Partnerships for enhancing the water-saving culture in Zaragoza, Spain

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Abstract
Impacts of climate change coupled with the rapidly increasing world population have resulted in declining per capita availability of water resources. This situation has escalated in urban areas where over 50% of the global population lives since 2007. To cope with the situation, urban water managers need to adopt Integrated Urban Water Resources Management concepts, one of which is demand management. This paper describes how Fundación Ecología y Desarrollo, an environmental NGO spearheaded and coordinated a project whose objective was to improve efficient water use in Zaragosa, Spain. Two phases of the project 'Zaragoza, a water-saving city' were implemented between 1997 and 2003, in which stakeholders from government, private sector, civil society and households worked together to enhance the city's water-saving culture. Key achievements of the project were reduction of over 5% in annual domestic water use and mapping of good practices for efficient water use in non-domestic sectors. This study shows that given a dedicated and competent champion, various stakeholders could be mobilised to adopt more efficient uses of water. This model could be adapted in other cities for demand management programmes.

Keywords

Demand Management, Efficient water devices, Partnerships, Public Education

INTRODUCTION

Need for Integrated Urban Water Resources Management Approaches

While the population in many industrialised countries is either decreasing or constant, the population in most developing countries is increasing rapidly, resulting in an overall global population increase. The most recent UN world population prospects report estimated that the global population reached a mark of 6.7 billion in July 2007, 5.4 billion of which live in developing countries (United Nations, 2007). But the water resources have not only remained constant but have increasingly been polluted by the growing population. The rate of abstraction of freshwater has grown rapidly in tandem with human population growth. Consequently, per capita water availability is steadily declining. The water scarcity situation is compounded by the major impacts

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of climate change on the water resources, and the practical distribution problems concerned with time, space and affordability, leading to a widening gap between demand and supply in many parts of the world.

According to UN-HABITAT, 2007 is a historical year in which the number of people living in the worlds' urban population hit a 50% mark (UN-HABITAT, 2006). The water scarcity situation will escalate in the urban areas where it is projected there will be a population increase of 2.12 billion people between 2000 and 2030, 95% of which will occur in developing countries (UN-HABITAT, 2004). The situation calls for the adoption of integrated urban water resources management (IUWRM). The principal components of IUWRM are supply optimisation; demand management; participatory approaches to ensure equitable distribution; improved policy, regulatory and institutional framework; and intersectoral approach to decision-making (UNEP-International Environmental Technology Centre, 2003).

Demand management (DM), one of the IUWRM components may be defined as the development and implementation of strategies, policies, measures or other initiatives aimed at influencing demand, so as to achieve efficient and sustainable use of the scarce water resource (Savenije and van der Zaag, 2002). DM contrasts with the conventional supply-driven approach to water resources management, whose response to the ever increasing water demand is development of new water sources. There are five major categories of DM measures (White and Fane, 2001): those measures that (i) increase system efficiency at the utility level; (ii) increase end use efficiency; (iii) promote locally available resources not currently being used, such as rainwater harvesting; (iv) promote substitution of resource use, e.g. use of waterless sanitation; and (v) use economic instruments to bring about an improvement in resource usage, such as use of tariffs. In order for any IUWRM strategy to work, there is need for full participation by all stakeholders, including staff of relevant organisations and community members (UNEP-International Environmental Technology Centre, 2003).

This paper describes how a partnership of various stakeholders in Zaragoza, Spain has enhanced a water-saving culture in the city. This analysis was carried out as part of an integrated research project funded by the European Union (EU), whose overall objective is apply IUWRM concepts for achievement of effective and sustainable urban water schemes in the 'city of tomorrow (i.e. projected 30-50 years from now)'. The five-year SWITCH (Sustainable Water management Improves Tomorrow's City Health) project aims at developing efficient and interactive urban water systems and services in the city's geographical and ecological setting, which are robust, flexible and responsive to a range of global change pressures. Zaragoza is one of the partner cities for the SWITCH project, and is a demonstration city for the research activities under the (DM) work package of the project. The objective of the DM work package is to develop and test holistic DM tools, encompassing social, commercial and physical aspects, in order to reduce water wastage and provide educational materials for the benefit of service providers.

