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***Regional Review of Water Charge Instruments for Water Management  
in Latin America and the Caribbean***

*Case Studies of Brazil, México and France*

EXECUTIVE SUMMARY

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## **Regional Review of Water Charge Instruments for Water Management in Latin America and the Caribbean: from Theoretical to Practical Issues**

### **Executive Summary**

#### **Objectives**

The economic literature commonly identifies economic instruments (EIs) as a “better” way to achieve environmental goals than specified quantity and technological standards commonly known as command-and-control mechanisms (CAC). However, the choice of an appropriate economic instrument is theoretically complex; and the experiences with their application are full of controversy about their effectiveness in accomplishing desired environmental targets.

Environmental regulators usually apply two different kinds of individual standards to induce agents to conform to environmental or resource management goals. One type specifies emission rates or levels, or permissible rates of resource (water) use. The other kind of standard is technologically defined, requiring for example a specific kind of pollution control technology. Overall ambient standards also are set to identify the aggregate environmental performance targets in, for example, a watershed. Theoretically, individual technology or performance standards would be set in order to make agents achieve, in aggregate, the ambient standards.

If instead of complying with a uniform individual standard, pollution or resource use levels were charged, each agent’s control or use level would be different. Agents with lower costs will control more than agents with higher costs (and agents with higher demand responsiveness for the water resource will reduce consumption less, for a given charge, than those with a lower demand responsiveness). With a uniform pollution charge, all private agents will choose between paying the charge and reducing the effluent to the point where they have the same marginal cost of control. In this situation, control will then follow the least-cost path among agents for a given reduction in aggregate pollution loading. In other words, the reduction in aggregate loading will be cost-effective.

Equity issues also can become more interesting than with a single standard for everyone. Since each source’s control level will be determined by the point that the pollution or use price equals marginal control cost, by definition all controlled units will cost less than the charged price whereas pollution and use level not controlled will be charged at this pollution/use price.

In addition to that, charging all units of pollution and use will create a stronger dynamic incentive for eco-friendly technological change (resource conservation, pollution prevention or treatment), since all remaining units of pollution or water use will incur a cost, not just those required to achieve compliance status. In most cases, however, the ambient environmental consequences of

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the loading reduction from a uniform pollution charge will depend on where the reductions occur as well as how much.

While a uniform charge will yield cost-effectiveness gains compared to the same reduction in loading through uniform individual standards, the environmental performance of such pricing mechanisms depends on whatever ambient environmental standards the charge system seeks to achieve. If these underlying environmental standards are weak or fail to capture all relevant ecological dimensions, then the pricing mechanisms also will be limited in their environmental consequences. Nevertheless, pricing with these limitations may still offer the least cost-approach to total pollution reduction when compared to standards with the same ecological restrictions. As already noted, the overall environmental performance of both charges and standards can depend on where the reductions occur, as well as on how much. The more homogeneous the effects of pollution from different sources on ambient conditions, the less important this consideration will be.

Although theoretically pricing instruments promise cost-effectiveness relative to control instruments, the potential cost-savings with economic instruments will depend on the degree of control cost heterogeneity among polluters/users which depends in turn on size, technology, information and managerial skills and other factors. If marginal costs of control are not too different, then the cost savings from the charge system will be more modest. The overall cost-effectiveness of a charge system also depends on the costs to obtain all the required information and to set up the charging and monitoring basis. The system may have high transaction costs that could dissipate the expected cost-savings. Therefore, regulators must have in mind that control cost savings must be balanced against implementation costs including staffing and monitoring facilities.

Seroa da Motta, Huber and Ruitenbeek (1999) first presented a comprehensive survey of the Latin America and Caribbean's EI experiences through the mid-nineties. They concluded that there is a wide range of application of EIs in the region and that they have closely followed the OECD pattern with revenue-raising aims. Water charges have been the most advanced case. They have, however, showed problems in design and implementation issues, such as:

- i. Weak targeting and performance monitoring of environmental goals;
- ii. Lack of sound pricing criteria;
- iii. Poor performance on revenue collection.

