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AGENDA 21 AND INTEGRATED WATER RESOURCE MANAGEMENT IN LATIN AMERICA AND THE CARIBBEAN */

*/ This is an unofficial translation of the document prepared by Mr. Armando Llop, Consultant, Division of Natural Resources and Energy. The views expressed by the author do not necessarily represent those of the organization.

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I. INTRODUCTION

The purpose of this document is to make some observations on the degree of adhesion or follow-up of the Governments of Latin America and the Caribbean in respect to the agreements in Chapter 18 of Agenda 21. Specifically, to see whether steps are being taken to comply with the goals fixed for the year 2000, directed to the integrated management and use of the water resources, which are:

i) To have designed and initiated costed and targeted national action programmes, and have put in place appropriate institutional structures and legal instruments;

ii) To have established efficient water-use programmes to attain sustainable resource utilization patterns.

These actions should be based on actual conditions in the various countries of Latin America and The Caribbean, whose contexts and circumstances are extremely heterogeneous. There are many historical cultural, social, economic and structural factors which prompt or hinder social investment and participation in the development and conservation of water resources. As is known, institutional, economic and legal dimensions play a preponderant role in the integrated management of these resources.

1. Water resources in Latin America

In modern societies water is used for human consumption, sanitation, the generation of energy, industry and agriculture, transportation, recreation and the maintenance of the environmental systems. Water, as a natural resource, has a set of very particular characteristics, since it constitutes one of the principal vehicles for the transmition of environmental impacts and is present in all ecological systems. Until recently, in Latin America and the Caribbean, water has been treated as a resource which, for some reason, is not subject to shortage. This misconception is particularly important to the effort to solve the problems of growing demand, competition among sectors and, particularly, water pollution.

More than 90% of the Latin American population lives in areas that receive between 500 and 2,000 mm of annual rainfall, showing that nature was prodigal when it established the existing water systems. Nevertheless, as always occurs, the spatial distribution of rainfall and rivers is sufficiently heterogeneous as to result in areas with serious problems of water excess, characterized by flooding, and areas of important water deficit in which irrigation constitutes the only means of maintaining viable social systems.

According to FAO estimates, the total irrigated area in Latin America and the Caribbean had reached almost 15.9 million hectares in 1991, equal to a little more than 10% of the arable land, the improved pasture and the land under permanent crops.

The United Nations estimates that the net installed capacity for producing hydroelectricity in Latin America and the Caribbean had reached almost 98.8 million kilowatts in 1991. This is equal to a little more than 12% of the hydroelectric potential which can be economically exploited.

According to recent estimates of the Pan-American Health Organization (1992), some 333 million persons, that is 80% of the urban population and 53% of the rural population, have access to a drinking water supply system and almost 285 million, that is 74% of the urban population and 30% of the rural population, to sewerage.

Even though the above figures imply a relatively low rate of overall use of the water resources, in recent decades there there has been increasing use and there have been important changes in the sectoral composition of the demand for water. Particularly important are the increases observed in urban and industrial demand, which is, unfortunately, producing growing levels of pollution.

In most Latin American countries, responsibility for the administration of the water resources is shared by several institutions. At the same time, there are various regional administrations for specific uses. As is also frequent, everpresent problems such as that of water pollution, are part of the responsibility of a great many agencies, such as centralized agencies, municipalities, irrigation departments, water supply companies, hydroelectric companies, etc. Pollution is the area which shows by far the greatest institutional dispersion. This implies that most of the countries would require adopting a means of institutional coordination for the achievement of integrated water resource management.

2. The recent economic crisis in the region

In the last decade, what has most tended to aggravate the general situation in Latin America has been the growing fiscal deficit, aside from other already secular problems such as the external debt. In several countries of the region, this situation led to what Tweeten (1989) has called the "economic degradation process", predominantly in the late 1980s and the early 1990s.

The manifestations of this economic degradation process can be summed up as follows: a) persistent deficits in government budgets and in the balance of trade. The state is living beyond its means; b) debt accumulation, both internal and external and both private and public. The debt has very high repayment costs in relationship with the national revenue and the debt service has become impossible, with the result that it is not paid; c) growing inflation, originating in monetary expansion above the increase in real product. General prices levels have easily reached the two digits per month figure in some countries, resulting, in some cases, in hyperinflation. d) currency overevaluation, to the extent that the domestic or local currency is inflated at a rate higher than the exchange rate. e) trade deficits, to the extent that imports expand quickly in relationship with exports.

What must be underlined, is that these processes strongly affect the resources allocated for the provision of basic services, such as education, health, environmental problems, etc., within which

water resources play a primary role. All these sectors are relegated to second priority, because of the magnitude of the need to stabilize the economy and the pressures this generates.

3. Water resource management in an economy in crisis

When a severe economic recession hits a traditional Latin American country, where the bulk of the water resource management is done by the government, the entire range of available economic instruments is called upon. Many of the adjustment tools result inoperable in a state of crisis and instability, since, with growing inflation rates, the familiar Tanzig effect produces a significant reduction in government revenue in the short term. This is accompanied by a lag in the real value of the tariffs collected for the provision of public services, such as water, electricity, etc. These tariff lags lead to a notorious reduction in the operational capacity of the companies that administer the services. Consequently, situations arise where they cannot even finance their operational and maintenance costs.

In relatively stable conditions, periods of financial imbalance in these companies have been solved to some extent, by government budget allocations, either by way of subsidies or by the assignment of temporary funds to override the economic problems. Nevertheless, in periods when there is growing need for adjustment, the central governments react by limiting and reducing expenses to the minimum possible. This means that the financial requirements of the public companies are neglected and, faced with a real lack of resources, they become indebted (contributing their quota to the overall problem), postpone or discontinue investment and neglect maintenance. This, in turn, induces a process of increasing failure to meet demand, a reduction in the quality of the services offered, and generalized deterioration of the infrastructure of the company.

Together with this, wages in the public sector go down, which, to a certain extent, induces competent staff to leave - technical and managerial staff, trained in the exercise of their institutional tasks. This causes a deterioration in the quality of the human resources in the administration of the sector and the water services are consequently also deteriorated. Current experience in Brazil and Argentina indicates that this continuing loss of human resources and the general organizational deterioration has a significant effect over time, since it takes a long time to regain standards of efficiency.

This syndrome of decay in the quantity and quality of the various services leads to a crisis in the systems. The lack of public confidence in the service companies reaches such a high level, that it produces general public agreement that deep and radical change is necessary. Thus, the notion of private companies is seen as a way of producing change that would actually result in beneficial improvements in the services and increases in efficiency. It can, therefore, be observed that, since the late 1980s, most of the Latin American countries are quickly following the road to privatization of their large public companies.

The structural changes are resulting in a thorough reorganization of the government apparatus, where it is undeniable that the leading role in the provision of services is being assigned to private capital, and that the management of natural resources and the environment is increasingly decentralized and dispersed. This is accompanied by the exigency of the crisis for the self-financing of the services, in such a way that the tariff structure is required to at least cover operational and

maintenance costs and, in most cases, capital costs for the expansion of the systems. In these last cases, explicit subsidies are incorporated for redistribution purposes (Chile, Mexico and Colombia).

4. The water sector and integrated management

The traditional governmental organization in Latin America and the Caribbean is essentially sectoral. Therefore, activities related to the uses of the water resource have been carried out by specialized agencies, normally the production of hydroelectricity, the provision of drinking water, irrigation and others. These are, as a rule, the most important activities related to water. Within this spectrum, the generation of hydroelectricity is usually the most systematically developed and modern in the countries of the region. Next in importance with respect to level of development, is water supply and sanitation, which is very heterogeneous over the region. Finally, within the water family, irrigation is notable as presenting the worst conditions in various respects (technological, organizational, financial, etc.). It is very common in Latin America to find that so-called "private irrigation" is much more developed, both institutionally and in practice, than government projects.

What is lacking in Latin America and the Caribbean is an institutional arrangement for the integrated management of water resources, even though efforts are being made in this direction. The creation of environmental ministries or authorities perhaps meets an unsatisfied social need, but it has not yet achieved this objective. An important exception is the case of Mexico, a country in which the water sector has always been under a single authority. This structure was reinforced in 1989 with the creation of the National Water Commission, which is taking the lead in the decentralization that is being carried out in the sector. The rest of the countries have to overcome the formidable barrier imposed by the need for institutional coordination.

The worst consequence of this lack of integrated management is its effect on the least protected element, the environment associated with the water resources. Given the nature of the water environment as a public good, it depends directly on the budget allotment or on collective action for its conservation. Normally, it is under the jurisdiction of a multitude of administrative agencies which rarely give it priority. Even though this situation induces the appearance of non-governmental organizations, unless an appropriate institutional development is produced, the environment will eventually deteriorate to a state which is irreversible, at least at admissible cost.

5. Riverbasin management as an instrument for sustainable development and integrated water resource management

There is general agreement among politicians and technicians involved in development, in general, and in the development of the water resources, in particular, that a new and valid concept of development has recently emerged: so-called sustainable development (Batie, 1989). This is a concept that is based on the notion of intergenerational equity, which means that the current generation should not compromise the possibility of future generations obtaining the necessary elements for their material needs and enjoying a healthy environment.

In this context, a new figure appears on the institutional stage, associated with the concept of integrated resource management - riverbasin management. It is a management plan that, over the

area defined by a water system, integrates the management of all the resources (at least of the water and the soils) and of other components of the environmental systems existing in the basin.

Although chapter 18 of Agenda 21 makes recommendations for water preferably from a sectoral point of view (water supply, sustainable urban development, sustainable rural development, etc.), many countries are incorporating the idea of water resource management based on the riverbasin, since this makes it possible to identify and to handle with greater clarity the externalities that occur in the environmental system, both those produced by the managing of water on other resources, and those external factors which affect the water sector itself.

For example, Colombia has several cases of basins managed by an integrated administrative system, which have given excellent results and are, to some extent, included in its new environmental law. Chile has decided to develop water management at the riverbasin level as a means of allowing the water systems themselves to perceive and internalize the externalities, something that the water market alone cannot do. In Brazil, the experiences that promise to be most successful in water resource management, are those which are being carried out at the riverbasin level. In Mexico, riverbasin management is fostered by the water authority as a desirable complement to water management.

It seems apparent that the integrated management of water resources in federal countries, where there are many levels of government, is only feasible and simple when it is carried out it at the riverbasin level.

II. WATER RESOURCE MANAGEMENT IN SELECTED COUNTRIES

1. Argentina

a) Introduction

Between 1975 and 1990, Argentina suffered a severe economic crisis, with serious deterioration of the regional economies and unprecedented low levels of investment and has suffered two significant periods of hyperinflation. That is, the country has been in economic recession and there has been considerable neglect of the problem of the environment and of water resource management, in general.

The process of industrial development which began in Argentina in the 1930s has resulted in a totally imbalanced spatial distribution of activities. More than 70% of the almost 33 million inhabitants live in the humid pampa and 11.5 million live in the metropolitan area of Buenos Aires. Although it is true that the greatest environmental problems are to be found here, the situation is similar in the provincial cities with populations of over 50,000.

The urban settlements are in high-risk areas which, together with uncontrolled urban expansion, generates space and sanitation problems. Less than 40% of the population has access to sewerage and some 3,600 rural communities have no sewerage service, at all. One of the most important consequences of this situation is the existence of infectious and contagious diseases. The general morbidity index of the country is 8.7% compared with 1% in countries which have successfully met the requirements for water supply and sanitation.

Virtually half of the industrial activity is concentrated in Greater Buenos Aires, haphazardly and unsuitably located in residential areas. The lack of prevention and control over polluting industrial processes results in very dangerous effects: meat packers, tanneries and large numbers of small and medium-sized industries which consume large quantities of water and produce important volumes of organic and chemical effluents which have serious effects and represent a very high risk for health and the quality of life. There have recently been cases of pollution by dangerous toxic products which have caused several deaths.

As a result of this, pollution levels in the rivers that flow through Buenos Aires are extremely high and the rivers could be described as open sewers. These rivers flow through densely populated areas and empty into the River Plate in the most primitive fashion, with no treatment whatsoever. These effluents pollute the shores and the water of the River Plate, generating serious risks for the intake of drinking water for the Greater Buenos Aires area. This situation, although at a different level of magnitude, is found in all the settled areas of the country.