Background on the City of Zaragoza, the study setting

The city of Zaragoza, situated in the central area of the River Ebro basin, is the capital of Aragón region in North-eastern Spain. Zaragoza, with a mean elevation of 199m above seal level, experiences a hybrid of continental/Mediterranean climates,

characterised by long winters (about 121 days with temperatures lower than 10°) and long summers (about 150 days with temperatures higher than 17°). Zaragoza is situated in a semi-arid region with an average annual precipitation of 314 mm, and a potential evapotranspiration rate of 795 mm per year (Arbués and Villanúa, 2006; Arbués, et al, 2004). To mitigate against the widely varying seasonal flow rates of River Ebro, 138 dams have been constructed on the river since the 1930s, providing a total storage capacity of 687,300 m^3 (Penagos, 2007).

The 2001 national census put the population of Zaragoza at 614,905 (a 31% increase with respect to the 1970 population), making it the fifth largest city in Spain (Arbués and Villanúa, 2006). While 96% of the city population currently live in the central cores dominated by high buildings (of between 6-12 floors), the suburban areas with single-family homes have shown a higher growth rate, in line with an increase in real disposal income (Arbués and Villanúa, 2006). As a result, the average household occupancy rate has reduced from 3.04 to 2.72 people per household between 1991 and 2001 (Arbués et al, 2004). The increasing income levels over the past couple of decades have invariably led to higher affluence, which has in turn resulted into higher household water consumption rates.

Water and sewerage services to the city residents are provided by Zaragoza City Council, through centralised municipal departments. Raw water for the city supply is abstracted from River Ebro, mainly through the Aragón Imperial Canal. Although there are plentiful groundwater resources in Zaragoza, underground water has not been exploited for the municipal water supply, mainly because it contains high concentrations of minerals such as sulphates, nitrates, sodium and magnesium (Arbués et al, 2004). To respond to the increasing water demand, the city council has in the past focused on supply-side options, namely abstracting surface water further away from Zaragoza, through construction of dams, barrages, aqueducts and canals, the development of the Yesa dam being the most recent such project (Arbués and Villanúa, 2006). This paper demonstrates how Zaragoza City Council is turning round to implement some aspects of IUWRM to respond to the growing water supply needs.

METHODS

The main objective of this study was to find out how various stakeholders in the City of Zaragoza have been engaged to enhance a water-saving culture in the city, mainly through behavioural changes and use of water saving devices/equipment. This study was conducted in 2007 as an early part of a larger five-year SWITCH research project, and provides a snapshot of what has already been done by stakeholders in Zaragoza on the front of DM. The main methods of data collection were (i) review of departmental reports, grey and published literature; (ii) key informant interviews; and (iii) non-participant observations. In Zaragoza City Council, key stakeholders that were interviewed represented the Environmental Education Section of the Local Agenda Department, Infrastructure Department, Pricing Unit and Department of Public Health. Others were key informants from the Department of Economics, Zaragoza University and Fundación Ecología y Desarrollo (FED), the environmental NGO that spearheaded the project.

FINDINGS AND DISCUSSION

The launch of the first phase of 'Zaragoza: The Water-saving City' Project

There was a serious drought in Spain during the period 1991 to 1995, which prompted Zaragoza City Council, the water service provider in Zaragoza to impose a variety of water restrictions. Consumers were unhappy about the restrictions, as evidenced by numerous public demonstrations. Furthermore, there were disagreements and confrontations between various regions of Spain about mass transfer of water through building dams, tunnels and channels. A survey carried out in 1997 showed that about 60% of the respondents could not remember or were ignorant of water saving strategies in the households (FED, 1998). This paradox stimulated Fundación Ecología y Desarrollo (FED), a Spanish environmental Non-Governmental Organisation (NGO) to develop a pilot project focused on improving the efficiency of urban water use (Garrido et al, 2005). FED wanted to demonstrate that the water shortage problem could be solved using a cheaper, more environmentally friendly, and socially acceptable approach (FED, 1998).

