

## **WATER RESOURCES POLICY IN BRAZIL**

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### **INTRODUCTION**

Water is a resource of paramount importance and, as such, requires careful management. This situation is aggravated when there is rapid population growth accompanied by accelerated urbanization. Competing needs for this beneficial resource include municipal supply, industry, and agriculture, among others. Water is also essential to sustain development. Two decades ago, with Brazil already facing these conditions, decisions regarding water issues had to be based on the Water Code, which was promulgated in 1934. It was time for change.

The geographic extent of the country, regional differences, and difficult economic conditions necessitated comprehensive reform in the water resources sector to increase efficiency, reduce costs and promote development. With strong support from water resources professionals, the Brazilian government in 1984 opened discussion on what should be the country's water policy. However, the major change did not occur until 1997 with the promulgation of the National Water Resources Management Act, which established the National Water Resources Policy and the National Water Resources Management System.

In this paper we describe the policy and the management system as established in the 1997 Act and discuss the many challenges facing the country as the government seeks to implement the Act. Despite Brazil's size and its regional differences, the country is undergoing a

major change in the way water is perceived and managed by different sectors of society.

### **BRAZIL: LARGE BUT DIVERSE**

Brazil is a federal republic of 8.5 million km<sup>2</sup> located in the southern hemisphere, between the Equator and the Tropic of Capricorn. The country is divided into 26 states and a Federal District, in which the capital, Brasilia, is located. Brazil is known as a country of plentiful water, with the highest total renewable fresh water supply of the planet (Gleick 1998). The average amount of water available per capita exceeds 1700 m<sup>3</sup>/person.year, estimated to be the threshold below which the country will not provide itself with sufficient food production (Postel 1997; Gleick, 1998). However, the availability of 6950 km<sup>3</sup>/year in fresh water must be viewed as merely an indicator of the average situation. In fact, 70% of the water is in the Amazon Basin where only 7% of the population lives. The remaining 93% of the country's population depends on only 30% of the available supply. The per capita availability varies from 1460 m<sup>3</sup> per person, per year in the semi-arid Northeast to 634 887 m<sup>3</sup> per person, per year in the Amazon region.

Water supplies in four different geographic regions present a major contrast. The *North*, including the Amazon basin with abundant freshwater resources, is sparsely populated but poor. The *Northeast*, which is semi-arid with a constant threat of severe droughts, struggles to sustain a population of 40 million people living in oppressive conditions. The *West*, with two dominating ecosystems, the savanna and the wetlands, is devoted to cattle raising and intensive agricultural development. The *South*, which is the industrial and financial hub of the country, is noted for its unbalanced water supply/demand relation, due to excessive consumption and pollution in the larger, urbanized areas.

Each of these regions is unique and beset by different problems. Because water is a fundamental resource and a critical issue throughout Brazil, an efficient and sound water management system that addresses these various inequities is imperative.

## **A FLEXIBLE WATER RESOURCES MANAGEMENT SYSTEM**

The main objective of a management system is to allow optimum water allocations so that essential uses are guaranteed, and that economic activities have reliable access to water in order to sustain growth. If water is to be viewed as an economic good, a normative system has to discipline its uses within an adequate institutional and legal framework. However, this framework should be tailored to the situations and constraints facing individual regions. The need for flexibility in the water allocation system was the first and foremost condition to which all parties agreed from the beginning of the reform process almost twenty years ago. The water managers and water resources professionals shared the view that the new system would have to accommodate the extensive regional diversities, interdependency among many uses, and protection of the environment. The only way to make such a system feasible would be to emphasize the need for efficiency, use economic incentives, and decentralize decision making.

## **THE DEVELOPMENT OF THE BRAZILIAN WATER RESOURCES SYSTEM**

The Brazilian Water Act of 1934 was promulgated at a time when Brazil was changing from an agricultural to an urban-industrial society. Economic uses of water had to be regulated and the main criteria was to provide a safe yield of water supply for development of the country's significant hydropower potential. Although the law was innovative at the time--with provisions for pollution control, including the "polluter-pays" principle, among others-- it was never completely enforced. It was used mainly to regulate hydropower uses.

During the 1980s, government as well as non-government water professionals felt that modern, specific legislation for water management was needed. Because Brazil was reforming its constitution, the time was right for change.