The environmental conditions in rural areas where Argentina's most important economic activities are located - grain and livestock farming on the pampa and, of lesser importance, specialized regional economies producing fruits and vegetables, sugar cane, cotton, yerba mate, etc. - also show critical signs.

The expansion of the agricultural frontier over the last eighty years has resulted in the loss of almost two thirds of the forest wealth. This had led to the development of a level of soil erosion which is threatening significant areas of agricultural production and endangering many sources of water. It is known that almost half of the surface area of the country suffers problems of wind and water erosion, but the problem of water erosion is particularly important on the humid pampa. Only recently have conservationist practices been disseminated and applied in agriculture.

Moreover, there are desertification problems, many caused by bad management of irrigated areas in the arid and semi-arid part of the country, salinization problems caused by incorrect practices and the lack of drainage are common. This is also causing a deterioration in the quality of important sources of groundwater.

b) Environmental policy

The above situation has been largely ignored in the political and institutional arena in the country. In fact, the problems of industrial pollution have never been handled correctly in Argentina, although there have been some previous unsuccessful attempts. The same is true of most of the environmental problems in rural areas.

It can easily be said that the problems of environmental deterioration in Argentina are mainly due to the lack of correct policies and legislation in the area, together with inconsistent and inefficient enforcement of the existing regulations. This is compounded by the lack of available information and inadequate public awareness of the nature and magnitude of the problems.

At present, there is no defined environmental or natural resource management policy in Argentina, nor is there a general environmental law. The clearest statement of the country's approach to the environment is expressed in the decree creating the Natural Resources and Human Environment Secretariat.

Environmental policy objectives have to be consistent with the constitution structure of the country, under which property rights over water and other natural resources pertain to the provincial governments. This implies their direct responsibility for preserving the quality of the environment in their jurisdictions. Any federal law, therefore, would have to have the support of the provincial governments for it to be genuinely national in scope.

This distribution of property rights over natural resources and, therefore, of responsibility for the environment, has advantages and disadvantages. It can be said that it is disadvantageous, because this institutional dispersion of responsibilities has been the source of many conflicts and has generated an extremely heterogeneous basis for managing the resources of the country, and the existence of many provinces which have given little attention to the problem has generated significant shortcomings in the institutional development of the sector. It can be said that it is advantageous, because this division of responsibilities facilitates the current decentralization of decision-making on the question, since those provinces with more developed views of the environment and the conservation of their natural resources can take measures more quickly.

c) Institutional aspects of the environment

Important steps have recently been taken to control this deterioration. Most significant are the creation of the Natural Resources and Human Environment Secretariat and the passing of the law on toxic wastes.

i) The Natural Resources and Human Environment Secretariat

The Natural Resources and Human Environment Secretariat (SRNAH) was created in 1992, is responsible to the President and is charged with coordinating environmental measures at the federal level. It is interesting to note that a Secretariat of the same name was created in 1973 and eliminated during the military government which took power in 1976, which means that for 20 years the environment played no role in the institutional life of Argentina. This new agency replaces the previous Environmental Policy Subsecretariat and the Natural Resources Subsecretariat, which were originally part of the Agriculture Secretariat in the Ministry of the Economy.

The Natural Resources and Human Environment Secretariat (SRNAH) is starting out with limitations. As a new organization, its budget is still quite modest. Moreover, the distribution of staff is highly biased in favour of administrative staff, who make up more than two thirds of the total. This reduces its technical potential and the performance of the agency. Also, only a small percentage of its few professional staff have academic qualifications in environmental subjects. This is partly due to the fact that the staff has been transferred from the agencies that originally formed the Secretariat. The National Institute for Hydrological Science and Technology (INCYTH) is responsible to it.

ii) The provincial governments

The various provincial governments, and sometimes the municipalities, have environmental administration offices. In some provinces, the environmental administrations are clearly more developed than the federal ones. Moreover, there have been occasions when legal agreements for environmental cooperation among provinces for developing homogeneous legislation have been passed, such as in the Nuevo Cuyo region (the provinces of La Rioja, San Juan, Mendoza and San Luis).

Although several provincial governments have given priority to environmental questions in response to public demand, the resulting policies have not established explicit links with economic, educational and social policy. At the same time, while many provinces have designated authorities for enforcing existing legislation, these agencies have serious staff limitations in respect to training and technical proficiency, which largely impedes the achieving of their objectives. There is a lack of administrative ability to move from overall policy statements to the development of regulations and procedures for putting them into effect.

iii) The Federal Environmental Council

The Federal Environmental Council, made up of the existing provincial environmental agencies, has recently been created. The Natural Resources and Human Environment Secretariat is also a member of this Council. Its main purpose is to produce a federal environmental agreement. In the middle of 1993 an agreement was approved for supporting nation-wide environmental policies, for creating a framework for agreements between the federal and the provincial governments and for streamlining environmental protection and making it more efficient, in accordance with the principles of Agenda 21.

Although the present agreement is more an expression of good will than a guide for future action, the fact that it was signed is an important step towards the development of a consistent environmental policy with agreed and specific programmes.

iv) Federal law on toxic wastes

A federal law has recently been passed for controlling toxic waste emissions, mostly industrial, which are a threat to human health or to the environment. This has resulted in an impressive number of legal cases which, in turn, has led to the beginning of waste treatment in large industrial plants in Greater Buenos Aires. Nevertheless, there is a long row to hoe before existing regulations can be adequately enforced.

d) Water policy and water resource management

Although Argentina is at present rewriting its constitution, the Magna Carta of 1853 is still the law and it states that the system of government is representative, republican and federal and that water resources are in the public domain. In Argentina, the major responsibility for the water resources falls to the provinces or to the municipalities, except for interprovincial or international waters. The result is a complex system of federal, provincial and municipal institutions with jurisdiction over the management of the water resources. As a result, each province has its own policy and management practices.

i) Institutional structure

The administrative reform begun in 1989 consists primarily in reducing the public sector and this has left the water sector without a high level institution which represents it. It went from the level of State Secretariat (Vice-Ministerial) to Sub-Secretariat in the early 1980s, but remained responsible to the Ministry of Public Works and Services. In 1990 it was given the rank of National Directorate and made responsible to the Ministry of the Economy.

In recent years, management at the federal level has been quite anarchic. Agencies of the Ministries of Social Welfare, Health, Interior, Economy, The Natural Resources and Human Environment Secretariat (SRNMA), and others have intervened independently and with no coordination. This situation is very serious in cases such as the apparition of cholera, when all the agencies involved attempt to participate, but in an inefficient way, are little effective and there is no continuity.

ii) Integrated water resource management and riverbasin management

Argentina has no serious experience in integrated water resource management, since historically it has been strictly sectoral. There have been some experiences at the riverbasin level, where the different water authorities and other interested parties are represented on Riverbasin Committees, with the objective of carrying out integrated water management for quantity as well as for quality. Most of these experiences have been unsuccessful, in that the organizations created at the riverbasin level, have had no authority for handling financial resources, and have had a complex relationship of dependency, both administrative and financial, on the federal and the various provincial governments that formed them.

In spite of the adverse context in which these attempts have been made, valuable experiences, such as those of the River Plate Basin (international), the Vermilion River Regional Corporation (COREBE), the Colorado River Interprovincial Commission(COIRCO), the Lake San Roque Riverbasin Committee, and some others. In nearly all these experiences, progress has been made in the development of agreements and joint plans among the parties involved and, in some cases, progress has been made in making important investments to overcome various types of problems, but integrated water resource management has never been achieved. Currently, the decentralization that has been begun in the country considerably facilitates this sort of association, by the creation of riverbasin committees or authorities.

As in the case of the environment, the water sector is better organized at the provincial level that at the federal level. Although in the more developed provinces water management has been largely sectoral, at present there are initiatives to reach an organizational level that permits integrated water resource management. This is happening in Corrientes, Jujuy, Mendoza, Salta and San Juan, provinces that have begun an institutional coordination process, some of them forming so-called "Water Cabinets". At these levels, which today are motivated and have investment capacity, efforts to support their institutional and technical development are high-priority.

e) Sectoral water use

i) Water supply and sanitation

Until fifteen years ago, the supply of drinking water and sewerage systems was undertaken by a national company, the National Sanitation Company (OSN), which was charged with the provision with these basic services through a system of regional management and operational agencies in the most important centres. In 1980, it was decentralized, and the management was transferred from the federal government to the provinces. This decentralization was sudden and in some cases traumatic, due to scanty institutional development in the provinces, or to the backwardness of the population, from a social and economic point of view. In most cases, this decentralization was assumed by the provincial governments, sometimes by the municipalities, which continued to provide

the service. The original national company remained responsible for the provision of the service in the federal capital and in thirteen municipalities of the province of Buenos Aires. This company was privatized by concession in 1993.

The principal agencies that have been associated with the water supply and sanitation problems in the country are the Argentinian Association of Sanitary Engineers (AIDIS), associated with the international organization of the same name, the Federal Sanitation Council (COFES), created by the provincial public works ministries, the Federal Water Supply and Sanitation Council (COFAPyS), whose responsibility is to establish a means for financing water supply and sanitation programmes. This organization has negotiated more than five international loans for the development of the sector.

It can be said that the development of this sector has not been significant in the last fifteen years and that the increases in coverage have been slight and have generally been at the cost of a deterioration of the existing systems. In 1993 only 2/3 of the total population was supplied with drinking water, and only 1/3 had access to sewerage. According to Chang (1993) this situation is not consistent with the economic indices associated with a country such as Argentina. The low sewerage coverage and the lack of waste water treatment present a huge risk, as seen by the apparition of cholera, of which there have already been more than two thousand cases in the country.

At the provincial level, only exceptionally do medium- or long-term plans to develop the sector exist, and neither is there a financial policy for facilitating the development of the sector, outside of the role of the Federal Water Supply and Sanitation Council (COFAPyS).

The inefficiency of the leading water supply and sanitation services, has created a receptive environment for the current privatization process. It must be understood that, in Argentina, privatization means not the transfer of assets to the private sector, but the grant of a concession for the administration and operation of the systems by a private entity. The concessions are granted for a given number of years, generally thirty, and it is laid down that the concessionaire comply with basic standards of water quality and supply, of the quality of the waste water before final discharge, supply goals, etc.

Argentinian experience indicates that cooperatives for the provision of water supply and sanitation services have been the most successful institutional arrangements, particularly in rural areas.

ii) Irrigation and drainage

Although irrigation in Argentina falls to the jurisdiction of the provincial governments, nevertheless the Water and Electricity Company (AyE), the former public electricity company, was made responsible for some irrigation districts in the interior of the country. The administration of irrigation varies greatly from province to province. Each province maintains its history and its irrigation culture, along with the institutions in charge of it. Therefore, some very centralized organizations exist, whereas others are autarchic, corporations, state companies, etc. User participation varies from direct participation in the regulation of the water as in Mendoza and San Juan, to simple user participation, such as has been traditional in organizations in Salta and Jujuy. In many Provinces, where irrigation is not important, there are no specific institutions.

Currently, with the privatization and dismemberment of the Water and Electricity Company (AyE), the provincial governments have assumed the administration of all the irrigation districts. At the same time, as part of the reform of the government administration, the management of the systems has begun to be transferred to the irrigators, which is, in many cases, promoted by farmer organizations, as is happening in Salta. In Mendoza, where water has been managed in a decentralized manner for more than a century, steps are being taken to confer rights and responsibilities on the irrigators that presently still pertain to the central authority.

iii) Hydroelectricity

Until 1990, hydroelectricity was administered by the national Water and Electricity Company, which was responsible for the development of the hydroelectric infrastructure of the country and for the administration of electricity. Later, the federal government Norpatagonica Hydroelectric company (HIDRONOR) appeared and was responsible for the generation and supply of electricity produced in Patagonia. During the last two years, these companies have been privatized.

There are also specific institutions developed for carrying out binational projects, such as the Mixed Uruguayan and Argentinian Commission for Salto Grande, the Joint Yacireta Commission, in charge of the development of this dam between Argentina and Paraguay.

iv) Water pollution

Problems of water quality have been long ignored in Argentina, with jurisdiction pertaining to a multiplicity of important agencies whose responsibilities are excessively overlapping, while vast areas are not covered.

