

Educational Strategies for the Responsible Use of Water

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1. Introduction

The management of urban services related to water –the provision of safe water, sewers and storm sewers– is closely related to environmental physical conditions, such as availability and quality of sources and watercourses used for disposal in each particular region. It is also related to hydro-meteorological conditions.

This close relationship between water resources of a certain geographical area and the services related to them is in contradiction with a typical phenomenon of modern societies, specially in cities. The growing distance between citizens' everyday activities and the impact that these activities imply in environmental terms, in connection to extractive processes as well as the disposal of solid and liquid effluents.

The main challenge for education is to reduce the distance between citizens and environmental conditions –a phenomenon that we will name *the “deterritorialization” of the environmental experience*.

Moreover, in recent decades a school of thought which intended to administer services by introducing some type of regulation in the demand. This means to arbitrate in users habits in order to obtain a responsible use of the resources. From that moment, communication and education became part of management tools.

Although it usually appears as a universal and well defined concept, sustainable use of water and services may mean very different things in each the country, region and city. Environmental physical conditions on their own imply important differences in defining the concept of sustainability, yet we also must include aspects related to available infrastructure, the economic resources to maintain and operate it, management history and rate structure, among others, which will give a different content to this concept in different regions.

Additionally, there is another element which has a determinant role in the definition of sustainability: the concept of user responsibility historically defined by a community.

From the above it may be deduced that education as a tool to obtain sustainability and citizen responsibility must be considered within a historically and geographically specific context. As a substance, water responds to physical-chemical laws which are work much the same way everywhere. Mechanics can explain the workings of diverse instruments of service, which do not vary either. Yet water is more than a substance that nature gives us, or a service associated to it: it is a social good to which every society assigns different values and meanings. As a consequence, the relationship with water will be different in every society, and the educational approach adopted will be different in each case.

In this paper we will describe some reflections on the different variables that take part in the definition of an educational programme about the sustainable use of water. As an example, we will adopt the case of an educational programme designed for Argentina which has taken into account the principles above. Due to Argentina's diversity of environments, some of the considerations of this work refer to a specific region: provinces that form the *Río de la Plata* Basin.

2. Sanitary Services in a Federal Country

The first characteristic to be taken into account is political organization. Argentina is a federal country made up of 24 districts which have jurisdiction over their natural resources, water being one of them. Thus, each province dictates its own norms, framed by the national law.

Provinces also have the power to control environmental issues, the rendering of services, which they do on their own or through licensees, and are autonomous in key issues (such as education) and in every other aspect that has not been expressly delegated to the Nation.

The differences between districts are very important in number, characteristics and distribution of population, as well as in natural resources, economic activity and political and institutional history. These differences are reflected in the level of services received by the population, in the level of education and in the strategies of intervention of provincial states -just to mention the aspects involved in this study. This explains why the availability of water resources does not have a direct relationship with the population's access to water supply or sewers. (CIPPEC, 2007)

The *Río de la Plata* Basin —to which we will refer specially— represents less than 30 % of the continental territory of Argentina, but concentrates 80% of the population, the largest productive activity and the main urban centres. The basin is formed by the draining territory of the rivers Paraná, Paraguay, Uruguay and Río de la Plata. It is an extended basin shared with the neighbouring countries of Uruguay, Brazil, Paraguay and Bolivia, and is rich in surface and underground water resources.

Today sanitary services in Argentina are managed in three ways: public organisms, private companies and cooperative societies. In the first case, it is possible to distinguish different types of organisms, including one case of a national state company (*Aysa*, 2007). In some provinces, it is the provincial state that provides services through a state company or a government division. The same occurs when municipal organisms provide water services: they do it through autonomous entities or some organism of the local administration.

Private companies have a relevant presence in several provinces: Córdoba, Mendoza, Corrientes, Misiones, Santiago del Estero and Salta, among others. In these cases, as a minimum, companies provide services in the provincial capital and in some cases in other locales.

At present, national businesses own most of these companies, though there are still some international groups with different levels of stock ownership. However, the foreign groups that had the most participation in licences in the 1990s have left the country since 2003, because of an unfavourable exchange rate and new policies implemented by the national government.