When the constitution was approved in 1988, Section 21 explicitly defined a National Water Resources Management System (Constitution of Brazil, Title III, Section 21 (XIX)). The constitution made clear that water management in Brazil would be a future agenda item. In fact,

it also defined water as a public good, administered by the Government (Constitution of Brazil, Title III, Section 20 (III)). The Constitution assigns the responsibility to administer water use in rivers, rather than in river basins, either to the federal government or to the state governments. Rivers that run entirely within state borders are administered by the state. Large rivers that flow through several states, or that serve as a border between states, are administered by the federal government, although tributaries may be administered by different state governments. Given this legal arrangement, water resources management at the river basin scale is dependent on the coordinated efforts of state and federal Governments. This coordination is, perhaps, the most difficult challenge in implementing the Brazilian Water Resources Management System .

With the adoption of the new constitution, there was a call for a reassessment of all legal and institutional arrangements related to water, and planning for a National System began almost immediately. Throughout the country, significant changes were in progress. Several states also began developing their own systems to manage the rivers located within their boundaries.

The discussion process was opened to different sectors of society. Organizations of water professionals played a key role in leading the discussion. The Brazilian Water Resources Association, for instance, produced formal statements, approved by its members, that helped introduce novel concepts into the discussion. In particular, the Association statement of 1989, included the following principles (Porto 1998):

- (1) water quantity and water quality aspects cannot be dissociated;
- (2) the river basin is the territorial unity for management actions;
- (3) water is an economic good; pricing is one of the mechanisms to promote its rational use;
- (4) water use is to be disciplined through a permit system; no one is allowed to withdrawal water without its respective permit;
- (5) the decision making process is to be decentralized, with full participation of the local community.

The Dublin Declaration (International Conference on Water and the Environment 1992) of 1992 reinforced the principles under which the Brazilian water resources management system

was already being discussed. The State of São Paulo was the first to develop a management system along these lines and the State of São Paulo Water Act was issued in 1991.

The legal and policy review process at the national level involved a wide cross section of participants. Several workshops that included politicians, water professionals, users, non-government organizations, and local communities were held around the country between 1991 and 1996, and strong support was voiced for the decentralization process and intensive community participation. One of the most controversial issues was promotion of rational use through pricing.

The result of the extensive debate and public consultation was a bill that reflected the views of the vast majority of stakeholders and interested parties, and represented an agreement between government, users, and the community. The bill was submitted to the House of Representatives and Senate and was finally approved in December 1996. The President of Brazil signed the National Water Act (Law n. 9433) on 8 January 1997.

## **THE NATIONAL WATER ACT**

The National Water Act of 1997 (Law 9.433) defines the objectives, principles, and instruments of the National Water Resources Policy and the National Water Resources Management System. The law establishes the institutional arrangement under which the country's water policies are to be implemented.

### **The Brazilian Water Resources Policy**

The National Water Resources Policy was proposed to achieve (1) sustainability-- to ensure that the present and future generations have an adequate availability of water with suitable quality; (2) integrated management-- to ensure the integration among uses in order to guarantee continuing development; and (3) safety-- to prevent and protect against critical events, due either to natural causes or inappropriate uses.

To achieve such objectives, water management must be implemented according to the

following principles:

- (1) water is a public good;
- (2) water is a finite resource that has economic value;
- (3) the use of water required to meet people's basic needs shall have priority, especially in critical periods;
- (4) water management shall comprise and induce multiple uses;
- (5) the river basin is the appropriate unit for water management;
- (6) water management shall be decentralized, with the participation of government, stakeholders and society.

(1)

These same principles are viewed today as the embodiment of modern water management. Together they encompass such themes as protection of the environment, economic development, and improvement of social conditions-- all of which are intended to achieve sustainability.

The general guidelines for implementing the water resources policy emphasize the need for integrated management, flexibility to accommodate regional differences, coordination among the different sectors, land use planning (relevant to water management), and integration between inland and coastal water management.

The specific tools outlined in the Act to implement the policy include (1) water resources plans; (2) classification of water bodies for different use, resulting water quality standards tailored to the target use of each water body, (3) a permit system for withdrawal or use of water; (4) water pricing; and (5) a water resources information system.

Water resources plans are developed to guide future decisions and are to be developed for each river basin and state as well as the country. The objective is to coordinate efforts and establish guidelines and priorities for water allocation and water pricing. Each plan must be approved by the corresponding river basin committee.