The federal agency responsible for this area is the Natural Resources and Human Environment Secretariat, which is at present administering the restoration of the most polluted rivers in Buenos Aires, to which US$150 million have been allocated. Furthermore, this agency has just signed a loan agreement for more than US$30 million to finance institutional development for environmental management, within which particular attention is given to industrial pollution and to riverbasin management.

Since water pollution is handled by the provinces, progress varies widely over the country. One of the most advanced provinces is Mendoza, where a general environmental law has been recently passed, as well as a specific water resource law. The Mendoza Sanitation Works, formerly a government company, is now a limited company, on a legal basis similar to those found in Chile. It also creates the Provincial Water Supply and Sanitation Agency (EPAS), responsible for regulating and controlling all the water supply and sanitation companies, and for monitoring and controlling water quality in the province, assuming the central role in water pollution control.

2. Brazil

a) Introduction

Brazil is endowed with large quantities of water resources, sufficient to satisfy demands for irrigation, electricity and water supply and sanitation over a long period of time. The country has enormous hydroelectricity and irrigation potential. However, the distribution of the water is not uniform. The semi-arid and arid northwest has only a few months of rain per year and suffers frequent droughts. Other areas have excesses of water and, therefore, suffer the problems of floods and landslides with considerable frequency.

The accelerated increase in the population, the extensive industrialization that has occurred in the country, together with the great expansion of the cities and the considerable economic development that have taken place in the last decade have created a growing demand for water. There is no integrated management of the various uses of the resource, for the generation of hydroelectricity, for irrigation, for domestic and other uses, which are largely sectorally managed. Although irrigation requirements represent the most important use, in terms of volume, most of the water systems are operated exclusively according to the requirements for generating electricity, with no consideration of the other uses. This is so, because this sector is the most developed and handles considerable financial resources.

The development of the resource has occurred, therefore, with no administration of the system and no integrated management. Competition among uses, competition among states that share riverbasins, etc., has generated a growing number of problems, and there is still no normative and legal framework for their adequate resolution.

As in other countries, most of urban and industrial sewerage empties directly into the rivers without any sort of treatment. This pollution problem is extremely serious in most of the large cities, particularly in Sao Paulo.

Most of the irrigation intake, the development of small hydroelectric plants, important quantities of water intake from various sources by the private sector, many of them through pumping, have been installed without any sort of authorization and without being adequately registered. Various municipalities responsible for drainage systems act in the same way, with no effort to prevent the environmental impacts that are generated.

b) Water resources in the Constitution of 1988

According to the new constitution, water is a public good, as is hydroelectricity. The development of the water resource is, therefore, a prerrogative of the federal government, which coordinates these activities with the states and distributes the benefits among the state, federal and municipal governments. The federal government is also responsible for interstate navigation, as well as for the prevention of disasters, particularly of floods and droughts. The federal government is responsible for creating a system of water resource management at the federal level and for developing criteria for the provision of water rights. The formulation and implementation of social and economic development plans are also the responsibility of the federal government, which is exclusively responsible for water legislation. However, this responsibility for water legislation can be delegated.

The federal, state and municipal governments are jointly responsible for environmental protection, health care, pollution control, the mitigation of poverty and social integration. Also, they share responsibility for the registration, follow-up and monitoring of water rights. According to the constitution, the rules for cooperation among the different levels of government are to be determined by federal law.

All three levels of government can legislate in the areas of pollution control, resource conservation and environmental protection. The federal government is responsible for general legislation while the states can develop supplementary legislation. In the absence of federal legislation, the states have full competence to develop legislation in accordance with their particular needs. The waters within the states belong to the state where they are located, and interstate waters are federal, as are the waters stored in the federal reservoirs. Groundwater also belongs to the states.

The federal government can create development regions in low income areas subject to drought, in which the water use priorities are to be directed to attend problems of an economic or social nature. In these areas, the federal government will promote the recovery of arid lands, co-operating with the small and medium-size owners to establish sources of water and small irrigation systems (Art. 43 of the National Constitution).

c) The water bill

The state and federal governments are currently debating a bill for future legislation, based on the abovementioned constitutional principles. Some States have already developed their own legislation.

The National Water Resource Policy bill, which is under debate and will very probably be approved, creates a national system for water resource administration, and will allocate the necessary funds.

According to its first article, the basic components of this bill consist, in the first place, in the setting-up of an environment for the formulation of a National Water Resource Policy (PNRH), in order to assure the harmonic and integrated use of the water resources, and to promote the development and welfare of Brazilian society.

The policy instruments specifically stated are the granting of rights to the use of the water resources, charging for water use through tariffs, costs recovery for the multiple-purpose works, and the setting-up of protection areas for public springs and sources of water. Also, it is specified that those responsible for waste emissions are obligated to meet the norms established for pollution control.

This bill creates a National System of Water Resource Administration (SINGREH) for the purpose of providing for the management of the water resources and the execution of a National Water Resource Plan (PLANRHI). The following guidelines for the administration of the water resources are proposed: a) consideration of regional heterogeneity; b) coordination among the three levels of government; c) promotion of the decentralization of activities by delegating many responsibilities of the federal government to the states; d) encouraging technical, institutional and financial cooperation among the users; and, finally, e) stimulating the participation of the communities involved.

The National System of Water Resource Administration (SINGREH) has the following basic structure: first, a federal committee; second, the formation of riverbasin committees and, finally; an Executive Secretariat. The federal committee will be made up of representatives from all the government agencies involved in water resources, and regional representatives. This federal committee will be responsible for formulating overall guidelines for developing the National Water Resource Plan and promoting all the necessary steps for carrying it out.

A special role is assigned to the riverbasin committees. These are composed of representatives of public entities with interests in the water resource, either in its use or in its protection. The municipalities, the water users and the future sub-riverbasin committees or user associations will be represented on the riverbasin committees.

A reconsideration of existing systems of financing is proposed. It is proposed to follow the present procedure of distributing 5% of the income obtained from the sale of hydroelectricity, with 45% to the states, 45% to the municipalities where the dams are located, but with the following innovations: 6% to the National Water and Energy Department (DNAEE), 2% to scientific and technical activities, 1% to the Secretariat for the Environment and 1% to the Ministry of the Army. Of the funds allocated to the National Water and Energy Department (DNAEE), 65% will be directed to the operation of the hydrometeorological network and the rest to the institutionalization of the system for water resource administration.

d) Present institutional and administrative structure

The participation of many levels in water administration, including the federal government and the various state governments, and the existence of different regulations for water property rights, which can be federal or state, incorporates a tremendous complexity into water resource management, similar to that in Argentina.

Thus, the control of water quantity and quality is frequently distributed among several government agencies. Within the federal government, the agency responsible for allocating water rights is normally the National Water and Energy Department, an agency responsible to the Ministry of Mines and Energy. Rights for irrigation with federal water are the responsibility of the Irrigation Secretariat (SIR), responsible to the Ministry of Regional Integration, while rights on state rivers are administered by the relevant local agencies. At each level of government, management is fragmented over various sectoral institutions. Water supply and sanitation is also the responsibility of federal and state sanitation offices and water conservation is under the jurisdiction of the Brazilian Environmental Institute. The Ministry of the Environment, although it should participate directly in this problem, is somewhat marginalized.

i) Role of the National Water and Energy Department (DNAEE) and the Irrigation Secretariat (SRI)

The two agencies that predominate in water resource management are the National Water and Energy Department (DNAEE) and the Irrigation Secretariat (SIR), which have agreed to develop a joint action programme towards the development of integrated water resource management, beginning with the establishment of regulations for the allocation of water-use rights. In addition to the agreements, there is a close operational link among the officials of these agencies in carrying this out.

The coordination existing between the Irrigation Secretariat (SIR) and the National Water and Energy Department (DNAEE) is based on the principles formulated at a meeting of experts in Brazil in 1983, where it was established that integrated water resource management was necessary. Both organizations then made important follow-ups on the international meetings in Dublin, and later on the United Nations Conference on Environment and Development (UNCED) 1992. Agenda 21, therefore, is considered a fundamental basis for the various policies that are being formulated for integrated water resource management.

The Brazilian Irrigation Secretariat is responsible to the Ministry of Regional Integration. In the near future it is probable that this Secretariat be moved to the Ministry of Agriculture, Agrarian Reform and Supply. This situation generates a framework of uncertainty that tends to minimize or postpone the progress that has been made in terms of organizational development towards integrated water resource management.

The Irrigation Secretariat is composed of four general coordination offices:

a) Planning;
b) General Coordination, Technical;
c) General Coordination of Special Projects;
d) General Coordination, Operations.

The General Coordination of Special Projects is the office responsible for managing external loans, which are currently directed to facilitating the institutional development of integrated water resource management.

The Secretariat is a Ministerial support agency and collaborates with agencies such as the San Francisco Valley Development Corporation,(CODEVASF), and the National Department of Drought Prevention (DNOCS), etc. The projects were of the latter handed over to the General coordination, Technical, Office when this organization was abolished in March, 1990.

At present, the Irrigation Secretariat (SIR) has relatively little staff, but fortunately they have kept the main technical personnel responsible for irrigation, which guarantees the continuity of what has already been begun towards water resource management at the federal level.

It is important to recognize that in some states a very interesting method of moving towards integrated water resource management has been adopted, as in the case of Ceará, in close collaboration with the Irrigation Secretariat (SIR). Besides the case of Ceará, progress made in Sao Paulo, Santa Catarina and Paraná is notable. The most important aspects of the progress are based on:

1. Close coordination among the Regional Development Ministries, through the Irrigation Secretariat (SIR) and the Ministry of Mines and Energy through the National Water and Energy Department (DNAEE), specifically through its General Coordination Office for Water Resources.

2. Support to state governments, particularly from the Irrigation Secretariat (SIR), for the development of integrated water resource management projects, such as Ceará.

3. An attempt at coordination among agencies handling water problems at all three levels of government for integrated management.

4. The cooperation of all possible agencies in strengthening the participation of the various users of the water resources.

5. The implementation of costs recovery mechanisms.

6. The organizational development at the federal level for integrated water resource management will be facilitated by the attainment of funds from the hydroelectricity sector which, by means of the mechanism described below, will generate some US$25 million per year for the unit.

The strategy of the government, with greater or lesser emphasis according to the various economic and political events, has been promote equitable and efficient use of the water resources. This objective meets with several problems, beginning with the lack of a suitable system for the granting of water rights, the absence of administrative means for settling the many conflicts that arise and the present inadequate information base. There is no useful information on the water resources, either on their quantity or on their quality, at any level of government. The survey of irrigators or of users of water for irrigation purposes that was begun in 1985 has suffered various interruptions and is still not finished. It was begun originally by the National Irrigation Programme (PRONI) and later continued by the Irrigation Secretariat. As for the residential use of water and the state of the sewerage systems, as well as industrial use, they are at a very primitive development level.

ii) Financing and the economic crisis

A considerable weakness of the agencies involved in water resources resource management at the federal level is the significant reduction in staff and the dramatic lack of funds they suffered during the last government administration. For example, the National Water and Energy Department (DNAEE) had some 70 professional staff assigned to the general problem of water resources, of whom only five are still employed. This generates conditions which make progress difficult. They have suffered in every possible way from the economic deterioration noted in section I of this document.

The Irrigation Secretariat (SRI) is negotiating with the World Bank to finance the development of pilot irrigation projects with the active participation of the irrigators, and for testing decentralized self-financed management systems.

An important aspect to consider is that since 1989, according to federal laws 7990 and 8001, the hydroelectricity companies have to pay dues, which funds are distributed among states and municipalities as compensation for the flood areas produced by the reservoirs. Part of the funds thus generated are destined for the Brazilian Environmental Institute, and are used partly for water resource monitoring systems and partly for water resource management.

e) Strategy and the state of the development of water administration

i) Sector strategy

The development of water policies is directed to increase productivity and yields on irrigated lands, to increase hydroelectricity production, to increase water supply for industrial and domestic use

and to improve navigation. The National Water Resource Policy also gives special attention to flood problems, drought mitigation, pollution control and other environmental effects.