Finally, the segment of cooperative societies operates in both medium-sized and smaller cities.

The present situation is not consolidated due to important changes produced in recent years, specially as a consequence of some operators' returning to public from private management, and because some major operators have purchased other, smaller ones.

But these changes are not new: the organization of water and sewer services in Argentina are not characterized by long term continuity, especially since the 1980s when the military government disarticulated *Obras Sanitarias de la Nación (OSN)* -a national corporation once considered a model company which most expanded Argentina's service.

Thus an educational programme on the sustainable use of water in Argentina must consider: the lack of national-level coordination, the federal organization, the great extension of Argentina's territory, the different systems in services management, the differences among provinces, and the lack of continuity in politics for the sector in the long term.

Yet other, additional aspects are essential and determine how difficult it is to approach the issue of water in education. The first is the traditional management of water services focused from the point of view of supply. Second, the way the tariff is structured is closer to the concept of a tax. These two have remained steady throughout different periods of time and across provinces, despite political fluctuations which we mentioned above. We will refer to them below.

3. Atomization of the sanitary map

These variations in organization originated in isolation in each town and city which solved problems with water and sewers supply without the assistance of the central state, or before the state had real power to provide assistance. However in the first decade of the 20th century, the central government created OSN, a national company that had the mission of organizing services in most of the country. Unification in the supply of services and the policies of expansion brought about an extensive development of service, especially during decades 1950 and 1960 (*FICH, 2005; Aguas Argentinas, 1999*).

Since 1980, within a framework of the national policy of transferring costs to provinces, excessive opening of economy and huge external debt, OSN was dismantled and services were transferred to provinces and, in some cases, municipal administrations. In the 1990s, this economic scheme became more evident. The central government forced provinces to privatize many services (banks, roads, electricity and sewers, among others) in exchange for transfer national resources to provinces (*Azpiazu, 2001; Gerchunoff, 1995; Schvarzer, 1993*). As a consequence, this change in the organization of services did not come from specific planning carried out by the water sector.

Many of the functions developed by OSN - balancing investments throughout in the country, formulating a general plan, developing human resources and becoming a model for service standards- were not transferred to any other organism. On the contrary, as a result of privatization processes, many regulation entities appeared, but each with jurisdiction over a particular company.

Thus at the end of 20th century, the map of sanitary service in Argentina again became divided into diverse independent operators and companies, with different degrees of management capacity, as had happened a century before in the beginning of sanitary era in the country. But in mid-20th century, private intervention was equal in the whole basic infrastructure. In the case of water, national state had an early intervention unlike other sectors, and throughout the 20th century, political and social movements generated a different frame of action, specially in the role that the central state had to play. In Argentina, these changes are expressed in popular movements, such as Peronism and Radicalism.

However, the 1976 dictatorship implied an abrupt break both politically and economically, which meant the end of the state organization that had allowed a sustained economic growth, social inclusion and extension of the welfare to large sectors of population for 60 years.

Since 1976, and more intensely since 1989, the central state has assumed a subsidiary role, disarticulating areas of coordination and keeping minimal control structures and leaving investment and the development of different economical and social sectors in the hands of private companies.

A deep social and political crisis was necessary to make the state reoccupy a protagonist role in the mentioned aspects in late 2001. However, even today challenges remain: a great lack of specialized human resources, a forgotten management culture and more concentrated economic actors.

In opposition, the international situation -high commodity prices (Argentina's main exports) and a favourable exchange rate- has conferred the national state with extraordinary resources for intervention.

State action has been more evident in public investment -through an important public works plan that is attempting to recover from the lack of investment in the last 3 decades- rather than in matters of coordination at the national level.

In 2003, the *Consejo Hídrico Federal* (COHIFE, Federal Water Council), made up of the provinces and the Nation, was created. Its creation represented an important step in the coordination of the sector, particularly in matters referred to water resource management, though not in sanitary policies. This was because in most of the provinces, these two aspects related to water are under the authority of different entities.