The classification of water bodies by different classes of use is the basis for truly

integrating the quantity and quality of water management. Water quality standards in water bodies are to be enforced based on the decided use of the water in the river basin. The classification is a planning device that is intended to balance water quality standards and waste treatment costs, either to keep the standards or to restore the quality of degraded rivers and lakes.

The permit system is being organized to set the rules for using rivers and lakes, either to divert water or to dilute pollutants. Permits are granted for a fixed period of time, never longer than 35 years. All withdrawals and uses of rivers and lakes must have a permit-- except those in insignificant amounts, which are determined by each river basin committee. Permits are to be issued according to the priority of uses as established in the water plan of the river basin. Permits may be modified, suspended, or canceled if water is not used for three consecutive years, or if critical hydrologic situations exist. Water pricing is the single most controversial instrument of the law. The pricing system is also the most difficult step to implement. The pricing system recognizes the economic value of water, as stated in the principles of the policy. The expression "economic value", refers only to the use of water as a natural resource, and not the related water services. For example, in France, charging for water use has been common practice for more than three decades, and that system appears to be effective in promoting sustainability and efficient operation of the infrastructure (Barth et al. 1987). The tradition in Germany for sharing investment and maintenance costs of common infrastructure at the river basin scale started before World War I. More recently, Mexican Water Law introduced charges for exploitation and use of surface and groundwater (Solanes and Gonzalez-Villarreal 1999). In Brazil, several states are also introducing pricing of bulk water in their laws and regulations. The main reasons for charging water users are twofold:

- (1) To send them an economic message that they may be constraining the water use of others. The Brazilian system is unique among the world's water policies because it tries to use water prices to capture these externalities as much as possible in order to internalize them for water use. In this way, balance between water demand and supply can be reached by augmenting

supply and decreasing demand;

- (2) To provide the necessary funds for adequate operation and maintenance of existing systems at the basin scale and to implement new projects. Funding may also contribute to environmental conservation and restoration.

Experience shows that the revenues collected from bulk water fees must be invested in the same basin where they are generated. This is the single most efficient way to increase the user's willingness to pay. Otherwise, the stakeholders perceive such payments as taxes. If this happens, it could spur rejection of the system, which would be very difficult to overcome.

Agriculture is potentially the sector most affected by the pricing of bulk water, due to its intensive use. This difficulty is amplified by commercial barriers imposed by the United States and other developed countries on imports from Brazil, such as orange juice, and by the subsidies for agricultural activities in several of these countries, particularly France. These barriers decrease the ability of Brazilian farmers to compete in the global market and, therefore, reduce their ability to pay for bulk water. The effect of trade barriers is to delay the implementation of the Brazilian water system, which would result in a more rational use of water.

The development of a new, modern, and complete water resources information system is one of the basic needs for the implementation of the water resources management system. A complete and comprehensive database on water availability, users, water quality monitoring, current technologies (like geographical information systems), is certainly the way to produce an efficient framework for decision making. Lack of information is one of the most critical points regarding the development and implementation of the new management system.

### The Brazilian Water Resources Management System

A primary strength of the new system is its decentralization. The goal is that decisions should be made at the lowest appropriate level with effective participation by stakeholders. After observing several river basin committees already established under the new system, it



seems clear that decisions on water allocation tend to be made through consensus rather than conflict. Participation by government, stakeholders, and organized society increases the willingness to implement the decisions and even prevents misuse and degradation of the resource.

The National Water Resources Management System is implemented under the Ministry of the Environment, which includes the National Water Resources Council (NWRC); state water resources councils; federal and state agencies, in charge of managing the permit system at the river scale; river basin committees; and river basin agencies, which will be the executive offices of river basin committees.

The NWRC is formed by (1) representatives of the federal government, who have some level of jurisdiction over water and related issues); (2) representatives designated by the state water resources councils; (3) representatives of the stakeholders; and (4) representatives of non-governmental organizations involved with water resources management or water use. The main responsibilities of the NWRC are to arbitrate, as a final administrative instance, conflicts between states; and approve guidelines regarding the permit system for withdrawals and water use, and also for the implementation of bulk water charges. The Executive Secretariat of the Council is under the responsibility of the Office of Water Resources, Ministry of Environment.