The review of the bills being debated at the federal level, and of some similar bills in the states, indicates that the central elements of the strategy are decentralization, the incorporation of private capital, the application of cost and efficiency criteria, costs recovery and environmental protection.

ii) Institutional development

In general terms, the country needs some considerable institutional development and sources of financing to satisfy social needs and for this there are considerable difficulties. This situation has caused the federal government to instruct the Secretariat for Strategic Affairs, responsible to the Presidency, to collaborate in the search for sources of financing for the water sector and its institutional development during the debate on its legal framework in Congress. For this, it has created a Water Resources Subcommittee, which includes important organizations, such as the Brazilian Water Resources Association, which has collaborated considerably in developing a national awareness of the critical state of the water resources and the need for establishing suitable management practices.

However, the institutionalizing of a framework that facilitates integrated water resource management is extremely slow. The federal government is supporting the bill described above in order to introduce a National Water Resource Policy and to develop a national water resource management system. This bill was introduced in 1991 but has not yet been approved.

While this is going on at the federal level, some states, such as Sao Paulo, Santa Catarina, Ceará and Paraná, have made significant progress towards sustainable and integrated water resource management, but there are many others that still have not begun this task.

f) Requirements for integrated management

At present, resource planning and management in Brazil are taking place in a strictly sectoral framework, and there are very few examples of integrated development or multiple-purpose management. In Annex 1 there is a description of the cases of Ceará, Rio Doce and Paraná, where significant progress has been made. Aside from these, there are a great many riverbasins and water projects with inadequately resolved problems. Sector employees and World Bank technicians agree that the sources of the problems are the following:

* Lack of an agency for integrated management (intersectoral, interinstitutional, interdisciplinary and multiple-purpose).

* Consequently, there is a lack of effective institutional coordination.

* Lack of a plan for adequate water resource management.

* Incorrect criteria for the design of projects and programmes.

* Incorrect criteria and procedures for guaranteeing water rights, both for intake and for discharge.

* Non-existent or insufficient information.

* Ineffective system of costs recovery.

* Lack of user participation.

* Lack of criteria for the allocation and use of the water among states, among uses and among users.

* Difficulties in obtaining the necessary information for granting water rights.

* Due to the lack of a national water administration system and given the absence of clear rules, the present situation is extremely vulnerable to every political and administrative change.

The current institutional framework is very fragmented, with some specialization in the sectoral uses of water. Moreover, in most of the states, the control and management of water quality is totally divorced from the criteria for the allocation of quantity. The legislation is directed to administrative aspects, makes substantive statements on the principles of water rights and on the recognition of existing uses. Nevertheless, the criteria for granting water rights are still to be developed.

The 1934 Code has to be reformed in accordance with the principles of the Constitution of 1988. A national information system must be created. An operating and systematic plan for evaluating programmes and projects is needed. Also, a costs recovery plan must be developed that is legally and practically implemented. The survey system for the registration of water rights and of discharge rights must also be implemented. Principles for the resolution of conflicts and matters related to water courses crossing state lines should also be outlined. Operational regulations for the federal reservoirs are also required, given the various water uses. Authority for the provision of water rights at the federal level is not yet consolidated.

A substantive capacity for integrated water resource management has not yet been developed, with the existence of institutions with only sectoral competence and with no development whatsoever of the necessary capacities for intersectoral water resource management.

3. Colombia

a) Introduction

Colombia is a country very well endowed with water resources, but there is considerable variation in their temporal and spatial distribution, from the Amazonian high rainfall area in the southeast of the country to the La Guajira desert, with less than 400 mm of rainfall annually.

Urban and industrial development is largely concentrated on the Bogota plain, encroaching on highly productive agricultural lands. As in most of the countries of the region, the greatest

pollution problems of industrial and urban origin, congestion, etc. tend to occur in the metropolitan area. Colombia, however, shows less concentration than the majority of the countries in the region.

There is significant water pollution, both of surface waters and of groundwater, aggravated by population growth and increases in all the uses of the water. The principal pollutants are organic matter (BOD), pathogenic agents and wastes from manufacturing industry. The main pollution problems are in the riverbasins of the densely populated valleys, particularly on the Bogota plain, and in the water systems supporting the settlements on the coast. The Cauca and Magdalena rivers are the main receptors of the urban, industrial and agricultural pollution produced in the high valleys, but their problems are the same as those described for the large rivers of the region: high content of organic matter, microorganisms causing waterborne diseases, pesticides, heavy metals, etc.

In the large population centres, the dense industrial and urban concentration, combined with the surrounding agriculture, generates all sorts of environmental impacts, not all of them on water. The new environmental law delegates the responsibility for controlling these processes to the Regional Corporations.

The water systems present a high risk of torrents, floods, and drought, the latter occurring very frequently in the northeast of the country.

The lands with the greatest agricultural potential are located mainly in the Andean valleys, where agriculture is well developed. Irrigation techniques are widely used. Of the 810,000 hectares of irrigated farmland in the country, 347,000 are managed by the private sector. The rest, managed by the ex- Columbian Hydrology Meteorology and Land Improvement Institute (HIMAT), will also be transferred to the irrigators. The successful transfer of the management of irrigation districts to the irrigators began in Colombia in 1976, in the Coello district.

The use of irrigation for growing fruit, vegetables and coffee in the mountains, and for commercial crops on the coast, is profitable because of the increased diversity and better yields that have been procured. It should be remembered that there are 4 to 6 months of drought annually in this region.

In the Andean area, the nature of the soil and the torrential nature of the rainfall cause serious erosion. Studies carried out by the National Natural Resources and Water Institute (INDERENA) in 1977 show that 49.2% of the country's surface area is moderately to severely affected by water erosion; 22.9% is affected by mass land movements, and only 24.8% is not affected by erosion. Millions of hectares of agricultural land are in areas of high water-erosion risk.

Associated with this problem, the downstream sediment deposits aggravate the problems of flooding and reduce the capacity and useful life of the dams through silting.

There are also problems of soil salinization: it has been estimated that in the Cauca river valley 70,000 hectares have been affected by this phenomenon. In addition, there are problems of alkali deposits.

As for basic water services, 73% of the urban population is supplied with drinking water and 65% with sewerage connections. In the rural areas, Colombia has one of the better water supply services in Latin America: 80% of the rural population has access to safe water. Colombia has an

important potential for hydroelectricity production. In 1991, 81% of the energy produced was from this source.

Of the countries studied, Colombia is making the most radical changes in its administrative and legal structure in relationship to the environment in general, including water resources as a particular case. From a traditional government structure, organized according to sectors of social and economic activity, it has become an organization directed to environmental objectives and economic development, with strong decentralization of power and support to the development of a regional structure, but there is great uncertainty about the final form of the modified agencies. The definitions in the institutional and legal framework are clear, but there are a great many procedures and decisions that have to be taken about the shape and organization of the new agencies. Nevertheless, it is agreed that the direction of the change is favorable and desirable.

b) Recent institutional and legal changes

The most radical changes that have occurred in the recent past are, first, the passing of law 99, 22 December, 1993, which creates the Ministry of the Environment and reorganizes the public sector responsible for the management and conservation of the environment and of renewable natural resources. This includes water resources. A national environmental system is being organized, together with a series of regulations that are discussed below. Second, the Ministry of Economic Development was restructured on 30 December, 1992, giving water supply and sanitation a leading role.
Together with these changes in the legal and administrative superstructure, a series of very important changes are being made. The present moment in the life of the Colombian administration can be defined as a turning point, where the many changes that are occurring lead to a new institutional life. In spite of the dizziness of the change, it can be anticipated that it will prove to be successful in practice, to the extent that it pivots on administrative decentralization, the regionalization of decision-making, and a strategy of costs recovery and the self-financing of most of the activities.

c) The new Colombian environmental policy

i) Principles and strategy

The new Colombian environmental law is based on statements of general principles, such as the following: "the economic and social development of the country will be guided by the universal and sustainable development principles in the statement of Rio de Janeiro of June, 1992, on environment and development", which is the clearest expression yet of the impact of Agenda 21 on the organization of an overall national environmental system and the inclusion of integrated water resource management as an annex to a more general policy. In addition to the above, the first article of the law incorporates the objectives of maintaining biological diversity, of respect for human rights, of the special protection of wetlands, springs and watershed areas, and gives priority to human consumption of the water resources over all other uses. It also establishes that the lack of scientific knowledge proving the inevitability of specific environmental impacts will not be reason to defer effective decision-making to prevent the degradation of the environment.

It is established, as important, that the government will encourage the absorption of environmental costs and will use economic instruments for the prevention and recovery of environmental deterioration and for the conservation of the renewable natural resources.

It also establishes that the landscape must be protected since it constitutes a common heritage, that the basic tool for decision-making will be environmental impact studies and that the environmental management of the country, pursuant to the constitution, will be decentralized, democratic and participatory. The creation of the National Environment System is established in the first article.

The contents of this first article of the law give a clear idea of how revolutionary the position of the Colombian government is, in respect to the management of the public heritage, and not only in general statements, but in action, taking the lead in the transformation of the government in keeping with the broad outlines that have been seen as the road to success in recent times: systems approach, rational decision-making, decentralization, participation, costs recovery and self-financing.

ii) The creation of the Ministry of the Environment

The Ministry of the Environment and the National Environmental System are to be created. In this plan, the order of precedence is: the Ministry of the Environment, the Autonomous Regional Corporations, the Departments and, finally, the Districts or Municipalities. The importance that is given to the role of the Autonomous Regional Corporations is noteworthy. The Ministry has all the formal responsibility for fixing policy and for coordination with other levels of administration. It is important and must be underlined that it is the Ministry which establishes the quality standards and the permitted emission limits, which fixes the tariffs for the use and exploitation of renewable natural resources, and administers the National Environmental Fund and the Amazon Environmental Fund.

Section III gives the structure of the Ministry of the Environment, within which five departments are of interest here: 1) the General Directorate for Human Settlements and Population; 2) the General Directorate for the Physical Environment. Within this there are five significant sub-directorates: Continental Waters, Coastal and Marine Areas Soils, Subsoils, the Atmosphere, Meteorology and Climate. This is the agency directly concerned with water resource management; 3) the General Directorate for Forests and Wild Life; 4)the General Directorate for Environmental Land improvement Planning and finally; 5) the Sectoral Environmental Directorate. Parallel with this, national environmental funds have been set up.

It gives shape to the National Environmental Council, in which all the Ministries, representatives of various community and private organizations of various types are represented.

iii) Changes in the administrative system: Technological Institutes

The law creates a set of institutes that serve as technological and scientific support, thus producing a series of changes in existing institutions. For example, the ex Colombian Hydrology, Meteorology and Land Improvement Institute (HIMAT) is now to be designated the National Land Improvement Institute (INAT), and the meteorological and hydrological aspects are to be moved to a new Hydrology, Meteorology and Environmental Studies Institute (IDEAM). The basic research functions of the National Natural Resources and Water Institute (INDERENA) is also assigned to this new institute, and the previous institute is to be dissolved within a period of time not to exceed two years, delegating its other duties to the Autonomous Regional Corporations.

Apart from the institute mentioned, four more institutes are created, for coastal marine research, for biological resources, and another two to study the problems of the Amazon and the Pacific environmental systems.

iv) Changes in the administrative system: Regional Corporations

The law institutes the Autonomous Regional Corporations as public corporations, made up of the territorial units that, because of their geographical characteristics, constitute a single ecosystem or form a geopolitical, biogeographical or hydrogeographical unit. They are to have financial and administrative autonomy, independent financing and legal personality. They are responsible for the administration of the environment and the renewable natural resources within their jurisdictions, with a view to sustainable development in keeping with the overall principles characteristic of the law. As can be seen, the riverbasin criterion is only one among several for the determination of the jurisdictional boundaries of the Autonomous Regional Corporations.

The corporations are directed by a corporate assembly, made up of all the legal representatives of the territorial units in the jurisdiction. The administrative committees of the corporations are the executive council, made up of the governor or the governors of the departments in whose territory the corporation operates, by a representative of the president of the republic, a representative of the Ministry of the Environment, up to four mayors of municipalities in the territory of the jurisdiction, two representatives of the private sector, one of the indigenous, or ethnic, communities traditionally settled in the territory, and representatives of the non-profit organizations that are registered in the jurisdiction of the corporation, and whose objectives are the protection of the renewable natural resources.

