decision making. Some of the members, such as NGOs and citizen’s associations, have into account the citizens opinions and present them to the other members. The different priorities and interests, experts advice, etc. are discussed in the Water Commission, and the final decision is made at a political level.

There is another advantage related with public participation in the city of Zaragoza, as the Municipality is the one who manages and operates the urban water cycle. Zaragoza is divided in fifteen municipal districts as figure 2.5 shows. Each district has a municipality committee in charge of encourage and manage the public participation of the citizens in the different areas regarding with the different aspects of the municipality management, including water issues. Each municipal committee is headed by a councillor, he/she is the one in charge of communicating the suggestions or complains of the citizens to the right department and the municipal technicians when needed. Each department has into account these suggestions and complains and establishes the priorities and interests in each moment in order develop their action plans.

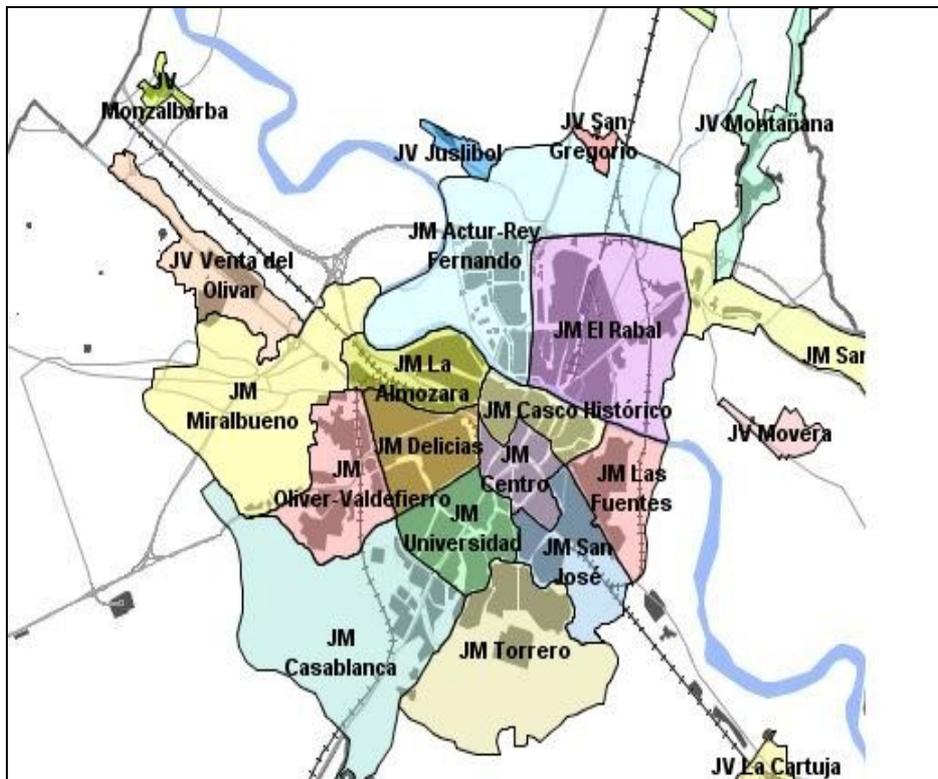


Figure 2.5: Geographical distribution of the districts of Zaragoza

An example of the power of the public participation is the new project of the Department of Infrastructures about the installation of storm water tanks to collect the rain water in two neighbourhoods of the city. In these areas, when it rains, the water floods and hold back several days. The neighbours complained to the municipal committee, then this complains where reported to the appropriate department and it studied the case in order to take action.

2.3 Private Sector

As stated before, the Municipality is the owner and responsible of the integral urban water cycle of the city of Zaragoza, given that fact, it is the one who have the power of decision making, and most of them are taken at a political level. The private sector also participates in the Water Commission. In the meetings they present their interests and knowledge, the same as the other members do, to discuss and find the best solution of a specific problem for all the involved stakeholders.