FED developed the 'Zaragoza: Water Saving City' project in 1996, and opted for a phased approach to its implementation. Other founding partners included The European Union LIFE programme, Zaragoza City Council, Aragón Regional Government, Ibercaja (a national Spanish savings bank) and four other private companies (Balay, Jacob Delafon, Contazara and RST). With a budget of 0.87 million euros variously contributed by the founding partners, the first phase of the project kicked off in February 1997, for two years, while the second phase run from 2000 to 2002. The first phase, focusing on 'small steps, great solutions', sought to have a systematic focus on all aspects that individually and institutionally determine a water culture such as institutional policy framework, technology, knowledge/information, regulations and consumer habits. Based on the principle of shared responsibility, the intervention was also designed to create a collective challenge which would bring about participation of all stakeholders in the city, and build on the synergy of these partnerships to (i) create awareness of the need for water-saving; (ii) promote information about simple water-saving technologies; (iii) work towards creating a water-saving city, which would be set an example for the outside world; and (iv) save water without sacrificing comfort.

In concrete terms, the first phase aimed at saving at least 1,000 million litres of water in the homes of the city of Zaragoza per year (FED, 1998). For this objective to be achieved, there was need to promote the following actions: (i) change of attitude towards water use and consumption, leading to behavioural change; (ii) provision of information, education, training and advisory services which assist consumers who wish to take action to reduce their water use; (iii) replacement of old equipment with new water-saving devices; (iv) acquisition of new water-saving sanitary fittings (e.g. flushing toilets, taps, showers) and household appliances (e.g. washing machines and dish washers); (v) the introduction of individual household hot water meters; and (vi) other actions that would save water, such as timely repair of leaks in the premises, and recycling of domestic water.

Partnerships for the water-saving project

It was recognised right from the project inception that improving a water-saving culture was a collective challenge, and required the full participation of all

stakeholders that contribute to the water culture. As part of the preparation stage, the project deliberately sought the participation of all stakeholders including consumers, plumbers, policy makers, manufacturers, retail outlets, businessmen, building companies, financial institutions and architects. The steering partners actively participated in promotion strategies as well as monitoring and evaluating the implementation of the project. It was also important to involve elements of the business sector linked with manufacture, sale, distribution and installation of water fittings and equipments. Educational institutions and other civil society organisations collaborated in disseminating the promotion messages to the general public. Finally, the project worked with individual households and owners/overseers of large non-domestic premises that consume high volumes of water. Table 1 shows a summary of actions carried out with the key partners of the project.

Table 1 Main actions targeted at key partners of the project.(Source: FED, 1998)

Key partners	**Main actions**
Professionals involved in domestic water use	• Project objectives and strategies mailed to builders, property agencies, promoters, architects, etc. • Information sessions arranged for plumbers, distributors and manufacturers • Publicity materials distributed in retail outlets • Competitions organised to reward sales staff promoting water-saving devices • Development & distribution of a catalogue providing water-saving technology • Development & distribution of a catalogue of techniques for planning, design and maintenance of parks/gardens, and planning of water management
Large scale consumers	• Information sent on environmental & economic advantages of saving water • Information sessions arranged on efficient water management • Stickers provided for public washrooms, which identified water-saving equipment; showed users how to use them properly; and remind users on importance of water saving
School children and teachers	• Teaching materials were produced for teachers to work through with pupils: o Big Book of Water - with blank pages for pupils to fill in their ideas o Water Card – each pupil designed an image & slogan to persuade others of the need to preserve precious water o Water Savings Book – to keep a record of monthly progressive savings achieved o - Experiences Directory - a collection of classroom activities related to water
General Public	• Publicity campaign using TV stations, radios, newspapers, leaflets, posters, billboards, buses, urban installations. • Water help-line – a telephone service to inform the public about water-saving technology and where they could find the devices. • A web-page - to publicise the project on the internet • Water –saving products toolkit – a package including a flow regulator for taps, water-saving shower, water-saving cistern, plus information on their use, distributed free of charge to public personalities