The executive directors of the corporations will be nominated by the executive councils for a three year period as of January, 1995, and can be reelected. Until then, the president of the republic will name or ratify the executive directors of the regional corporations for 1994.

The law validates the existing Autonomous Regional Corporations, 15 in number, eight of which will change their names or their jurisdictions, and creates more regional corporations resulting in a total of 34.

The Autonomous Regional Corporations are to have revenues originating from: a) compensatory or retributive taxes; b) water taxes. Water use will be charged for at rates fixed by the national government and the revenue will be used for payment of the costs of the protection and recycling of the water resources; c) an environmental percentage of the real estate taxes, based on the amount collected to the order of between 15% and 25.9%; d) a transfer of funds from the electricity sector. The hydroelectricity companies with installed power superior to 10,000 KW will transfer 6% of the gross revenue from sales of energy of their own generation. 3% will go to the Autonomous Regional Corporations, and the remaining 3% to the municipalities and districts located in the riverbasin, 50% for each one. The thermal power plants will transfer 4% of the gross value of energy sold; and e) capital and revenues of the Autonomous Regional Corporations.

These financing plans give a very solid basis to the corporations and if they are well and prudently administered, will have a very significant effect on the decentralization of political and economic power.

The law institutionalizes environmental permits, obligatory for the building of works, for establishing industries or for pursuing any activity that could result in environmental deterioration.

The development of projects for irrigation and drainage, for land recovery, for flood protection or river regulation or for the correct management and use of the riverbasins, remains in the jurisdiction of the departments, which are to coordinate these activities with the National Land improvement System and the Autonomous Regional Corporation in whose jurisdiction the department is located.

The law establishes the procedures for public participation, establishing environmental and administrative procedures, the processing of petitions for intervention, and establishes administrative public hearings on environmental decisions in process. It establishes a system of sanctions and control measures.

v) Environmental funds

It establishes the National Environmental Fund and the Amazon Environmental Fund. This is simply an accounting system in the Ministry of the Environment, with legal status and independent funding, but with neither administrative structure nor staff. Its objective is to meet the environmental needs of the country, financing projects, studies, research, plans, programmes, etc.

The resources of the National Environmental Fund (FONAM) will come from the following sources: 1) general budget allocations; 2) interest on loans granted for the fulfillment of its objectives; 3) external loans; 4) financial yield on transient excesses of liquidity; 5) income from the national natural parks system; 6)funds generated by the exchange of foreign debt for environmental protection or improvement projects; 7) 50% of the amount of indemnities imposed and collected as a consequence of actions undertaken and gifts.

d) Water supply and sanitation

i) Recent changes

During the 1980s water supply and sanitation was lagging and national coverage was less than 70% in water supply and 65% in sewerage connections. Up to now, this area has been covered by an urban development financing fund, but this did not satisfy all the needs of the sector.

Since 1988-1989, water supply has assumed a fundamental role. In this year, the Water Supply Adjustment Plan (PAS) appeared, which has firm goals to increase the coverage of water supply and sanitation. Loans for this have been obtained from the World Bank to the order of US$150 million, which is increased by US$300 million from its own resources and central government contributions. The National Development Financing Office (FINDETER) was created in 1989, by law No. 57, to support municipal development through the provision of water supply and sanitation services. In 1991 this financial office began operations through 10 regional offices to carry out the Water Supply Adjustment Plan (PAS), whose objective is, on the one hand, to build physical works and, on the other, to assist institutional development. Today, the National Development Financial Office (FINDETER) operates in 600 of the 1,034 municipalities in the country.

Until now, responsibility for water supply and sanitation was centralized in a national company. It is being decentralized in accordance with the Water Supply Adjustment Plan (PAS) which is responsible for water supply at the municipal level.

As a consequence of these steps, the privatization and decentralization of water supply works has been successfully begun. An example is Barranquilla. As a public company, it had to be declared bankrupt, because of its permanent and growing financial deficits. It has now been reformed as a mixed company, in which the private sector participates with 13% of the shares. The company is successfully self-financing and generates profits.

In other cases, the institutional structure has been successfully changed to allow the company personnel themselves, to become shareholders, such as in Monteria.

ii) Present institutional framework of the water supply and sanitation sector

In December, 1992, a new structure for the Ministry of Economic Development was decreed, and it now incorporates the water supply and sanitation sector at the vice-ministerial level. This answers the need for providing the sector with a new institutional framework as part of the current decentralization process, and answers the need for establishing suitable regulations, and for creating information and follow-up systems. In addition to this vice-ministry and its corresponding directorate, an advisory and coordinating agency has been created, the Superior Council for Development, Public Housing and Water Supply. Finally, the "Regulating Commission for Water Supply and Basic Sanitation" was formed.

- The Vice-ministry

Within the responsibilities of the Ministry of Economic Development, the preparation of government policy on housing, community equipment, urban planning and development and water supply and basic sanitation are specifically mentioned. Its other responsibilities, such as social and economic development, industrial technology, domestic trade and tourism, etc., are included in the Vice-minister for Housing, Urban Development and Water Supply. This vice-ministry has three departments, one of which is the Water Supply and Basic Sanitation Department.

The vice-ministry is to advise the ministry on the formation of policies, plans and programmes, specifically in the area of the Water Supply and Basic Sanitation Department. It is to prepare a sectoral development plan consistent with the national economic and social development policy and to provide technical and institutional support to local agencies. It is also required to carry out research and find external and internal financing and to design and promote special programmes for rural and other areas.

It must, therefore, indicate the technical requirements of the works and equipment and the procedures that the companies follow, when this is necessary to guarantee the quality of the service. Furthermore, it must plan for the annual expansion of service coverage and for determining the public investment necessary for this, identify sources of financing for the sector and determine the amount of government subsidy required and the criteria by which these should be established.

- The Superior Council for Urban Development, Public Housing and Water Supply

The Superior Council for Urban Development, Public Housing and Water Supply is made up of the Minister of Economic Development, the Minister of Health, the Director of the National Planning Department and the superintendents and presidents, managers or directors of relevant agencies.

- The Water Supply and Basic Sanitation Control Commission

Finally, it created the Water Supply and Basic Sanitation Control Commission, as a special administrative unit without legal personality, as the administrative part of the Ministry. This commission is made up of the Minister of Development, the corresponding Vice-minister, the Minister of Health or a delegate, the Head of the National Planning Department and three full-time professional advisors, nominated by the president of the republic for a three year term, with the possibility of re-appointment.

The responsibility of this commission is to ensure competition among the provisioners of water supply and basic sanitation services and to regulate monopolies where competition is not possible, by establishing competitive figures. Also, it must report any practices contrary to the regulations for environmental protection to the Industry and Trade Superintendency, define the efficiency criteria and develop guidelines and models for evaluating the financial, technical and administrative management of the companies providing the regulated public services.

It must make the required technical procedures obligatory, fix the tariffs charged for regulated public services and, when necessary, establish formulas for use by the private or government companies providing the services. The commission can establish a regime of regulated freedom or monitored freedom or indicate where tariffs can be freely fixed. It will also have to establish criteria and procedures for protecting the rights of the users in connection with billing, marketing and other aspects. It must make follow-up studies of the contracts on order to determine for the regulated public services the units of measure and periodicity to be used for establishing consumption.

The Commission began operations in 1993, using a regime of regulated freedom, and has produced four sets of regulations.

e) Irrigation in Colombia

Colombia is a country with a long tradition of irrigation, with. as in many countries of the region, an important element of private irrigation. User participation is important and very active. Until 1992, government irrigation was in the hands of the Colombian Hydrology, Meteorology and Land Improvement Institute (HIMAT), responsible to the Ministry of Agriculture.

The policies adopted during 1993 have resulted in important changes in the structure of irrigation. In January, 1992 the Land improvement Law was promulgated, and in December of the same year the structure of the Columbian Hydrology, Meteorology and Land Improvement Institute (HIMAT) was changed by the Law of the Environment. The government's central idea is to privatize the public irrigation districts, insofar as is possible, in an attempt to make them self-financing.

However, the responsibility for water resources is still shared by three ministries (Environment, Economic Development and Agriculture - the Ministry of Health has left the stage, and coordination is still through the National Planning Department). This situation hinders the

integrated management of water resources, and imposes considerable responsibility on the National Planning Department, on the central government and on the autonomous corporations.

f) The new Land Improvement Law

The purpose of this law is to regulate the construction of land improvement works to increase agricultural yields and to monitor the protection and conservation of the riverbasins. The administrative authority for land improvement works will be responsible for obtaining the necessary concessions for the use of surface water and groundwater. The administrative unit of each irrigation district is responsible for granting use rights in the area of the district.

Land improvement is understood to include the construction of infrastructure works for managing irrigation, drainage or flood protection.

i) Administrative organization

The land improvement subsector will be made up of the Ministry of Agriculture, the Land Improvement Superior Council, as advisory committee and coordinator, and the National Land Improvement Institute (INAT) (ex Columbian Hydrology, Meteorology and Land Improvement Institute (HIMAT)), together with private and public organizations. A National Land Improvement Fund will form part of the system, as the unit for administering the financing of the irrigation, drainage and flood protection projects.

The Land Improvement Superior Council is made up of the Minister of Agriculture, the Chief of the National Planning Department, the General Director for Environmental Affairs and Renewable Natural Resources, the President of the Agricultural Support Fund, and representatives of research institutes, farmers and indigenous groups.

ii) Criteria for project selection

The Technical Secretariat of the Superior Council will be the National Land Improvement Institute (INAT). The responsibilities of this Council are to select the projects, to establish the terms of the building contracts for the works, to establish the criteria on forms of payment, periods, etc., and to indicate the standards and economic and technical criteria that serve as the basis for fixing the tariffs for the services, so as to guarantee coverage of the operational and maintenance costs. It will also determine the ways in which the investments are to be recovered.

It will also be responsible for determining the social and economic conditions under which users are entitled to subsidies which would be granted, reducing or annulling the recovery of the investments.

The criteria for project selection should be determined by the degree of interest in the communities where the project is to be carried out, its social profitability, the location of the project with respect to export ports, and a concentration index of small and medium-sized landholders.

A parallel National Land Improvement Fund (FONAP) has been created with the objective of financing studies, designing and building of irrigation, drainage and flood protection works.

To be eligible for the benefits of this law, the users in a land improvement district have to be organized for the management and administration of the district and they will be designated a users association.

All executive agencies in a land improvement district have the right to total or partial recovery of the investments made for the building of the works. There is a subsidy of 50% of the project investment recovery quotas, for small farmers with limited capacity to pay.

4. Chile

a) Introduction

In Chile there is a wide variety of climatic conditions, ranging from the desert climate in the north to the glacial climate in the south. The Chilean rivers are mainly of pluvial origin in winter and glacial in the months of spring and summer.

The flow in the riverbasins north of 32° S is, as a rule, insufficient to irrigate all the land classified as suitable and it is necessary, therefore, to build captation and regulation works and to employ highly efficient and sophisticated irrigation techniques. In the central valley, between the Aconcagua river and the Itata river there are periods of severe water shortage. The population and economic activity are concentrated in this area which can be described as a typical region of wet and cold winters and warm and dry summers. Irrigation is necessary and is the most important use of the water, but there is also considerable urban and industrial demand. To the south of 38° average rainfall surpasses 2000 mm. annually. In the extreme south, precipitation is around 400 mm.

At present, as a result of government and private action, there is a surface area of 1,800,000 hectares of irrigated land in the country, but the water supply for 700.000 hectares is insecure. Approximately 75% of the agricultural produce is grown in irrigated areas and is equivalent to 7% of the gross domestic product.

Recent studies have identified the greatest problems in water resource management as pollution in the most densely populated areas and shortage in the extreme north and south. Almost all the waste water produced by the urban population and by industry is dumped directly into the rivers or the sea with no treatment whatsoever.

As for the basic water services, 97.4% of the urban population is supplied with drinking water and 82.6% has sewerage connections. There are 794 rural drinking water supply services serving 655,000 inhabitants or 82% of the concentrated rural population. Chile has an important potential for hydroelectricity production and 75% of the electricity produced comes from this source.