Among experiences in developed countries, the French river basin system has been seen as a paradigm for Latin America experiences. This was mostly due to the fact that the French system was created by governmental decision quite recently and implemented in a reasonable time with immediate results. Praising of this experience has obscured the identification of its main difficulties and constraints that, once recognized could be of great value for followers, particularly when countries in the region are already struggling to initiate or improve the implementation of their systems.

Based on this diagnostic, after presenting a summary review of the literature, this study reviewed water charge experiences in France, Mexico and Brazil. These country reviews were undertaken by local experts and, despite differences in emphasis, each country evaluation is organized along

the same guidelines covering topics of relevance for the application of a policy instrument, namely:

(i) *policy analysis phase*: the policy setting in which the water EI was introduced as a mean of achieving policy goals.

(ii) *instrument design phase*: the theoretical, institutional and legal basis on which the EI was conceived .

(iii) *instrument implementation phase*: successes and failures of the EI application and its review process.

## **Country Cases**

The 1964 Water Act profoundly modified the French water management system and its apparent success set later a new paradigm for water policies in the world, particularly in Latin America.

The new approach in France was based on two general principles: decentralization and planning. Decentralization is based on the idea that water management organization should reflect the physical unity of water bodies in order to account for the potential sources of conflicts. To handle the externality problems linked to water pollution and conflicts of use as an integrated approach, the river basin is defined as the basic administrative unit rather than addressing uses differently and water management centrally with one set of unified performance standards. Planning is intended to provide consistent decisions at the river basin level, and to introduce a medium-term perspective on water management.

The decentralization principle is put into practice by the creation of Water Agencies and River Basin Committees in each of the six French river basins. While the former is intended to perform executive functions, river basin committees act as consultative bodies. To carry this on, two new instruments were adopted: five-year management plans and water charges.

Implementation of water charges was gradual and it worked very well to generate revenues for water-related investments, with much of the revenue transferred back towards water charge payers. However, no major role for price incentives has been found at the prevailing water charge levels to induce changed water use patterns. Moreover, the special treatment to agricultural users through exemptions has led to the sacrifice of noticeable environmental gains.

Close to the French approach, Mexico has adopted water charges in the last two decades. The water use charge from federal water bodies has been in place since 1986 whereas the wastewater charge since 1991. A central agency in charge of the use of federal water resources, the National Water Commission (Spanish initials CNA), was created in 1989. The CNA is the sole authority for federal water management and is responsible for the promotion and execution of federal infrastructure and the necessary services for the preservation of water quality. The most recent regulation is the 1992 National Water Law that is the backbone of the federal water system.

The CNA is attached to the Ministry of Environment and Natural Resources (SEMARNAT). The Federal water management system encompasses 13 administrative regions defined by the CNA, following hydrographic criteria. Each region comprises one or more basins, thus basins and not states are the basic division of the Mexican water management system. In total the system includes

26 Basin Councils. Following the French principles, the objective of the Councils is to promote participation in the management process of the basin. Pricing criteria of water charges are, however, set by a federal law revised every year. These Councils, moreover, have not been fully implemented and their capability has not been completely developed in order to be fully evaluated.

Water pollution charges in Mexico perform the role of a non-compliance charge since polluters only pay for units above the discharge standard. However, the implementation of the water charges has not been very successful since national coverage of the vast country's water system has required monitoring resources and enforcement capability beyond the CNA institutional capacity. In addition to that, CNA institutional power has been more concerned with infrastructure development than pursuing environmental targets. The reduced scope for private and public participation, associated with lack of information based on careful analysis of expected impacts from charge incidence, has created polluters' opposition on competitiveness and distributive grounds.