The Municipality transfers and supervises some operation activities to private enterprises, such as the waste water treatment, but the private enterprises do not have power for decision making within the IUWM. they just follow the rules and guidelines that the Department of Infrastructures establishes, in the term and conditions of the public tender.

3. SWITCH in Zaragoza

The aim of this section is to explain the current situation of water governance and institutional mapping within SWITCH-Zaragoza, for three main reasons: i) the key sources of information are involved in SWITCH-Zaragoza, ii) the author is more familiar with the the part of the IUWC related with SWITCH, iii) to try to reduce somehow the lack of communication between the Municipality of Zaragoza and other SWITCH members explaining briefly the current situation of the SWITCH activities in Zaragoza and its main actors. For that reason, and due to time constrictions, only the activities regarding to SWITCH are going to be mapped more in detail.

As stated before, Zaragoza is working with SWITCH in the WP 3.1. Demand management for optimisation of urban water services. The actions of the city are focussed in the reduction of water consumption. There are two man action plans: i) improvement of the drinking water supply system, at a municipal and private level and ii) public awareness. That are going to be explained more in detail below. Furthermore, as most of the UWM stakeholders are involved in the project and it is a local administration, it can be assumed that the whole UWM will have the same weak and strong points.

It is important to know the behaviour of Zaragoza for a better understanding of its actions. It is a city that owns a high level of environmental awareness. In 1998 a Strategic Plan of Zaragoza was developed to improve the city trying to be more sustainable. One of it's objectives was to reduce water consumption. It has an important public participation process trough questionnaires, opinion forums and a public participation area in the web site of Ebropolis (the one in charge of carry out the plan). Furthermore, Zaragoza Municipality has undertaken and is undertaking different environmental projects to increase the citizen's water culture and awareness, such as "Zaragoza,

water saving city” or “100,000 commitments with water”. Another example of the implication of Zaragoza has been the International Exposition of 2008 “Water and Sustainable Development”, where the problems and possible solutions have been exposed to the general public and also there has been discussions, conferences, meetings to deal with water issues, and SWITCH participated in a “thematic week” organised by the Municipality. Furthermore, Zaragoza has been also elected as the Headquarters of the Secretariat of the United Nations Organisation during the Water Decade.

3.1 Water Governance

Figure 2.3. shows the power in the decision making process regarding to the IUWC in the city of Zaragoza. It is crucial to have in mind that it is the local administration and not a public or private enterprise the institution that is managing the IUWC. This fact slows down and make more difficult the decision making process, the budgeting, the execution of the different action plans, etc. As stated before, the most important decisions are taken by the mayor and the municipality board, at a political level. In the decision making process, the municipality has into account public and professional opinions (see section 2.2).

For example, after showing and discussing in the Water Commission the possibility of the participation of the city of Zaragoza in the SWITCH project, it was approved by the Mayor of Zaragoza and the Municipal Board, because it was one of the most important decisions. The action plans have been elaborated by the AES, the Department of Tributary Management, the Department of Infrastructures and the Unizar - a public university, has an important position in the decision making process of the water taxes and SWITCH-. The private companies that are collaborating in the project do not have power in decision making, their role is to carry out the guidelines that the municipality establishes. However, there is a collaboration between them and also their opinions are having into account in the design if the activities.

There are several departments of the IUWM working in SWITCH, within all of them, it can be said that the Agency of Environment and Sustainability is a very important actor because from this agency the project is been coordinated. All the activities that the AES undertakes have to be approved by the manager of the agency, and the most important activities have to be approved at the political level (environmental councillor and other high politicians, such as the Infrastructure councillor). It is a very active agency with a lot of projects, that have to be approved by one person, this fact slows down and limits the actions that the AES is undertaken.