Many organisations in Zaragoza participated in the water saving project. By the end of the first phase of the project, over 150 organisations were actively involved in project activities, such as distribution of information. The active partners included public institutions, NGOs, private companies, trade unions, professional bodies, community-based organisations and business associations. About 90% of the media houses in Zaragoza fully participated in the project. Furthermore, over 140 wholesale and retail establishments selling products related to water consumption, accounting for about 65% of all the traders, collaborated in the campaign. From the educational sector, 474 teachers and about 70,000 pupils from 183 schools collaborated in the

educational programme on water-saving culture (FED, 1998). Clearly, in the two years of the first phase of the project, FED, the leading project partner successfully mobilised partnerships for enhancing water-saving culture in Zaragoza.

The Second Phase of the Project

The aim of the project was fulfilled to a great extent as shown by a survey carried out in 1999 to evaluate the outcome of the intervention, the results of which were compared with those from the baseline study. The number of people aware of the importance of water-saving measures improved from 40% to 72% of the respondents. As a result of the campaign, there was an increase in water saving habits and use of water-saving devices in the households, leading to an overall saving of 1.176 billion litres of water in Zaragoza City, equivalent to 5.6% of annual domestic consumption. However, this evaluation survey also showed that the water saved was more as a result of behavioural change than adoption of water saving technology (Edo & Soler, 2004; FED, 2001).

The project partners recognised that emphasis on only behavioural change will not make a sustainable impact in conservation of water: there was need to adopt an integrated strategy, including adoption of water-saving technology. As a result, the second phase of the project, entitled ‘Zaragoza, water saving city – 50 good practices’ was initiated to widen and extend the intervention to non-domestic sectors, and at the same time consolidate the achievements realised by emphasising the use of water-saving technology in the households. This phase was implemented from June 1999 to March 2003, and aimed at developing 50 best practices for efficient water use in selected public buildings, industries, and parks/gardens, such that these demonstration centres become a reference and model for others in the respective sub-sectors (Edo & Soler, 2004; FED, 2001).

Proactive representatives of the sub-sectors of parks/gardens, public buildings (e.g. health centres, schools, offices), and industries participated. Through continuous promotion activities, other members of the sub-sectors were kept informed of the progress of these demonstrations and were encouraged to adopt the tested good practices. The Parks and Gardens Section of City of Zaragoza was a key participant, and by extension committed several private firms managing 36 green zones in the city, covering about 2.4 million sq metres. Other institutions that took part in the study included educational institutions, health centres, hospitals, residences for the elderly, university halls of residence, hotels and sports centres. A few industries involved in the extraction and transformation of non-energetic minerals, metal transformation and manufacturing enterprises dealing with food, wood and plastic also participated in the project (Edo & Soler, 2004).

Initially, preliminary surveys were conducted in the participating organisations to map out existing consumption rates and current polices and practices on water use and conservation. Thereafter, detailed audits were undertaken to evaluate the installations and practices, and make recommendations for more efficient water use. The audits solicited data on (i) description of water consumption fittings; (ii) consumption rates and costs; (iii) maintenance costs; and (iv) the environmental situation (i.e. the policy and level of sensitisation, mapped through a staff survey). The auditors also developed a plan of action to improved the efficiency of water use, and supported the

organisation in the implementation process. Other organisations and companies in the sub-sector were kept informed of the progress, and were encouraged to participate in the project (Edo & Soler, 2004; FED, 2001).