Chile was one of the pioneer countries in the region in incorporating the rules of the market to the administration of water resources. In August, 1981, a decree was passed in which, although article 5 specifies that water is a national good for public use and that the right to water use is granted to the individual, in reality, water is now treated as a strictly private good. In effect, article 21 states explicitly that the transfer, transmission and acquisition or loss by prescription of water use rights will be effected according to the regulations of the Civil Code. This is the same as saying that water rights are to be treated as just another marketable good.

In reality, having generated a market in water rights implies a series of administrative savings, given the operational decentralization involved. However, the old economic saw that says that the market can efficiently allocate many goods, but will never, by itself, solve environmental problems, is proving to be true. Present action is centred on the creation of riverbasin commissions to provide an autonomous and decentralized administrative framework that allows for the management of externalities.

b) Present operational and institutional structure

The administrative organization of Chile has two ministries direct responsibility for water resources. First, the Ministry of the Economy, Promotion and Reconstruction under which is found the Corporation for the Promotion of Production (CORFO), an autonomous agency which holds shares in government electricity and water supply companies and the National Irrigation Commission, which is operationally dependent.

The Ministry of Public Works includes: a) the General Water Directorate and b) the General Public Works Directorate which includes the Irrigation Directorate. The Superintendent of Sanitation Services is operationally dependent on this Ministry.

i) The General Water Directorate (DGA)

Until now, this has been the agency responsible for the implementation of the water law. The principal duties of this agency are: research on and measurement of the water resource through the National Hydrometric Service; planning, monitoring and policing of waters in natural riverbeds; supervision of the functioning of the control committees and other user organizations; establishment of the rights to the use of water in the natural riverbeds; a public water survey and studies to determine the amount of the resource existing in the country.

In addition to these responsibilities, assigned by the current law, the present administration has given it responsibility for developing bases for the formulation of a more comprehensive national water policy. The government has thus made progress in defining a new objective for national water policy. This consists in ratifying, as a basic legal principle, that the water resource is a national good for public use; use is to be based on sustainable and rational principles; pollution is to be avoided and deterioration prevented; the legal rights of the users are to be guaranteed; user organizations are to be encouraged; the environmental aspect is to be incorporated in the property of the water use rights, in order to require their owners to use them in such a way as to assure the conservation and the recovery of the quality of the resource.

ii) The National Irrigation Commission

The National Irrigation Commission is responsible for financing and controlling of planning, researching and preparing of integrated irrigation projects by the irrigators. An effort has been made to put emphasis on the integrated exploitation of irrigation at the riverbasin level. The Irrigation Directorate of the Ministry of Public Works has the responsibility for studying, designing, building, maintaining, repairing and developing irrigation works built with public funds.

The current Water Code stipulates that the irrigators have to create associations or some other sort of organization that assumes the responsibility for managing the water, encompassing

construction, development, conservation, etc. These institutions, known as water communities, irrigator associations or watch committees have played an active role in the administration of the water resource and in the development of infrastructure. The Federation of Irrigator Associations, a national body, is an organization of some considerable social importance in Chile and its achievement record is widely recognized.

iii) Water supply and sanitation

The administration of sanitary services in Chile at the beginning of the 1970s was shared by a multiplicity of agencies with similar responsibilities, but which had neither administrative nor financial autonomy and no overall planning or criteria that provided guidelines to the sector.

Because of this situation, the National Sanitary Works Service (SENDOS) was created in 1977 to integrate all the entities operating in the sector. The National Sanitary Works Service (SENDOS) was an autonomous government agency, with legal personality and independent funding. It was regionally decentralized over the country and responsible to the Ministry of Public Works. From the beginning, it was made up of a National Directorate and eleven Regional Directorates, one in each administrative region of the country.

In the Metropolitan Region and in Region V, the autonomous companies, Metropolitan Sanitary Works Company (EMOS) and the Valparaíso Sanitation Company (ESVAL), were simultaneously created under the jurisdiction of the National Sanitary Works Service (SENDOS).

Towards the end of 1989, it was considered convenient to redefine the role of the government in this sector, removing activities related specifically to the provision of the service, and leaving the subsidiary normative and monitoring role as its main activity. This new interpretation of the norms required another institutional reorganization which included the following elements:

a) the separation of the normative and monitoring responsibilities that the government must exercise from the producing and commercial activities which are carried out by various agencies. The Superintendent of Sanitation Services and regional public companies were created.

b) the application of common legislation to both the regional public companies and the private companies operating in the sector.

c) the definition of a set of regulations for controlling the natural monopolies.

d) the establishment of a tariff system that encourages the efficiency of the companies and provides both the consumers and the proveyors of the services with guidelines. This was accompanied by the setting-up of a direct subsidy to low income users.

In fact, a legal framework for the sector was structured that provided stability in that the companies could obtain the necessary resources for their efficient operation, generate adequate profits and eventually attract resources from the private sector for the development of the services.

c) Change in the governmental role in water resources

After more than ten years operation of the Water Code, it has been realized that there are important areas in the water systems that are not covered by it. This led to the development of a movement in Chile to amend or to mitigate these failings. This movement came to a peak in December, 1992, with the appearance of a bill to modify the existing Water Code.

i) Arguments for changing the law

In introducing the bill, the government recognized that Chile is facing critical and general conditions of shortage and of severe water pollution in arid areas that require effective legal procedures for their solution. It recognized that the current legislation suffers from excessive permissiveness and passivity in the administration and conservation of this finite and scarce resource, defects that should be amended as quickly as possible to avoid crisis situations that lead, in practice, to untimely and unreasonable solutions.

It also criticized the irrationality resulting from conceding water rights without imposing an initial acquisition cost, an error of the 1981 Water Code which is widely recognized. This situation allows "free entry" and the possibility of keeping the right indefinitely with no payment whatsoever.

ii) The changes proposed

The modification proposals cover four large areas. In the first place, they are directed to producing norms for recovering the condition of water as a national good for public use; the justification of need and its obligatory use. As was said, the present legislation permits the request for and unlimited obtainment of water resources without payment, with the single condition of fulfilling an administrative procedure. It is proposed to establish reasonable limits to the grants of water use rights that are based on a justification of need for the requested water and its effective use.

In the second place, it is directed to developing procedures for the conservation and protection of the water and the riverbeds. It is understood that the present Water Code is limited and does not cover all the aspects required for the adequate conservation and protection of the resource. It is said that the existing Code has partial views which tend to reduce pollution control to health protection or to the defense of agriculture or to sanitation goals, but there are no provisions with the express and exclusive objective of preserving and protecting the water resources of the country.

It is hoped that through the new legislation action could be taken in serious pollution situations to avoid harmful effects to third parties, to establish respect for the minimum flow for ecological reasons and to guarantee the survival of such systems, to introduce regulations prohibiting possible destructive actions on natural riverbeds that today are not protected at all, and to develop a network of control stations for monitoring water quality.

Third, it is hoped to develop norms for integrated riverbasin management and for improving the user organizations. It is understood that the problems needing solution affect both the basins and the users, themselves, such as erosion and the consequent sedimentation, droughts that affect irrigation in its integrity, periodic flooding that produces damage which is generally increased by human action, pollution, affecting practically all natural sources at the present time, etc. To fill these

gaps, a system of integrated riverbasin management is proposed that takes European experiences and attempts to adapt them to Chilean needs. In any event, the system is expected to allow the rule of the principles of "polluter pays", "user pays" and "beneficiary pays".

Finally, it is hoped to incorporate procedures related to regional aspects, since it is understood that a general law is little representative of the great variety of environmental systems existing in Chile, from the northern desert to the cold and rainy parts of the south.

iii) Efforts to increase efficiency

Aside from these new dimensions that are hopefully to be incorporated, there are other elements which would tend to increase the efficiency of the 1981 Code. In the first place, it is hoped to establish a time limit to the holding of unused water rights. It is proposed to establish that the right to use expires if the water is not used within five years or within the term established by the grant.

More recent modifications to the new bill incorporate the establishment of a payment for holding the grant, even when the water is not in fact being used. The objective is to impose a price on property in water rights in order to facilitate their transfer and sale.

Another important element is the possibility of the General Water Directorate acting in cases of groundwater development where there are externalities causing damage to third parties or pollution of the groundwater resource.

Finally, they are studying the possibility of including irrigation works among the public works given in concession to the private sector, as is presently done with water supply systems, ports and roads.

d) Progress in riverbasin management

The General Waters Directorate, in cooperation with the Irrigation Directorate, is carrying forward a series of programmes for integrated riverbasin management. Chile is formulating an integrated riverbasin management programme with the participation of various government agencies, such as the Ministry of Public Works, the Ministry of Agriculture, the Ministry of Planning, the National Environment Commission, etc.

The objectives of these actions are to develop an institutional infrastructure that encourages the rational and integrated management of natural resources, improves water management, protects and preserves the natural resources, as well as urban and agricultural areas, etc.

At present, riverbasin studies are being prepared which cover nine riverbasins in total, with an important coverage for the country. The riverbasins are the San José, the Aconcagua, the Maipo, the Mataquito, the Maule, the Bío Bío, the Imperial, the Valdivia and the Las Minas. These riverbasins support almost 70% of the population of the country.

The problems that this integrated management is intended to solve include the incorrect exploitation of renewable natural resources, the existing conflicts among users, decreases in vegetation coverage and increasing pollution, erosion, sedimentation and silting, the need to increase and improve the existing resource management infrastructure and to improve coordination among the

agencies and the actors in the riverbasins. It should be noted here, that water supply and sanitation is being explicitly incorporated into the riverbasin proposals and studies.

5. Mexico

The annual mean rainfall in Mexico averages 780 mm, with a very heterogeneous spatial distribution. 42% of the country, mainly in the north, has rainfall of less than 500 mm. In the southeast, 7% of the territory has more than 2000 mm. of rainfall. Given the spatial distribution of the rainfall and of the temperature, Mexico can be described as 31% desert and arid, 36% semiarid and 33% subhumid and wet.

There is a natural storage capacity (lakes) of 14,000 million m3, and more than 170,000 million m3 of constructed capacity. Groundwater constitutes an important source, with an area of 470,000 km2 and potential production of 31,000 million m3 per year.

The water system is associated with the risk of flash floods, inundations and drought, the latter being very frequent in the northern part of the country.

There is significant pollution of both surface water and groundwater, aggravated by population growth and increases in all water uses. The principal pollutants are organic matter and nutrients, pathogenic agents such as coliforms, heavy metals and pesticides. The main source of pollution is manufacturing industry, 90%, especially sugar production, oil refineries, pulp and paper, textiles, chemical products and iron and steel. Next in importance is domestic waste, 9.5%, and finally extractive industries, 0.5%.

The main pollution problems occur in the basins of the Mexico, Tula and Lerma valleys, where the largest urban settlements are located. The environmental syndrome produced is equivalent to that described for the large urban settlements in Argentina and Brazil.

In rural areas, the steep topography of the land and the torrential nature of the rains cause serious erosion problems. Studies indicate that 6.5 million hectares under agriculture are in areas with a high risk of water erosion. Associated with this problem, the deposition of sediments downstream aggravates the flood problems and reduces the capacity and useful life of the dams through silting.

The main use of the water is for agriculture, which uses an average of 46,252 million m3, which constitutes 74.5% of the water available. It must be remembered that Mexico has more than 5.5 million hectares under irrigation, which puts it at the head of Latin America and the Caribbean in this respect. Next in importance is industrial use, consuming 9,525 million m3 (15.3%), and finally domestic use with 6,342 million m3 (10.3%). In addition, some 115,000 million m3 is used for the production of electricity.

Mexico has maintained a centralized structure for the administration of water resources for many years. This situation, far from being a restriction on the current decentralization, has facilitated it enormously. This is because the water authorities are totally convinced of the need for these changes and of their advantages, and they, themselves, have initiated the delegation of management activities and have also developed the bases of the current bodies of law.

a) The National Water Law

In general terms, this is a law that shows considerable modernization in water resource management, explicitly incorporating aspects such as the planning and programming of water management and the rational and efficient use of the resource. It reiterates that public ownership of the water is inalienable.

It responds to modern currents of thought concerning the efficient use of natural resources and the preservation of quality, and also mentions integrated water management, with greater user participation and the consolidation of water programming. Annex II offers a fuller description of the law.