One of the main problems the municipality faces is the lack of human resources. There are a limited number of civil servants and they have specific tasks to develop. However, the city has a lot of interest on working in projects to improve the environment, to reach a more sustainable development, etc. and they collaborate in different projects, but unfortunately their priorities are

established in their specific tasks and not in these kind of projects. For example, if there is an accident regarding to an industrial waste water discharge, this is a priority for the civil servant of the corresponding department and there is no one to continue working on the other projects.

Given the fact of lack of human resources, it is important to have in mind that there is not a person or a group of people involved directly and exclusively in the projects, such as SWITCH, with the consequences of lack of communication within the different stakeholders; lack of staff needed to install new technologies and to report the activities they undertake.

There is a lack of communication between the AES, other SWITCH members and the departments of the Municipality that are not involved in SWITCH. Once the project was approved, the involved departments starting working on the project, but there is not an annual report which shows the actions and progress that each of them have developed. The manager of the AES thinks that it would be a good idea to develop it, in order to show to the whole Municipality, other SWITCH members and the population the progress of the project, but there is not enough staff, neither time, to write this annual report. Moreover, within the members of this project, they have an idea about what is doing who, but they also see the need of a detailed document that specifies the task that each department is doing, and the person in charge. This document would facilitate the communication process and would make the job more efficient because each one would know their and the other's role in the project and responsibilities.

3.2 Institutional Mapping

As said before, the main actors of the SWITCH project in Zaragoza are the Department of Tributary Management, the Department of Infrastructures and the Agency of Environment and Sustainability, three entities of the Municipality. The University of Zaragoza has also an important role because it collaborates in the project , but it is not a SWITCH member or collaborator. Figure 3 shows the institutional mapping of the main SWITCH actors. The new stakeholders that did not appeared in figure 2.4 are Contazara, a manufacturer of digital meters, and Arasem, a property administrator. Both of them are involved in the action plan focussed in the buildings.

The objective of Zaragoza is to work in the reduction of water consumption, through two main action plans, one focussed in the network, and the other focussed in households. Main action plans established by the AES:

- 1) Check out the metrology error.
- 2) Locate water leak.
- 3) Encourage the citizens to a more efficient water consumption and modify its aptitudes.
- 4) Study the possibility of working in another area.

The action plan focussed in the network is responsibility of the Department of Infrastructures. The involvement is SWITCH is coordinated by the AES and from this agency some ideas are proposed to the department. The main activities of this department are: i) locate the sectors of the system where biggest water leaks are produced, and ii) identify and assess non-measured water flows. To achieve this objectives, they need to implement new initiatives and to draw up new strategies to reduce water leaks and toe reduce commercial leaks.