As a consequence of these institutional barriers, revenue generation has been very low and no changes in water use pattern have occurred. A project law entitled *Ley de Cuencas y Aguas Nacionales* (Basin and National Water Law) and at least two other projects of reform to the current Law are being analyzed by the Congress. Although they are still in the discussion phase, it is worth mentioning that they all propose giving more autonomy to the river basin institutions. While the autonomy proposed might not go as far as it could, the undeniable goal of every proposal is to strengthen the institutional capacity of the participatory institutions.

The Brazilian experience is quite different. Following the approval of the Federal Water Law (Law 9433 of 1997), Brazil has recently implemented a wide-ranging water sector reform, including the introduction of environmental water charges. The Brazilian legal framework for water resources management is based on the constitutional distinction between federal and state waters. Federal waters are those that flow across state boundaries or along the boundaries between two or more states or a foreign country. State waters are those situated entirely within the territory of a single state.

The new water management system adopted the same French principles of management by water basin committees and agencies where water charges are associated with River Basin Management Plans that identify environmental targets to be accomplished with a set of water-related investments and financed with water charge revenues. However, pricing criteria for the setting of charges have no general structure and committees have more autonomy in this matter than in France.

The creation of river basin committees is also less centralized. It depends on the users' initiatives to form a committee that must fulfil some managerial requirements and then must seek approval in the National Water Council. So the river basin national grid will be gradually implemented. The National Water Council also deals with inter-basin and inter-state disputes. Supervising and assisting basin water agencies is the National Water Agency.

The first implementation of water charges in federal rivers is due to begin in March 2003 in the Paraíba do Sul River Basin, where a single low charge will be levied on users for only a small number of pollutants. In this initial phase, the aim is to collect charge revenue enough to entitle the basin to compete for federal funds oriented toward water clean-up projects.

At state levels, almost all states have their own water policy based on the principles adopted in the national framework. Ceará has already water use charges and São Paulo is also near to implementing its charge system very similar to the one adopted for the Paraíba do Sul River Basin.

There is no doubt that, so far, Brazilian experiences have followed revenue-raising aims as in France, and the participatory process through river basin committees was also not able to introduce clear price incentives for changes in water use patterns.

## **Conclusions**

Based on the reviews, our conclusions can be summarized as follows:

### **Policy Phase**

**Water charges have been introduced within a broader policy framework:** The introduction of water charges has occurred within a new policy context. Charges have been considered as instruments to achieve policy goals rather than being goals themselves. All three countries analyzed have been dealing with water policy far back into the early 19th century. However, increasing water scarcity and environmental problems due to rapid industrialization, urbanization and irrigation have forced policy changes in water resource management. In all three cases, water charges have been introduced as instruments for this new water policy approach. This new approach, however, has been primarily concerned with (1) the need to plan and decentralize water management in order to accommodate multiple conflicting uses and excesses over assimilative and support capacities of the country's water systems, and (2) the need to raise revenue.

The reference experience is undoubtedly the French case where the 1964 Water Act resulted in the new legal and institutional frameworks for water management. The apparent success of this experience was fully absorbed in the Mexican and Brazilian cases.

However, the Mexican pattern has been slightly different. Although it is currently close to the French approach, use charges were already in place in the eighties without proper institutional and policy frameworks. It was only with the creation of the National Water Commission (CNA) in 1989 and later with the 1992 National Water Law that their implementation was enlarged to pollution matters and conceived as tool for planning and decentralization.

**Water charges are introduced as a complement to CAC:** Despite the fact that the primary goal of water charges has been in principle to assign an economic value for water, in all cases charges were in place mainly to support the achievement of CAC instruments, such as discharge permits and standards. That is, no CAC instruments were replaced to give room for a pure economic instruments approach. For example, in the Mexico case, emission standards were simplified and set according to grace periods in order to facilitate the application of charges.