The objectives of the law are to regulate the use and exploitation of water, its distribution and monitoring, as well as to preserve its quantity and quality for sustainable integrated development. This is a definition of what could be called integrated water resource management.

It ratifies the National Water Commission (CNA), an independent administrative unit of the Ministry of Agriculture and Water Resources, as the administrative authority for national water affairs.

The National Water Commission (CNA) will establish Riverbasin Councils as coordination and deliberating bodies for the purpose of formulating and carrying out programmes and activities for better water management, developing the hydraulic infrastructure and the respective services and programmes for the preservation of the resources of the riverbasin. The Riverbasin Councils are, therefore, the primary instruments for integrated water resource management.

In the case of agricultural use, the law states that owners or occupiers of agricultural land will have the right to use or exploit the water granted them by the commission and that the rights are transferrable.

ii) Decentralization to Irrigation Districts

The Commission will soon begin to turn over the administration and operation of the districts to the users, according to this law and its regulations. The districts will then be operated, preserved and maintained by the users, themselves, who will be organized according to the criteria defined in the law.

Each irrigation district will establish a water committee which will determine the regulations for the district. The users of the irrigation districts are obligated to use the water and the services according to the regulations, to pay the quotas for the irrigation service that have been agreed to by the users, themselves, and which will have to cover at least the administration and operational costs of the service and those of the conservation and maintenance of the works. The quotas will be submitted for authorization by the Commission, which could object if they do not comply with the abovementioned requirements.

The Commission will coordinate the exploitation for hydroelectricity with the other water uses. Therefore, the National Water Commission (CNA), the water authority, as distinct from the hydroelectricity authority, sets the rules for the operation of the dams. This is novel in Latin America

and the Caribbean, since in most of the countries it is the hydroelectricity sector which determines the operation of the dams according to its needs, without the express intervention of the rest of the users of the water system.

iv) Pollution control and hydraulic infrastructure

The Commission will set the standards for waste discharges, the assimilation and dilution capacities of the national water bodies and the polluting loads they can absorb, as well as the quality goals and the timetables for reaching them.

The law states that the water users can build the hydraulic infrastructure works that are required for the exploitation or use of the water, themselves, or through third parties. The administration and operation of these will be the responsibility of the users or of the companies that build them.

v) Costs recovery

Finally, the law mentions the recovery of the public investment. Federal investments will be recovered according to the improvements tax law for federal public hydraulic infrastructure works, through the establishment of quotas that the beneficiaries will have to pay.

The operational, conservation and maintenance costs will have to be charged to the users of the services. In the case of the irrigation districts and irrigation units, property titles or, in the case of "ejidatarios" or members of communes, the rights to the use of the plots can be given in guarantee.

b) Federal Water Rights Law

This law was passed in February, 1993. It is basically for determining the payments to be charged to the various users for water use. The charges for the services will have to be related to the total cost of the service, including the financial cost. The payments are to be made in the amount, form, place and date of payment that is indicated in each particular case.

i) Price of the water

Article 222 of the law determines that all individuals or legal persons who use national waters are obligated to pay for the right to the water. In the following article, the amounts are fixed, per cubic meter, for each supply area, as defined by the commission. In the Federal District of Mexico supply area, it is established that the minimum charge is N$ 1.30 (new pesos) per m3. For the rest of the areas the rates are lower and variable, depending on the area.

For the use of the drinking water allocated to municipalities, independent government agencies, etc., the prices are fixed at between 60 and 70 new pesos per thousand m3, according to the supply area. Prices are fixed in the same way for hydroelectricity generation per KW/hour, for aquiculture, resorts and recreational centres.

ii) Discharge payments

The law also establishes the payments to be made for discharges. The amount to be paid for m3 of discharge, with a tariff per m3, per kg of chemical demand for oxygen of the discharge and per kg of total suspended solids. That is, the application of an extremely simple polynomial formula is used, that considers only the three variables defined. Previously, other criteria had been used, such as downstream water quality requirements, but they were abandoned because of the complications involved in their use.

It is important to note that dilution of the discharges is penalized.

c) Water policy

In the light of the new definitions and the changes which have been made, the National Water Commission (CNA) states that water policy objectives are the following:

i) to develop the necessary hydraulic infrastructure to eliminate existing weaknesses in the water supply and sanitation services, as well as to strengthen the infrastructure to support the broadening of coverage and the development of other sectors of the economy.

ii) to induce the efficient use of water, especially in regions of severe shortage, or in those sectors of use, such as agriculture and water supply, where the existing infrastructure is under-used and standards of efficiency are far below what is possible and desirable.

iii) to recover and to improve the quality of the water, particularly in the the more polluted riverbasins and groundwater sources, and to assure the quality of the water that is supplied to the population and for other uses that can affect health.

d) The National Water Commission

As the first step to introduce the water policy, the National Water Commission was created, an independent unit of the Ministry of Agriculture and Water Resources, in January, 1989, and was subsequently confirmed by the National Water Law.

The responsibilities of the National Water Commission (CNA) consist in the administration of the quantity and quality of all national waters; the exercise of its authority to promote efficient use and the preservation of water quality; the formalization of the economic mechanisms and financial incentives that induce efficient use and facilitate the financing of the sector, and the defense of the role of water resources in supporting the sustainable development of the country and greater public welfare.

The Mexican Water Technology Institute (IMTA), an agency charged with the technological development of the sector, is responsible to the National Water Commission (CNA). It consists in a General Directorate and five General Sub-offices, regional management offices and state management offices.

e) The Mexican Water Technology Institute (IMTA)

The Mexican Water Technology Institute (IMTA) has the role of developing and adapting technology for the sustainable development of the water resources. Their efforts are directed preferably to the efficient use of water and the preservation of its quality, in the framework of the present decentralization and strengthening of the user associations in the irrigation districts or of the agencies providing water supply and sanitation services.

The strengthening of the institutional capacity of the water sector is necessary if this is to be accomplished, and the training programmes for the human resources needed by new organizations are of prime importance. By means of example, in the recent past the activities of the Mexican Water Technology Institute (IMTA) were directed to the following subjects: a) the testing and development of devices for the measurement and control of irrigation water and water for urban use, as well as the development of methodologies and practical procedures for the detection of leaks in the water supply systems; b) the development of systems and processes for the treatment of industrial and municipal waste water; c) the preliminary testing of a programme for controlling aquatic weeds; d) the development and application of methodologies and information systems for better water management; e) the certification of equipment and devices.

f) An evaluation of the National Water Commission (CNA) in water resource management

The National Water Commission (CNA) has just made an evaluation of its activities and the results of its management since its creation in 1989. Without doubt, this can be described as successful. The most important points are summed up below.

i) The users of the water now contribute to finance hydraulic developments. The water has been given a price that reflects its relative shortage and other specific conditions. The criterion of paying for polluting has been applied. The income from water rights payments and other taxes have been allocated to finance sectoral programmes: "from the water to the water ".

ii) Between 1989 and 1994, Water Supply and Sanitation has received 40% of the international financing (US$1.5 billion) for the National Water Supply and Sanitation Programme.

iii) As for hydraulic infrastructure for agriculture, more than 145,000 hectares were incorporated and about 520,000 were rehabilitated. More than 252,000 hectares were improved by drainage.

iv) Through the irrigation plans greater user participation has been permitted in the administration of the irrigation districts, where 80% of the operational and maintenance costs is already recovered.

v) 65% of the total area of the irrigation districts (2 million hectares) has been transferred to the users. 25 irrigation districts have been totally and 13 partially handed over to 251 irrigation associations.

vi) In water supply, the participation and capacity of private initiative constitutes an important element in the carrying out of the strategy outlined. Water supply coverage is growing

faster than the population. During the period 13.5 million more inhabitants were incorporated to water supply systems, and 11.5 million were provided with sewerage.

vii) All this involved the development of a considerable infrastructure that meant the building of 21 aqueducts in 16 states, with a total capacity of 20,770 litres per second. The treatment of waste water also developed considerably, reaching a capacity of 34,200 litres per second.

viii) The achievements in the Lerma riverbasin are a good example of the integrated recovery programmes for rivers and lakes, where the pollutant load entering Chapala lake was decreased by 65%.

ix) Between 1989 and 1993 changes in legislation have been made in 17 States of the republic to modernize the water supply and sanitation services. Decentralized water supply and sanitation agencies have been set up in 129 of the 145 cities with more than 50,000 inhabitants.

x) An important point is that the total revenue of the water supply and sanitation systems was more than N$5,000 million in 1993, calculated in 1988 values, compared with the N$650 million collected in 1988.

xi) The National Water Commission (CNA) has implemented other programmes, such as the Clean Water Programme, which has helped to reduce infant mortality from waterborne gastrointestinal diseases by 30%, where the essential factor has been to defeat cholera. The number of localities with chlorinating equipment grew from 250 in 1988 to 13,000 at present. The population benefited by this disinfecting went from 35 to 67 million persons. The surface area of crops irrigated with contaminated water was reduced from more than 24,000 hectares to only 736.

xii) The programme for controlling aquatic weeds in some reservoirs was extended to control a great many lakes where weeds were a real problem.

xiii) The National Meteorological Service has been augmented and the short-term plan is to reach the goal of 600 automatic hydroclimatological stations.

xiv) The water management activities of the National Water Commission (CNA) are outlined in the new legal framework established by the National Water Law. Today this organization has technical, legal and economic instruments that permit it to regulate the distribution of the resource, to sponsor the solution of conflicts, to induce the efficient use of the resources, preserving their quality. With the achievement of greater public participation, and having achieved a stronger legal position and eliminated the ambiguities with respect to jurisdiction, an institutional framework has been obtained that promises better investment and significant improvement in the provision of water services and in reaching the quality goals.

xv) The Lerma-Chapala Riverbasin Council, established in January, 1993, has begun to work towards the equitable distribution of the water among the states making it up, as well as measures for the conservation of the levels of Chapala lake and the improvement of the quality of the water. Currently, the formation of the Bravo Riverbasin Council is being negotiated as well as that of the Mexico valley, both of which are very important riverbasins in the country.

xvi) During the same period, measures have been taken by the National Water Commission for staff training, as well as measures for modernizing its administration.

6. Venezuela

a) Introduction

The country has abundant surface water resources, but their geographical distribution shows marked regional differences. 85% of the 700 million hm3 flow generated annually, corresponds to the right hand side of the Orinoco. The remaining 15% is irregularly distributed, the most productive riverbasins being located on the southern slope of the Andean mountain chain.

The development pattern has resulted in the overpopulation of the northern, central, coastal axis and considerably lower density in the Lake Maracaibo basin, and the Andean valleys, with the result that 10% of the surface area of the country houses 90% of the population and generates more than 90% of the gross domestic product. Furthermore, it happens that this is the area with the least available water and energy, which results in very high and growing costs for the required expansion of the water supply services to the metropolitan area of Caracas. Also, most of the processing industries for raw materials are located in the northern, central part of the country.

The high industrial and urban concentration, with a chaotic structure where activities are juxtaposed and all sorts of externalities are generated, determines a syndrome akin to that described for the urban sectors of Argentina and Brazil. It is here where the industrial and urban pollution reaches critical levels that require public action. Attempts have been made to meet this problem with an overall approach through the creation of the Autonomous Authorities, such as those in the Tuy riverbasin and that for Lake Valencia.

Contrasting with the above, the area dominated by the Orinoco and Apure rivers, with tremendous hydraulic potential, is notably underpopulated. The environmental management strategy being followed is to develop this area.

The lands with the greatest productivity potential are found in the areas with the greatest urbanizing pressure. There, 4 to 6 months of annual drought restrict agricultural alternatives and irrigation is, therefore, necessary, and this need has given rise to multiple private and government undertakings. These are mostly located in the Andean valleys, where there is extensive use of high technology, micro-irrigation systems, and in the semi-arid areas, such as Barquisimeto. The use of irrigation for the growing of fruits and vegetables is sustained by its high profitability on the domestic market.

The relief of the Andean area, the steep slopes of most of the land, the erosion effect of the rainfall, together with the traditional practice of corn cropping or subsistence cropping, which is the joint planting of corn and beans, results in serious soil erosion. This results in reduced yields and downstream water problems caused by sedimentation, such as floods, and decreased reservoir capacity. The magnitude of these problems has induced the country to begin riverbasin conservation projects.