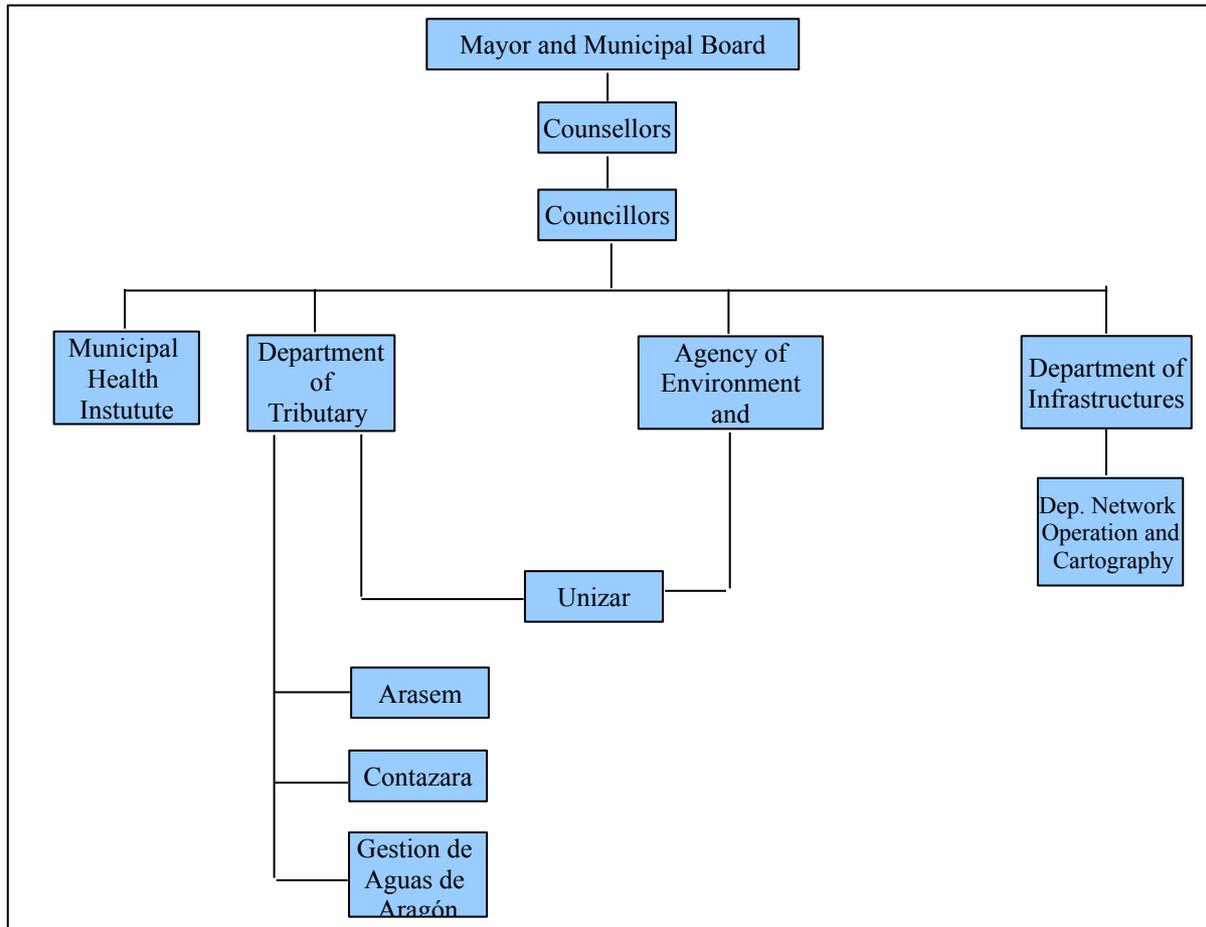


Figure 3: Institutional mapping of SWITCH main actors.

Here again the lack of staff appears as an important problem. A good example is the impact of the collaboration of SWITCH in this city. The Department of Infrastructures bought technology some years ago, to detect the water leaks, but there where no time neither staff to install them because, the priorities where others, such as street and pipes maintenance. These technologies where installed when a SWITCH collaborator went to the city to make a water balance analysis.

In the actions implemented in blocks of flats a lot of stakeholders are involved. The main actors in the planning of this actions have been the Environmental Education Department of the AES; the Department of Tributary Management, and the Unizar. They have been working for months and the collaboration of the university has been crucial, because . The three main actors mentioned above, have attended to several meetings in which they have discussed the functions of each of them, and

the collaboration of external actors, the contents of the action plan each actor is going to undertake.

The activities they are going to develop is to study the impact of the application of water saving technologies on one hand, and on the other the influence of environment awareness campaigns. The study will also help to know the end-user's water consumption, and it will be useful for future campaigns for encouraging water use efficiency. The role of each actor have been clearly defined, and it has facilitated the work.

4. Integrated Urban Water Management in the city of Zaragoza

In order to find the critical success factors to achieving a more IUWM it is important to know the current situation. For that reason, this section aims to show the weak and strong points of the urban water management that is been undertaken by the Municipality of Zaragoza. This is an special situation in which the municipality is in charge of the whole urban water management, with exception of the operation and maintenance of the two WWTP of the city and other specific tasks.