Before the COHIFE was created, *Principios Rectores de Política Hídrica* (Guiding Principles of Water Policies) were worded in consonance with the present trends in water resource management, encouraging user participation in decision-making and granting education and communication an important role. The same topic is included in the strategic objectives of official policies. (*SSRH, 2007*)

The objective of the current state policy seems to be to create large national or provincial state-owned companies (such as AYSA and ABSA), instead of attempting to coordinate different kinds of operators. Though not explicit, this could become a basis to re-create something similar to the old OSN.

However, there are private actors and cooperative societies that have kept their licenses and, in many cases, without major conflict with the provincial or municipal conceding power.

In any case, educational and communicational aspects are kept in the ambit of each operator. The same happens with legal and rate frameworks and any other relevant aspect in connection with the relationship that users establish with services and resources.

Water management includes a new territorial instance, which is the water basin. In Argentina, there are a hundred basins, but at present only few are managed by a formal entity. However, recommendations of international meetings about water and national policies for the sector consider a basin as the suitable space for water management (*SSRH, 2006*). A basin is a well-determined territorial space, but it also defines a cultural, social and economic social space, with common characteristics (*Dourojeanni and Jouravlev, 2002*). Basin management implies the participation of different actors in decision-making and, potentially it may mean an adequate arena in which to build aspects related to resource perception and develop methodological tools for education and communication.

4. Never ending water

As in every big city, first concernment of engineers in Buenos Aires and the other capitals in the country was to give people water, in quantity and quality enough for development of life and productive activities. But Argentine capital city has a peculiar characteristic: it is situated on the

coast of the widest river of the world, which, in practice, means to have a never-ending source of water.

Besides, Buenos Aires and its metropolitan area, with almost 13 million inhabitants, concentrate the third part of population of the country and is the main political, economic, cultural and communication centre of Argentina. Therefore, what happens there becomes –explicit or implicit – a model for the rest, even when the scale, the geographical, social and economic situation of the other regions do not justify to take such a model. Moreover, other important cities are also on the coast of big rivers, like Paraná, where the main problem related to water is that is excessive: floods are frequent.

That is why many aspects of water services organization in *Río de la Plata* basin area and in other regions of the country are taken from Buenos Aires. This includes legal and rate models and other aspects related to user perception that sees the resource as never-ending, even in those areas that must use underground water, that has lesser possibilities to dispose effluents and/or has different problems in impounding sources.

Additionally, scarce global population in the country (less than 14 inhabitants per km²), plus its main productive activity created an idealistic perception about environmental matters, increasing the belief that environmental problems were, in worst case, only a matter of the few big cities of the country.

In short, concerns related to water were connected to quality and coverage of services, exclusively. But they were not related to environmental conditions of water sources, on surface or underground. Management, that is cause and at the same time consequence of this perception, based its work in guaranteeing the supply before any kind of demand, without intervening on the demand itself.

The absence of integral educational programmes is a logic consequence of this perception. And although there are isolated campaigns that try to incorporate education as part of management, in most of the cases they are not developed with an adequate pedagogic methodology. Besides, they usually do not take into account the perceptive aspects over which to develop an educational strategy.

During the last years this has been changing. General environmental matters and in particular water are taking relevance in social and political agenda, because of several environmental events that alerted about these problems, an increase in participation of civil organizations and a growing international action that also reflex in the country.

But the greater environmental awareness of population (in which water managers are included) and the increasing social participation exist in the framework we described previously: institutional fragmentation, lack of coordination at national level, atomization and organizational differences among services operators and little certainty in the long term about public policies for the sector.

As a consequence, education and communication are usual but uncomfortable terms for operators, because they are not formal tools for management yet, but key concepts in documents and recommendation we still do not know how to take into practice. An exception to this is the use of communication tools by private operators since 1990s, but focused from the point of view of corporative image, not taken as tool for resources and services management.

5. Waste is cheap

As we have said, in a region rich in water resources, services management consisted in assuring water supply in cities and organize sewer systems to evacuate effluents (in most cases, without previous treatment) towards big rivers of the watershed or their affluents.

In this sense, the problem was mainly defined and treated technically, and the population was left outside of water management, even from the point of view of payment, because the tariff were defined by political criteria, which did not have connection with costs of operation, maintenance and/or extension of services.