Moreover, the new water policy frameworks created new CAC instruments such as the River Basin and National Water Management Plans where water charges would work to achieve the plan's targets. In fact, these plans ended up being the main instruments in this new policy framework since they combine a variety of considerations including water availability and priority supply, environmental targets, investment plans and distribution of water charge revenues. This point is crucial in analyzing implementation issues, since it shifts the role of water

charges to revenue-raising aims from their ability to induce attainment of environmental goals through behavioral changes.

**Decentralization is carried out with river basin institutions:** Decentralization is planned in two ways: (i) water management goals and targets differentiated by river basins and (ii) conflicts among users dealt with through a participatory process. Institutional bases for that are the River Basin Committees that define management targets to be executed by their Water Agencies. This is the basis of the French system in which river basin committees take managerial decisions on several water measures, particularly on charge levels.

In the case of Mexico this decentralization process is less accentuated since the federal water agency – CNA – is in charge of accommodating a basin's demands and needs, and river basin authorities have been relegated in practice to a secondary role. Brazil has gone further in decentralizing and shifting management power to basin authorities. In that country the creation of river basin authorities is not compulsory and water charges' pricing criteria are defined at basin level. Consequently, river basin committees gain more autonomy in this matter than in France and, in particular, than in Mexico.

### **Design Phase**

**Water charges are designed as a financing mechanism:** Following the same approach adopted in the French system, the pricing criteria for water charges take into account assimilative and support capacities of river basins. To accommodate economic and social conflicts they also differentiate by users on sectoral and equity grounds. However, all cases confirm that water charges in practice are financing mechanisms for investment solutions for water management, including pollution control investments. This revenue-raising feature is very clear in the Brazilian case, where investment plans, as in the French system, are designed in accordance with water charge levels to achieve water management targets. In the case of Mexico, the goals are somewhat clearly delineated since there is an emphasis on using the water charges (for discharges above the levels set by standards) and exemptions to enforce CAC instruments and targets.

**Revenue transfer and exemptions play a major instrumental role:** Apart from administrative costs, the major share of water charge revenues goes to infrastructure investments and direct transfer for users to finance their pollution abatement actions. Such transfers are thought of as the cornerstone for political acceptance and users' commitment to the charge system. Charge exemptions and rebates are also widely used to protect economic activities or are justified on equity grounds. All this has been pointed out in the French case, as revenue transfer has, in fact, increased over time, and the attempts of the federal government to use fund revenues in the general budget have failed. In Brazil the first experience in the Paraíba do Sul River Basin has set charge levels according to the financing needs required to leverage federal funds for river clean-up programs. In Mexico, recently the CNA has been explicitly committed to use revenue funds for water-related investments. In all cases, agriculture is either exempted or paying very low charges.

### **Implementation Phase**

Unsolved sectoral conflicts reduce system efficacy since they are the main barrier for the full application of charges. In France, the charge system was gradually implemented by increasing over time the set of pollutants and sectors included. The French system started by charging for

pollutants that are more easily monitored (industrial and residential organic matters and suspended solids, for example) and from sectors with less political resistance and higher ability to pay (industrial and residential users). It must be noted that ability to pay is used here in the sense of water intensity costs in total operational costs, so the agriculture sector in France only recently was subjected to user charge, and is still free of pollution ones.

Mexico, in turn, also adopting the same gradual approach, has failed to fully implement its charge system mostly due to political resistance that was not solved prior to the implementation phase. CNA was not able to attract enough federal budgetary resources to improve its monitoring and enforcement capacities to collect payments from state-owned sanitation companies and also from several industrial sectors that received waiver schemes during recession periods. All this contributes to undermine the system and reduce revenue allocation to improve institutional capacity. Mexico, in fact, has been trapped in this vicious circle despite several modifications in the water charge regulation. This can be partly explained by the fact that regulation enforcement in developing countries generally is often poor whatever the public policy. But it is also reasonable to assert that a greater autonomy of river basin authorities could have mitigated the weak monitoring and enforcement capabilities by accommodating conflicts. The recent movement to a more river basin oriented approach in this country may change this pattern.