The composition and the responsibilities of each State Water Resources Councils are established by the corresponding state law but, in general terms, it is very similar to the NWRC. The State Council arbitrates conflicts between river basin committees and establishes guidelines for water resources programs at the state level.

Each river basin committee is formed by representatives of the federal and state government (depending on the administrative jurisdiction for each river belonging to the basin), stakeholders, and the civil society. They collectively decide how to allocate water, implement new development projects, arbitrate conflicts among stakeholders, and impose pollution control restrictions;

Each river basin agency should perform all the executive work related to water

management in the basin. A single river basin agency may serve as the executive office for one or more river basin committees. Funds for financing the operation of these river basin agencies should be provided through the collection of bulk water fees. The water agency is responsible for all the technical work required to locally manage the water resources. Supplying expertise for database management, conducting hydrologic studies to evaluate water availability, ensuring adequate water withdrawal decisions, assessing and evaluating new water resources projects, as well as providing technical support to the committee on any other technical issue, are all responsibilities of the agency.

Recently, the House of Representatives approved a new law creating the National Water Agency. When approved by the Senate, the National Water Agency will be the executor of the water resources policy and will administer the permit system under control of the federal government. As a prerogative of the federal government, the Office of Water Resources will remain responsible for elaborating the country's water policy.

The National Water Agency was proposed in order to introduce more flexibility into the system. It will be easier to hire and fire staff, when compared to the rigid rules that stand for the entities of the direct administration of the federal government. However, top officers will be nominated for a fixed period of time and will not be dismissed due to political differences with the ruling government. The idea is to create an entity with sufficient stability and technical capability to implement the Water Resources Management System— a task that will take many years of continued efforts before maturing.

### **FROM THEORY TO PRACTICE**

In countries, such as Brazil, that do not adopt the Common Law, theory precedes practice. As mentioned above, Brazil's legal structure is based on the Constitution of 1988, which calls for the establishment of the National Water Resources System, to be detailed in a law. Before this law was discussed in the National Congress, a water resources law was approved by the São Paulo State Congress, in 1991. Many other states issued their respective

laws, very much inspired by the law passed in São Paulo. The result is a homogeneous set of state laws. However, this homogeneity does not mean that the diverse water problems at the country scale can all be solved by the same set of tools. It simply means that all discussions have occurred around the same hypothetical situations. In these circumstances, the wisest procedure was to avoid endless theoretical discussions and adopt a code with a reasonable internal coherence, as was the case with the law in São Paulo. Application of the state laws to real cases would result in improvements to the legal texts. In fact, this has already been observed. For example, the Water Resources Ceará State Law, approved in 1992, relied heavily on the action of the state government, through the agencies of the direct administration. However, it soon became obvious that the direct administration is too constrained (e.g., directors cannot hire or fire, no incentives for seeking efficiency) to be capable of implementing something new—such as water resources management at the river basin scale—that requires a long time to mature. For this reason, in 1993 the State of Ceará created a State Bulk Water Company --COGERH--to act as the river basin agency for all river basins in the state. The lesson is that the Ceará Water Law was barely a year old before reality forced the creation of an entity not included in the law.

Pricing bulk water use, or alternatively, pricing the water permit, may generate a substantial cash flow. To reduce any tendency to centralize the decision-making process, the water law calls for the formation of river basin committees, which would be formed only in basins with water allocation conflicts, actual or potential, and where stakeholders would be sufficiently committed to oversee the water issues. If these conditions are satisfied, then a river basin water agency should be created to function as an executive branch of the river basin committee. These water agencies would be Brazilian equivalents of the river basin agencies in Germany or France, or to the water district in the United States. However, river basin scale management is proper in most cases, but not all. Hydroelectric power plants in different river basins can be electrically interconnected. When a drought strikes a particular river basin, sometimes for several years in a row, the system may be sustained by power plants located in different river basins, separated by thousands of kilometers. In these circumstances, the electric

power sector will tend to plan and operate the reservoirs from the interconnected system perspective, rather than from the river basin perspective.