Measurement of consumption represents a minor percentage of the total connections to the water service. Although measurement of water consumption is a particular case about which we are not going to discuss, it allows including criteria of rationalization in consumption. But it was not an instrument generally used.

Although privatizations established aims in this sense, after the economic crisis in 2001, these aims disappeared in almost every contract, while at present state inversion is devoted mainly to extend services coverage.

From the economic point of view, water services have some peculiar characteristics, such as their high fixed costs for infrastructure and maintenance (*ADERASA, 2006*). As a result, operative costs do not have a direct connection with de quantity of water produced or extracted from a source, which produced even more distance between management and responsible use. In practice, this costs structure encourages water wasting (to managers and users) or, in the best case, it does not encourage the good use of the resource.

Additionally, tariff have been designed on cadastral bases: taking into account home place, land surface and, in some cases, quality of building, among other variables usually included to determine how much user should pay for the service, even in those places where consumption measurement exists. But consumption has an impact over the variable part of the tariff, while the whole price includes a fixed part that, in general, follows cadastral criteria and is usually an important proportion of the total to be paid (*Foster, 2003*).

Different rate mechanisms used to include distributive justice, to make poorer sectors pay proportionally less than sector with higher incomes, did not modify this situation: direct or indirect subsidies were established for the operators and/or the users.

As a consequence, tariff never became a tool for sustainable use of water. In fact, the capacity of collecting of the sector is lower than in other public services, such as electricity and natural gas. This is based in two wrong ideas:

- Invisibility of the water networks. Most of the population does not know the complex structure of water services and the necessary processes for its management.
- Difficulty to distinguish conceptually between water in its natural source and water in the point of consumption.

On other hand, political leaders on whose decision depends to change these aspects in national, provincial or municipal ambits, do not want to carry on the responsibility of rates increase, implementation of mechanisms to punish water wasting or announcement of decrease in the quality of water or service due to overexploitation of aquifers or other factors, especially in times of population political sensitivity.

As a consequence, biggest demands of water are solved with more supply, but almost never with a demand regulation. And as the increase of rates go far behind the costs of the system, this finishes as a vicious circle paid with sources degradation, inefficient infrastructure and wider distance between users actions and the environmental impacts they have.

All this has meant a barrier to include in social agenda precepts related to responsible use of water. Though civil society is starting to demand active participation in these topics, the risk is that such participation grows effectively on wrong bases, because of the ignorance about the subject. This could imply a wrong evaluation of risks and alternatives for solutions.

6. Water and education

Educational system in Argentina includes water in official curricula from the chemical and biological points of view (water function in metabolism, as a component of living being and ecosystems) and from the sanitary point of view (importance of water in health), with little or not reference to problems related to resource management and users role in it. As we have mentioned, informal education was, until the decade of 1990, minimum.

After privatizations, actions of regulators and companies made some information get to mass media, but in both cases it was not focused on relationship between management and responsible use. The short relationship between costs and tariff that was intended with the inclusion of private capital in services management was lost after economic crisis in 2001. This crisis printed in the social imaginary those tariffs (which are low) are an obstacle to water access for population. Therefore, in social agenda the main problem related to water became the increasing percentage of population that did not have access to services (in fact, a product of decades without inversion in the area) and the subject of responsible use that had started to appear, finally disappeared.

Taking as a show the peculiar situation described for Argentina (that it is only an example of the different challenges that must be faced in an educational process for the sustainable use of water) we can assert that an educational programme will need an integral strategy of intervention that takes into account conceptual and proceeding aspects, among which we indicate some, though they may vary depending on context and reality in each country or region.

a) Conceptual aspects

a.1) Definition of the problem:

People responsible of educational campaigns usually consider that failure is a consequence of population apathy or irresponsibility. However, people act according to a simple logic: to solve what we consider a problem. It does not make sense to us to solve matters, which we have not previously defined as “problematic”. Although we all act this way, planners usually make this logic disappear simply because they already have a definition of the problem.