There are several research and documents about the integrated urban water management, and most of them agree in the objectives that a city has to achieve in order to have an IUWM. As the purpose of this paper is to know the operation of the water governance in Zaragoza in order to improve its UWM, the objectives established in the document called "SWITCH Approach to Strategic planning for Integrated Urban Water Management", have been used as a guideline to show the current management if the urban water. In addition to the SWITCH objectives for an IUWM, also some objectives proposed by the United Nations Environment Programme, International Environmental Technology Centre (UNEP-IETC) have been used. According to both sources of information, six different objectives that a city should have in order to achieve an IUWM have been selected.

4.1 Water supply and sanitation

4.1.1. Improve water supply and consumption efficiency

The municipality has made a big investment in order to improve the water supply network and the consumption efficiency, in the "Plan de Mejora del Agua", a plan leaded by the Department of Infrastructures that aims to improve the water supply network management and the drinking water quality.

Figure 4 shows the evolution of the amount of water taken from a water body for water consumption, the Canal Imperial mainly, trough the years. The dark blue line indicates the population evolution, and shows a big increase. The trend of the caught amount of water shows that although the population is increasing, the water consumption has decreased. This is the result of

different activities that the Municipality has undertaken over the years. These activities were focussed on citizen's awareness and improvement of the technologies and networks. The satisfactory results are that the reduction in water collection from 2001 to 2008 has been a 22.8% (79.7 million m³ in 2001, and 61.5 million m³ in 2008).