In Brazil, the state-owned hydroelectric companies and the agricultural sector also have managed to receive favorable charge levels. Brazil, however, has adopted a more cautious approach recognizing that the country's territorial and hydrological dimensions would not allow for the immediate creation of a complex structure of river basin management, and planned to implement it gradually. To accomplish this, the new water policy shifts to users the initiative to create a river basin committee and, therefore, the application of water charges. Only when users fulfil some requirements, such as adequate users' representation, permit regularization and creation of a five-year management plan, can the river basin committee be officially recognized and autonomy for charge application given. That will certainly lead to a slow implementation pattern in the beginning, but it is expected that successful experiences will create incentives for the supply of qualified human resources and the transference of institutional capability that will speed up the whole process of mounting river basin committees over the country. Nevertheless, the lack of a national grid of river basin committees, as in France and in Mexico, poses serious problems related to inter-basin externalities when connected basins are not all organized in river basin committees, as already presented in the first major experience of the Paraíba do Sul River Basin Committee.

**Participatory process may preclude price incentives:** The need for a participatory process to accommodate users' conflicts and to increase acceptance does not in itself make available the potential benefits of a water charge system. The French case has shown that agricultural users can use sectoral subsidies to compensate for the increasing burden of water charges, thereby reducing their incentives for changes in water use patterns. It is also known that low charge levels can create incentives for operation of abatement facilities once they are in place, but it does induce abatement investments that are highly dependent on charge transfer. That is, participation may solve revenue-related conflicts but it does not necessarily create incentives for a charge system that will significantly change water use patterns. In the Brazilian experience of the Paraíba do Sul River Basin the charge level setting was initially calibrated to have the minimum economic impact level on users' costs with no attention to environmental consequences and water use levels.



### **Environmental and water management frameworks have to work together:**

Although monitoring of water use is usually under the responsibility of water agencies and so within the water management framework, water pollution control is exercised by environmental regulators. As said before, in France and in Mexico, where water charge systems are already in place, efforts have been made to conciliate the water pollution CAC instruments with the water charge systems. However, in both cases joint work in terms of monitoring and information sharing needs to be improved. It is also known that the lack of a continuous evaluation process to analyze the effects of the charge system on use levels and on environment quality has delayed improvements in the system and in the allocation of the water charge revenues.

### **Recommendations**

Based on the analysis presented above, we make the following recommendations:

- 1 – A policy framework must be in place before charges are designed, and charges must be in accordance with policy goals. If revenue-raising goals are the only politically viable options, that should be explicitly acknowledged and the reinforcement of CAC instruments for achieving environmental goals has to be planned.
- 2 – Autonomy of river basin authorities must be tailored according to the dimension and complexity of the hydrological system to maximize institutional capacity by facilitating political acceptance, reducing information gaps and administrative costs.
- 3 – River basin committees are important to launch the system but they can promote favor seeking and do not solve the economic and environmental conflicts that prevent charges from being implemented to support environmental targets.
- 4 – Water management framework must be integrated to other policy frameworks to increase monitoring and enforcement capacities. This is the case for environmental agencies as well as sectoral agencies in order to accommodate policy aims. Since this integration requires federal level negotiations this is a task for a federal water agency and cannot be delegated to river basin authorities.
- 5 – Even with emphasis on revenue generation, environmental consequences of charge application should be explicitly discussed to allow for gradual incorporation of environmental criteria in the charge system. Continuous environmental evaluation of the river basin should be undertaken incorporating economic models that identify water use changes related to charge impacts.
- 6- An explicit criterion for desirable charge levels should be elaborated based on economic and equity factors, and all users should be covered by the charge system from the beginning to strengthen commitment and enforcement.
- 7 –Cost-benefit analytical tools should be developed for projects to be financed with charge revenues to maximize the social value of the investment actions.
- 8 –Public opinion should be brought into the debate by putting public attention on water management issues with data release and technical arguments to consolidate river basin management and the role of water charges.