A typical example of this is that almost in every educational campaign the concept of water scarcity is overused, following data of United Nations. But while this international organization refers to scarcity for hundreds of millions people all over the world, especially in well-defined areas of Africa and Asia, this datum is transferred directly to an educational programme that will be applied in regions where the main problem is excessive water. The concept of scarcity, an interesting challenge for education, cannot be applied without previous analysis in certain places. On the other hand, the problem of management is almost universal, because beyond physic context of each region, all of them should manage their services.

a.2) Approach:

To focus on the educational processes from the management point of view means to define the place of every actor in it, including the user. To define the place means to determine in which degree they are responsible. This is very important because it is new for users. As we have said above, historically water problems were solved technically. Techniques were in charge of assuring the supply of the resource. What is new is to approach topics related to demand, that must be exposed in an adequate way.

This also questions the traditional approach to water in education, which can be seen in school contents and in isolated educational campaigns of sanitary system operators. This approach focuses on hydrological cycle. It is highly meaningful to observe how in most cases the cycle is illustrated in a “natural” space, with mountains, rivers, lakes, snow, etc. In that space there are not houses, animals, industries or people. In other words, it is a theoretical cycle not because it could not really exist, but because it is very far away from concrete experience of people. For example, in the area we are analyzing (*Río de la Plata* basin) there are not mountains, but illustrations still show them. And real context is basic in education.

a.3) Contextualization of environmental experience:

Environment gives essential services to human societies. However, almost none of them are directly perceived. Let's take two examples: water comes from a natural source and the wastewater we generate is also sent to watercourses, with or without previous treatment. For the user, however, water comes from household taps and is eliminated through toilets or drains. The transit from these artefacts towards their links to nature has disappeared (see point a.4), and so have its impacts: overexploitation, salinization of aquifers, contamination of recipient bodies, etc.

This separation between user's everyday experience of services and environmental aspects involved is also seen in other ambits: consumption, generation of solid garbage, use of transport, etc. An educational programme should try to rebuild conceptually the existent relationship between urban life, services that support it and their environmental consequences.

a.4) Visibility of networks:

Management approach has as one of its missions to deactivate the identity users perceive between natural water and water in the point of consumption. This identity is supported by different elements, like invisibility of nets (which are underground) and inefficient communication of the industrial nature of the water we drink, especially in connection with the two aspects in which natural water is modified to be used: quality and place. These two modifications, with their respective functions and costs, are key contents in an educational programme.

a.5) The perception of risk:

As a necessity to the development of life and maintenance of health, safe water is a basic human right, similar to the right to nourishment or shelter. Therefore the conditions in which water provision services are provided to the community are essential to obtain greatest coverage possible and the best quality that the community can obtain.

The clarity with which the population is inform of the different aspects of the service, its costs and the possible alternatives to solve specific problems will result in a better resource allotment, given that social decisions on water will be taken more rationally. When the information is deficient the perception of risk is also, consequently the decisions taken will not be the most adequate, minimally in regard to cost-benefit.

The risks associated with water and environmental factors in general are not usually correctly assessed by the population. The population tends to defend themselves from spectacular risks rather than from things that are likely to occur or are serious risks. The mass media plays a fundamental role in this perception, since an occurrence must be spectacular to make the news.

In other words, the population is usually more afraid of the violence of big cities than consuming unsafe water and will demand more investment from the state in relation to the former than the latter.

a.6) Integrated water resources management:

Integrated water resources management (IWRM) is a concept that was developed in different international meetings, and its principles are –at least initially- being incorporated into official policies and are known among non-government actors involved in water management. Educational programs must be a tool for the participational approach and involvement of users as well as water management planners and decision-makers, as stated in Principle 2 of the International Conference on Water and the Environment at Dublin (ICWE, Dublin, 1992).

b) Procedural aspects

b.1) Defining the audience:

Children are commonly considered the hope for a future in which environmental aspects of the planet are managed more rationally than did past and current generations. Yet children have grown up in cultural environmental circles created by adults (the most important being the family) and connected in complex ways. That is, school is not the only circle where future generations are formed.