By the end of the phase, 30 good practices were achieved in efficient water use in buildings for public use. Typical examples were (i) a shopping mall that achieved 92% water savings through a change in floor cleaning methods; (ii) an educational centre that saved 70% through environmental education; and (iii) a car-washing company that saved 75% through water re-use (Edo & Soler, 2004). Similarly, 13 good examples were established in the parks/gardens sub-sector, mainly through careful consideration of the design of the lawns, selection of the plant species, and water methods (ibid). In industries, huge savings were made in at least 9 enterprises through modification of the production and cooling processes, ranging from water recycling, water recirculation and reverse osmosis (ibid). The performing organisations were recognised by awards of certificates of proficiency, and were also recognised in various media and in national, regional and international forums. Furthermore, practical guidelines for efficient water use in the non-domestic sector were published and widely circulated. These publications include practical eco-audit guidelines for hotels, offices, industries, hospitals and educational institutions; and practical guidelines for dry-land gardening (Garrido et al, 2005).

Similarly, audits were also carried out in selected households, with the aim of promoting water-saving technology. As a result, a practical handbook on efficient water use in the homes was produced, which provided guidelines for householders to evaluate their water consumption rates, and adopt good practices for water use efficiency by installing technological devices and changing their habits. Households were offered subsidised kits of household water-saving devices, such as shower heads, tap devices and double-flush cisterns. The activities involving use of water-saving technology were carried out in full collaboration with the enterprises concerned with manufacturing, distribution and/or installation of the water-saving devices. Technical staff from these firms were continuously sensitised, kept informed of the project activities, and their profiles were widely circulated to the consumers.

The overall outcome of both phases of the project ‘Zaragoza: the water-saving city’ have been quite significant. Average water consumption in the households of Zaragoza reduced from 107 litres per capita per day in 1996 to 99 litres per capita per day in 1999 (Garrido et al, 2005). These figures are well collaborated with operational data for Zaragoza City Council, which show that, with an increase in population of 6.3% between 1996 and 2004, water supplied to the city reduced by 14% during the same period (Zaragoza City Council, 2006). To consolidate these achievements, another phase has was launched in November 2006. ‘Zaragaza, a water saving city: 100,0000 commitments’ aims to solicit for commitments from individual consumers for achieving efficient use of water in their premises.

CONCLUSIONS

The results of the initial fieldwork for the SWITCH research project in Zaragoza, as reported in this paper have been highly dependant on secondary data. It is hoped that as the research process progresses, primary data will be obtained, which will lead to improved validity and reliability. Notwithstanding these limitations, there is enough

evidence to show that the first two phases of the project 'Zaragoza, a water saving city' have largely achieved their objectives. The success of this project, which was initiated and championed by Fundación Ecología y Desarrollo (FED), an environmental NGO, shows that although it is important for the state to provide a facilitating role for successful public action, non-state organisations with able and dedicated leadership can successfully spearhead and coordinate public action. The success of this project also demonstrates that partnerships, awareness-building and technology can be combined to achieve a substantial increase in water use efficiency. It is however important that all stakeholders are involved in the process right from the inception of the project. It is also important to acknowledge that there are many innovative people out there in the general population 'lying low' with their untapped capacities. These potential skills need to be mobilised and mapped to various roles and functions for overall achievement of the project objectives.

Another key lesson learnt from the success of this project is the need for phasing the implementation, and ensuring that there are specific time-bound targets for each phase. Since environmental projects require the participation of many stakeholders, including actions at individual households, a phasing approach is more likely to sustain the motivation of a myriad of participants. The successful implementation of this project has enabled Zaragoza to be categorised as a model city for efficient water use. It is no wonder, therefore, that this project was selected as one of the 100 most successful interventions for sustainable urban management by the UN-HABITAT. The methods used in this project could easily be adapted to other urban areas for more efficient urban water management.

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