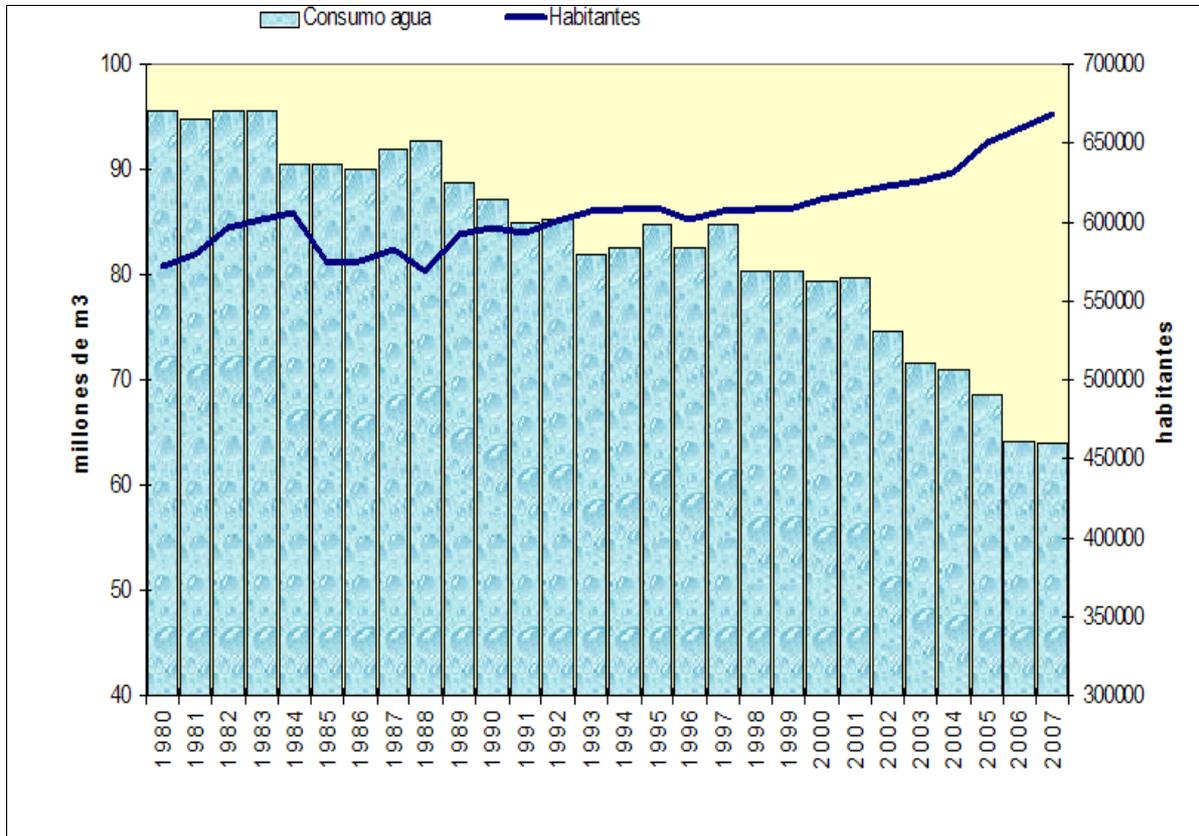


Figure 4: Amount of water for consumption.

The Municipality has the commitment of managing the natural resources in the most sustainable way, and they also want to show an environmental and sustainable image to the citizen's and other cities. In Zaragoza, the city has a big awareness about water issues, and for that reason, the Department of Infrastructure and the Department of Environmental Education are doing a big effort to improve the networks and infrastructures, to reduce water consumption.

4.1.2. Ensure adequate water quality for drinking water as well as waste water treatment

This objective is also included in the plan mentioned above. The main action regarding to water quality is the construction of ten intermediate installations for chlorination, in order to achieve the European guidelines of maintaining chlorine level in the network as much constant as possible. Another action is the improvement of some installations of the drinking water treatment plan.

There is another project, related with water quality as well: Zaragoza takes its water from the Ebro River, during dry seasons, there are water quality problems as the river has a high salinity index. For this reason, and to ensure adequate drinking water quality, water that is more suitable for human

consumption will be imported from the “Yesa” dam in the Pyrenees , 146 km away from the city of Zaragoza. This project is been undertaken by the Department of Infrastructures and it is also competence of the CHE and the DGA.

The Municipality, in order to assure the proper quality of the waste water discharges to the river, has technicians that visit everyday the WWTP to check that they are operating correctly and the Institute of Public Health makes analytic control of the waste water to guarantee that the pollutants concentration is the allowed by the legislation.

4.2 Improve economic efficiency

4.2.1 To sustain operations and guarantee the universal access to water

The Department of Treasury Management has developed together with the Department of Applied Economy of the University of Zaragoza (Unizar) a water tax that recovers up to a 99% the cost of the water supply and sanitation services. This tax also penalizes the abusive water consumption, but it has into account the families with more than six members to avoid the penalization of this households with more members than the average.

4.2.2. To make research activities

This is one of the main limitations of the Municipality. As it is a local administration, there is not enough funds to allocate in the research activity, neither enough human resources. The water tax recovers the cost of the services, but it is not enough for research studies. The other funds given to the departments of the urban water management are used for priority needs, such as the improvement of the pipes, the mentioned works in the drinking water plant, etc.

4.3. Utilise alternative water sources, including rainwater and treated water

As stated in the previous section, there is not enough funds and human resources to research in depth about these alternatives. However, thanks to the involvement of Zaragoza in SWITCH, they are trying to work on this. The possibility of reusing waste water has been refusing in a primary study because the energetic cost of pumping up the treated water again to the city for reusing it is high and it is not worthy. The reuse of rainwater for street cleaning is now being analysed to check its viability.

4.4. Engage the citizens to reflect their needs and knowledge for water management

As explained in chapter 2 the Municipality of Zaragoza has several ways of access to the information and for public participation. The main problem is that when suggestions and complains of the citizens are studied, there is a strong political influence in the decision making, and sometimes the decisions that are taken are not the ones that technicians would recommend for the improvement of the urban water system.

4.5. Establish and implement policies and strategies to facilitate the above activities

This is a strong point of the situation of Zaragoza, because it is the Municipality the one in charge of the implementation of policies and strategies and the creation of new regulations. As it has a big awareness about sustainable management of natural resources, they try to encourage environmental friendly activities through the implementation of policies and strategies. Furthermore, a spirit of sustainability and environmental care is being used to elaborate the new municipal water regulation.