Therefore the educational programme for the sustainable use of water should not only be directed toward children, but also incorporate strategies to reach the adult population, particularly the parents of the children the programme targets.

b.2)) Defining the scale

Many educational programmes and campaigns rely on the will of schools and teachers that *want* to apply them or are *motivated* to do so. Yet water management requires an integrated approach which means –among other things- we should try to cover all the target population in the geographic area.

Water and sewer networks do not allow segmentation by groups and the behaviour of all sectors - regardless of culture and income- affects the workings of networks and environmental surroundings.

b.3) Affordable costs:

Problems of scale are directly related to cost. Aiming to apply an educational programme for the entire population chosen may be financially beyond an administration's reach. It is therefore necessary to assess the impact of development and implementation costs in order to reach the desired scale. This is quite important because technical management areas generally have limited resources for this type of action.

b.4) Ease of implementation:

In addition to the lack of resources for water management, one characteristic (derived from its technical profile) is the lack of human resources suitable for education or communication processes. Thus an important aspect of the design of educational programmes is its ease of implementation for overcoming this deficiency.

7. Water goes to school

Bearing in mind the above considerations, we have developed an education program about a sustainable use of water to be implemented by service operators or public or private organisms related to the environmental management of the different provinces of Argentina.

Operators or organisms are to implement said program through the schools of the corresponding territory. At schools, the direct recipients are children between 10 and 11 years old, who are in the six year of the initial level. Such age was selected for different reasons such as the maturity of pupils, their capacity to understand and act accordingly in relation to particular problems and the type of contents given at that level of the formal education, and therefore, the program may be complementary and supportive.

The education program —called *Water goes to school*— was developed with the following objectives:

1. To promote a responsible use of water through a reflexive approach on daily use practices.
2. To become familiar with local water management: its sources, operators, network systems and related main problems.
3. To become aware of the importance of an appropriate use of sanitary services for health, economy and welfare of users.

To attain such objectives, the following printed materials were developed:

- a) For pupils: a book containing information and activities to do in the classroom, where problematic situations are included to promote reflection; and homework, which consists in short research activities to become familiar with the situation of each location and to involve family members in the resolution of exercises. We consider the subsequent presentation of the homework in the classroom an important instance in the pedagogical conception of this education program, because the particular situations at the pupils' homes may be examined and a connection with the activities of the different days may be made.
- c) For teachers: a book containing additional information, recommendations about strategies and dynamics for the activities, answers and exercise keys and supplementary bibliography.
- d) For spreading: posters, newsletters for the media, ads and other materials were developed in order that each operator may perform the relevant spreading in its own area.
- e) For assessment: the program contemplates a survey to teachers to assess the levels of satisfaction, relevance and understanding of the activities as well as the selected procedural aspects, and according to the results, to eventually make modifications of the program based on the own experience of the people who apply it.
- f) On line support: it provides teachers with a continuous consultation instance through electronic mail.

The application dynamics of the program contemplates a constructive teaching/learning process, which requires the identification of pupils' preliminary ideas related to matters of interest. Then, the problematic situations included in the activities are posed to pupils, who are encouraged to search for solutions with the help of the teacher. In this way, our goal is that pupils become familiar with water problem issues, communicate them to their families and have tools to promote a sustainable use of the resource.

The application of the program by schools is voluntary as it is an extracurricular, non official activity. However, the locations which applied the program have formally or informally incorporated the participation of the education area.

The program includes an integrated way to deal with the water management issue, but it also considers the possibility that the teacher may adapt it to his/her needs and time availability.

Water goes to school was implemented as a pilot test in 9 locations of the province of Buenos Aires and in Tucumán, including cities of different size. Although its application depended on the will of the own operators individually, without any official support except the formal support provided by the COHIFE, it was the first attempt at national level of unifying the education program for the sector from the point of view of the approach and pedagogical strategy.

To attain the above-mentioned objectives and to face the challenges described in this paper, it was necessary to extend the typical participation perspective, because we would not be able to reach such objectives only through communication campaigns based on the spreading of problems or positive actions about the resources or services. On the contrary, the program has an important pedagogical support, which is also supplemented with the perception aspects which area handled through communication, a discipline that also contributes concepts and planning methodologies for the circulation of messages.

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