The proper mix of representatives on a river basin committee can make a big difference. Limited experience has shown that if the NGO's outweigh the users' representatives (e.g., water-supply/sanitation companies, industries, irrigation districts, power companies), the decisions of river basin committees tend to be unfeasible because those who make the decisions do not have to pay the consequences of their decisions. On the other hand, if decisions are left only to users, there is a risk that the environment would not be properly preserved for present and future generations. Also, the composition of the committees often requires many members, especially when they accept the "one man, one vote" concept. To avoid the associated transaction costs, the committees have adopted a decision-making process based on "weighted votes" for each category represented on river basin committees (similar to what happens in an assembly of shareholders of a private company). Decisions within each category would be made by members of the category.

One of the most awkward features of the water law is that it calls for yet another law to establish the criteria and juridical personality of the River Basin Agency. Until the new law is passed, there will be a vacuum. Some efforts are being developed to ensure that, under the present legal structure, a "technical office" would temporarily perform the duties of the future River Basin Agency. In Ceara, the State Bulk Water Company, COGERH, that plays the role of the water agency for all the river basins in the state, was created before the existence of any river committee. Only after COGERH demonstrated positive results in managing the supply of bulk water (with the participation of the stakeholders) and after water users were better organized at the reservoir scale, did COGERH proceed to organize the river basin committees. This historical evolution is contrary to the concept embedded in either the national or state water laws that offer protections against the capturing of a river basin committee by its agency. Although this is a legitimate concern, the Ceara example demonstrates how difficult it is to build a complete legal system all at once. It would be preferable to build the legal system through an iterative process,

which relies on actual experience.

Water use permits should apply either to quantitative uses of water, such as irrigation or urban supply, or to qualitative uses, such as dilution of industrial and urban waste. In most cases, however, quantitative and qualitative permits are issued by different government agencies, which are often rivals. Ideally, both kinds of permits should be issued by the same agency. Because of this, the same yardstick should be adopted to reduce quantitative and qualitative uses to common ground. The parcel of river flow that each water user makes unavailable for the downstream users may be this yardstick. In case of quantitative (consumption) use, the parcel is just the quantity of water withdrawn from the river. In case of qualitative use, the parcel is the quantity of water necessary to dissolve the pollutant to an accepted concentration level in the river. It may decrease as it moves downstream due to the oxidation of some pollutants.

Pricing bulk water should not be a source of revenue for governments, because there is a widespread disbelief in Brazil that the government is capable of carrying out new policies, such as the rational use of water resources. Instead, the corresponding river basin committee should preferably use the revenue in the same river basin where it originated. Ideally, revenue should decrease with time because the money raised with the bulk water fee should finance improvements for the river basin as a whole. This is a strong argument against those sectors which believe that accepting lower environmental standards is the only hope for developing countries to compete in the global market.

River basin committees do not need to be established across the board. Committees should be formed only in basins, or sub-basins, which have some water conflict, actual or potential. Local problems may induce the formation of committees for some of the upstream sub-basins. In this case, it is necessary to create a hierarchical relationship between basin and sub-basin committees, preferably to ensure the right of the committee of the larger basin to impose boundary conditions for the river flow, quantity and quality, leaving the sub-basin. This means that the sub-basin committees would be free to decide matters internal to the sub-basin without external interference, provided that the boundary conditions are respected.

In intermittent rivers of the semi-arid region of the Brazilian Northeast, continuous flow of water is assured for limited river reaches downstream from each dam. In these circumstances, it is more relevant to establish users association for each reservoir, rather than river basin committees.

When it comes to flood control, community participation in the selection of solutions is highly useful. However, because flood protection is a community rather than individual benefit, government financing is unavoidable.

## REFERENCES

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- Barth, F. T., C. T. Pompeu, H. D. Fill, C.E.M. Tucci, and others. 1987. Modelos para Gerenciamento de Recursos Hídricos. São Paulo: Nobel/ABRH.
- Gleick, P. H. 1998. *The World's Water: 1998-1999*. Washington, DC: Island Press.
- ICWE. 1992. The Dublin statement and report of the conference. International Conference on Water and the Environment: Development Issues for the Twenty-first Century. Geneva, Switzerland: WMO.
- Porto, M. 1998. The Brazilian water law: A new level of participation and decision making. *International Journal of Water Resources Development*. 14(2):175-182.
- Solanes, M., F. Gonzales-Villarreal. 1999. The Dublin principles for water as reflected in a comparative assessment of institutional and legal arrangements for integrated water resources management. *GWP/TAC Background Papers*. N. 3. Stockholm: GWP/SIDA.
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