4.6. Management of the urban water system in an integrated way

As the IUWC in Zaragoza is totally managed by the Municipality, it can be said the urban water cycle is being managed by the same organisation, and it is trying to do it in an integrated way. All the departments involved in the urban water cycle are connected, and they discuss the new alternatives, technologies, etc. For example, in the elaboration process of the new water regulation, several departments of the urban water cycle have participated in order to give a broad overview and technical opinion to make a complete and efficient regulation. However, the same problem of lack of human resources has an impact here, because each department has its own priorities and it is not easy to meet and discuss important water issues, such as the viability of using rainwater for street cleaning or not.

The AES has developed a group of environmental indicators to assess the situation of the city regarding to the environment. There are five water sustainability indicators that try to assess the evolution of the UWC to a more sustainable management through the years.

The Municipality also has high-skilled engineers and technicians to support the political decisions in the decision making process. Furthermore, in the Water Commission important decisions are discussed with professional organisations and other experts in the different areas of an IUWM.

5. Conclusions and recommendations

This paper looked into the current water governance in the city of Zaragoza, due to resources and time restrictions, it shows a brief overview of the situation. This document could be a starting point of reference for further studies on this topic, to obtain a deeper comprehension of the water governance in the city of Zaragoza. Although the scope is not an evaluation of the water governance in Zaragoza to suggest changes that could help to the improvement of the current situation, it is important that all the actors, stakeholders, and members of this project understand the specific situation that each city is facing. This paper could help to understanding it.

The Spanish legislation establishes clearly who are the competent authorities in water resources

management. In the case of the city of Zaragoza, the Municipality is in charge of the urban water cycle of the city, but does not have competence in the water bodies, the CHE is the competent authority. Both, the Municipality and the CHE have good group of technicians that are undertaking a reasonable good water management. The CHE is an important stakeholder in some projects that the Municipality is developing, such as the project of “Yesa”, it has power in the decision making and, moreover, it has to have into account the interest of the population that lives near the Ebro river basin, and not only the interest of the population of a city, as is the case of the Municipality. It has not been possible to study this aspect in depth, but it would be interesting, as future work, to make a case study about the political relationships of the involved stakeholders. It is important to have in mind that in order to manage natural water resources in a sustainable way, the impact of the cities, villages, agriculture, etc. along the whole river basin must be studied and having into account, because they have different interests. The institution that deals with all this issues in the Ebro river basin is the CHE.

In the city of Zaragoza, the municipality manages the whole urban water cycle, there are several departments involved on it and specialised in a specific part of the cycle, such as taxes, water supply and sanitation services, etc. To avoid a fragmentation of the water management, the Water Commission was created. The main objective of this commission is to discuss water issues that affect different departments, such as the new water regulation; important water events in the city, such as the International Exposition of 2008; actions plans to improve the water management, such as the “Plan de Mejora del Agua”; etc. Given the fact that, the final decisions are made at a political level, a study of the political relationships within the different stakeholders could be a good topic of study.

As the Municipality is an elected body, the city society is taken into account within the urban water management, through different ways, such as the Water Commission -through NGOs, professional organisations, etc.-, the municipal committees, etc. Sometimes, if the people do not have a water culture or the proper knowledge, the suggestions they make are not according to the principles of sustainability and efficient water management. It is a problem that comes into the political arena – it is better to please the citizens although it is not a sustainable decision, or it is better to do a more sustainable action but with the risk of disappointing the citizens? -. This is a problem that municipalities face and a private or public enterprise do not, or not in such a big extent. A solution to try to minimize this complicates situation, which is a strong point, is a good access to information that Zaragoza offers to the population. There are a lot of places where citizens can ask for or search information. Furthermore, there are a number of projects aimed to encourage the civil society involvement in water issues, to increase the environmental awareness, etc.

Regarding to the Municipality financial capacity, it has the capacity of making the needed investments to manage and maintain the UWC in good working conditions. Most of the water supply and sanitation services costs are recovered by the water tax. At the same time, this tax guarantees the universal access to water, penalizing the abusive water consumption. However, there is not enough funds to encourage research activities, and it is crucial to improve the urban water management and go to a more sustainable one.

Related with the needed research activity to improve the UWC, another important problem is the lack of staff within the departments involved in SWITCH. There are not enough civil servants to do this activity, because they have their specific tasks, apart from SWITCH and other environmental projects. For that reason, they do not have time to report the activities they carry out and to do a research activity. The internal operation of the municipalities makes very difficult to hire more staff, because it is through competitive examination, so when new post need to be created, it i a political decision.

References

Aragón. Diputación General. (2007). *Bases de la política del agua en Aragón*.

Dias J., Costa H., Costa G., Welter M. and Nunes T. (2007) *Urban water management in Belo Horizonte: institutional mapping*. SWITCH deliverable for the 2nd scientific meeting.

Departamento de Infraestructuras (2008). Plan de Mejor del Agua.

Departamento de Infraestructuras. *Proyecto de márgenes y riberas urbanas del río Ebro. Zaragoza*. Documento divulgativo.

European Union. (2000). EU Water Framework Directive, (Directive 2000/60/EC)

Embid Irujo A., Albiac Murillo J. and Tortajada Quiroz C. (2007). *Gestión del agua en Aragón*.

Eve Hou. (2000). *Briefing Paper on Water Governance Structure in Beijing*.

Gil Ibáñez, JL. and Mateo Menéndez, F. (2003). *Legislación sobre aguas : normativa estatal y comunitaria concordancias, doctrina del Tribunal Constitucional y jurisprudencia del Tribunal Supremo*.

Green C. (2007). *Institutional arrangements and mapping for the governance of sustainable urban water management technologies*. Mapping protocol and case study of Birmingham, England

Green C.(2007) *Mapping the field: the landscapes of governance*.

Heller L. (2007). *Different approaches in analyzing water governance: implications to the case of Belo Horizonte, Brazil*. SWITCH deliverable for the 1st scientific meeting.

Heller L., Barbosa A.P. and Oliveira V. (2007). *Governance of water supply and sanitation in Belo Horizonte, Brazil: an assessment of the relationship between the municipality and the service provider*. SWITCH deliverable for the 2nd scientific meeting.

Mizanur Rahaman M. and Varis O. (2005). *Integrated water resources management: evolution, prospects and future challenges*. Sustainability: Science, Practice, & Policy. Available at <http://ejournal.nbii.org/archives/vol1iss1/0407-03.rahaman.html>.

Romero García, R. *Las riberas del Ebro en Zaragoza*.

Spanish legislation:

- Constitución Española.
- Estatuto de Autonomía de Aragón.
- Real Decreto Legislativo 1/01, de 20 de julio, por el que se aprueba el Texto Refundido de la Ley de Aguas.
- Ley 6/2001, de 17 de mayo, de Ordenación y Participación en la Gestión del Agua en Aragón.
- Ley 7/1985, de 2 de abril, Reguladora de las Bases del Régimen Local.
- Reglamento de Organos territoriales y Participación ciudadana, aprobado el 28 de julio de 2005 (BOP 5 de Septiembre de 2005) and Reglamento anterior de funcionamiento del consejo sectorial de Medio Ambiente ,de 30 de julio de 1998 (BOP 22 septiembre de 1998).

SWITCH Approach to Strategic planning for Integrated Urban Water Management (IUWM) (2008)
018530 - SWITCH

Tirado Robles, C. (2004). *La política del agua en el marco comunitario y su integracion en españa*

UGT Aragón. *La gestión y la eficiencia del ciclo integral del agua en la ciudad de Zaragoza.*

Proyecto de mejora para un uso sostenible y racional de los recursos hídricos. ciclo del agua_2m8.