With respect to basic water services, in 1989, 72% of the population had water supply services and 45% sewerage. Rural and small towns (17% of the 20 million population) had a level of services reaching 40% and 14%, respectively.

Venezuela has a high potential for hydroelectricity production. In 1991, 68% of the energy produced was from this source. Consumption reaches 2881 KWh per inhabitant, one of the highest levels in the region. 90% of the country has electricity service.
Water resource management in Venezuela has been centralized in the Ministry of the Environment and Renewable Natural Resources (MARNR), which is responsible, at the national level, for the environment, in general, and for water resources, in particular, and is charged with their administration, use, regulation, etc. It has traditionally been responsible for the development and building of water use projects for various purposes.

Over the period 1989-1993, there has been a steady reduction in budgetary allocations to the Ministry, a product of the national economic and political crisis. With this restriction and in order to satisfy the new needs in terms of the nature and quality of the environmental services, which involves participation, decentralization, greater efficiency, etc., the Ministry is reorganizing its administrative structure.

b) The Ministry of the Environment and Renewable Natural Resources (MARNR) and administrative decentralization

The decentralization is taking place in the framework of the recently passed Basic Law for the Decentralization, Delimiting and Transfer of Public Service Responsibilities, which requires administrative decentralization in various instances.

Therefore, the Ministry has asked the regions to present their estimates for dealing with environmental problems for consideration at the central government level, and the Sectoral General Directorates and the respective Regional Directorates will come to an agreement on the fate of the funds. The agreements reached will be obligatory, and the following aspects will be considered: a) the identification of the environmental problems in the region, b) their ranking and c) the physical and financial identification and quantification of the measures to be taken.

The budgetary expenditures of the Ministry of the Environment and Renewable Natural Resources (MARNR) will be made directly by the Regional Directorates in the amount and to the extent that there is no legislation to the contrary. Specifically, the idea is that the Regional Directorates should elaborate their own budgets and have the capacity to execute them. The Ministry of the Environment has allocated its budget in this way since March, 1992.

c) The Environmental Criminal Law

In January, 1992, the Environmental Criminal Law was passed by the Venezuelan Congress, and the Ministry of the Environment and Renewable Natural Resources (MARNR) was designated the agency responsible for its execution. Clearly, most of its terms are related to water resources.

The purpose of the law is to designate as offenses actions which transgress regulations related to the conservation, protection and improvement of the environment, establishing corresponding penal sanctions. It also fixes preventive, restitution and reparation measures where relevant.

The principal measures anticipated are imprisonment, arrest, fines and obligatory social service, all liable to application to natural persons. Accessory sanctions are also mentioned, such as disqualification for public service positions, disqualification for the exercise of one's profession, the obligation of destroying, neutralizing or disposing of the substances susceptible of causing damage to the environment or to public health, etc.

The sanctions for legal persons will be fines and the prohibition for three months to three years of continuing the activities that originated the pollution. If the damage is very serious, in addition to the fine, the sanction will be the closing down of the factory or establishment or the definitive prohibition of the activity.

d) Organizational structure of the Ministry of the Environment and Renewable Natural Resources (MARNR), proposed for 1994

The central operational units are six sectoral general directorates, which are the following: a) environmental information, b) environmental planning and management, c) environmental education, d) monitoring and environmental control, e) environmental quality and f) the office of the Orinoco-Apure programme. There are also seventeen regional directorates.

Up till now, the Ministry relied on four autonomous services for: a) forest problems, b) wildlife and aquatic life, c) the environmental development of the Amazon, and d) national geography and cartography.

i) Recent changes

Two new autonomous services have now appeared that are of great importance to water resource management. These are, first, the Autonomous Service for the Conservation, Administration and Use of Water Resources. The other is the Autonomous Service for Soils and Riverbasin Conservation.

Until 1993 there were only authorities for the following systems: a) the Yacambú-Quibor area, b) the Turimiquire protection area, c) the coastal area of Lake Maracaibo, d) the area of the Guayana Environmental Programme, and e) the Los Roques Archipelago National Park.

At present, two new Autonomous Authorities are to be created, the Lake Valencia and the Northern Slope of the Coastal Range of the States of Aragua and Carabobo Riverbasin Agency, and the Tuy and the Northern slope of the Mountainous Coast of the Federal District and the State of Miranda Riverbasin Agency.

Complementarily, the municipalization of environmental management has been achieved. facilitated by the creation of the Municipal Funds for Environmental Management. This consists of a source of funds that will be obtained as a one-time contribution on the part of companies or the main economic activities and which will be administered by way of a trusteeship dedicated to the management of environmental problems.

ii) Water resource management in the Ministry of the Environment and Renewable Natural Resources (MARNR) and Agenda 21

The preparation of the papers and the preparatory activities for the meeting in Brazil and follow-up carried out in the Ministry of the Environment and Renewable Natural Resources (MARNR), have resulted in the formation of an interinstitutional working group dedicated to the study of how better to adapt water resource management activities in conformity with chapter 18 of Agenda 21.

In the general conclusions of the working group, it is admitted that the approach proposed by the Conference coincides with that adopted by the Ministry for water resource management. Most of the actions indicated in this document, in one way or another, are included in the Ministry's programmes.

In the wake of the activities of the working group, some propositions emerged. These are: a) to create a coordination unit for water resource management, through which goals could be fixed for achieving fundamental objectives; b) to strengthen the Ministry's water resource evaluation programme; c) the protection of the water resources in order to preserve the quality and the sustainability of aquatic and other ecosystems; d) the extension of the water supply and sanitation services. The creation of the Autonomous Services described below, is to some extent a ministerial response to the needs identified by the group.

e) Autonomous Service for the Conservation, Management and Rational Use of Water Resources (SARH)

This Autonomous Service was created in April, 1993, by Decree No. 2888. The Service is responsible for the conservation, use and development of water resources through research, planning, management and promotion.

i) Duties

The Service is responsible for: a) participation in the formulation and evaluation of water development policies, b) participation in the elaboration of the relevant technical regulations, c) coordination of the participation of other agencies associated with water management, d) the preparation of a national inventory of water resources, e) planning water management and developing and supporting scientific research in the area.

Its operational section is to design, evaluate and build the projects for water use, to monitor the waters, to promote training and environmental education programmes, to implement mechanisms for generating and collecting financial resources, and other associated duties.

The resources of the Service will come from the ordinary and extraordinary annual budget allocations, the goods and income of any nature that are derived from its activities, the payments received for services and special allocations from the states and municipalities. Also, it will receive various donations and contributions, as well as the resources derived from the administration of the water, as established in the regulations.

The Decree specifies that the revenue from the provision of the service will have to be used for self-financing both operational and investment costs.

It is clear from this outline that if this Autonomous Service does not has an adequate source of income from services that cover the costs of the management of the resource, it will not have the autonomy to carry out its duties.

ii) Management of water use concessions

The ex Planning Directorate for Water Resources has become part of this Autonomous Service. Until very recently, this Directorate was responsible for the development of plans and projects for the water sector. The well-known Lake Valencia recovery project, currently in execution, originated in this office.

At present, its duties have changed drastically, centering today on the formulation of regulations for water use concessions. It is the organization that is charged with negotiating contracts or concession agreements and advising the ministry on their granting.

At the present moment, the regulations are being developed that establish ministerial procedure in this area. The Ministry of the Environment and Renewable Natural Resources (MARNR) will grant through this Directorate, the rights for the use of the resource, by concession, for all uses, according to the provisions established in the Forest, Land and Water Law, and according to the water resource and riverbasin regulations.

Water supply companies will have to obtain the corresponding concession from the Ministry for treating and distributing the resource. The relationship between the water supply companies and the users will be by contract. This is being introduced gradually, as the concessions to the water supply companies have not yet been granted and this is expected to take a year.

The concessions and contracts will be granted by onerous title, and will establish the rules encouraging more efficient use of water, as well as the payments to be made to the Autonomous Services of the Ministry of the Environment.

f) Autonomous Service for Soils and Riverbasin Conservation

This Service replaces the Riverbasin Conservation Directorate of the Ministry. This Directorate has been concerned with the collection of basic information on the various riverbasins in the country. At present, it is carrying out a conservation project, financed by the Inter-American Development Bank (IDB), which covers the high and middle basins of the Yaracuy, Tocuyo and Boconó rivers. It is analyzing other basins for the future financing and execution of conservation and development plans.

Another Autonomous Service was created by Decree 2889, 15 April, 1993, without legal personality and with the rank of General Sectoral Directorate, responsible to the Ministry of the Environment and Renewable Natural Resources.

The duties of this service will be the planning, organization, coordination, management and promotion of conservation and management policies and programmes for soils and riverbasins in Venezuela.

Its responsibilities will be to formulate the policies and national strategies; to formulate, evaluate and monitor plans, programmes and projects for the conservation of soils and the management of riverbasins; to exercise the internal and interinstitutional coordination at the national, international and regional levels; to cooperate with private and public, national and international organizations on research plans and the development of technical cooperation projects; etc.

The resources of the Autonomous Services will consist of budgetary allocations, the resources from various agreements, and revenue from providing services or other activities, gifts and other contributions, etc.

One of the sources of income of the Autonomous Services is established by Decree 2331, June, 1992. According to this decree, tariffs are to be established in such a way that the various agencies benefiting from the use of the natural resources in a given riverbasin will have to pay for the conservation of the riverbasin. These agencies are those related to the operation and maintenance of reservoirs, aqueducts, irrigation and electricity generating works, as well as other infrastructure works. The payments will be in the following amounts:

a) 0.5% of the amount paid by the users for each m3 of water taken from the source, using the average value charged the previous year as reference point.

b) 1% of the total charged for the sale of electricity.

These amounts can be modified by the National Executive according to real national needs for the protection, conservation and recovery of riverbasins. It is specified that the income from the various private and public agencies will be paid to the Autonomous Service of the Ministry of the Environment and Renewable Natural Resources (MARNR) to be used specifically to this end.

g) The Riverbasin Agency for the Tuy river and the Northern Slope of the Coastal Mountain Range in the Federal District and the State of Miranda

This Agency was created by Decree 2307, April, 1993. The riverbasins involved are very important, particularly that of the Tuy river, since it is the main source of water supply for the metropolitan area of Caracas. Given the complexity of the established and permitted activities in this riverbasin, it has been considered necessary to form an Autonomous Authority for its management.

i) Responsibilities

The responsibility of this Authority is for the integrated management of the territory and for the protection, preservation and environmental improvement of the critical area of high-priority treatment defined as the riverbasin of the Tuy river and the slopes to the north.

The authority is charged with the following:
a) the establishment of the environmental procedures and guidelines for the exploitation of the renewable natural resources and the management of the territory, b) the development and coordination of research on management, administration, policing, monitoring and environmental education plans and programmes, c) the coordination and control of the execution of the plans in the area, collaboration in the transfer of services to the regions. participating in the decentralization

procedures, according to existing regulations, the identification and evaluation of projects, and all management related to promotion, organization and execution.

ii) Structure and budget

The structure of each Autonomous Authority is to include a Superior Council, an Advisory Council, an Executive Directorate and General, Programme, Territorial and other operating Units.

These agencies will soon achieve financial autonomy. This total autonomy is to be achieved through generating resources by means of agreements, the provision of services, charges for services, etc.. Its funding will be made up of budget allocations, payments for services, donations, revenue from conventions and agreements, and revenue from bonds, when they are intended for the protection or recovery of the environment.

iii) Duties

The duties of the Autonomous Authorities will be related to land use, which must be done according to the organic law of land use management, and they will have the specific right to intervene in cases already within the project area or in the case of proposals to locate within "the critical area of priority treatment in the basin of the Tuy river".

It will also have the right to interfere in cases where the renewable natural resources may be affected, giving approval and authorization for their use and exploitation. It will be responsible for environmental control, attending to requests and carrying out environmental impact studies which are a prerequisite for authorization to occupy the territory. The costs incurred by the authority in providing the services, including protection or emergency measures, will be charged to those responsible.

h) The Riverbasin Agency for Valencia Lake and the Northern Slope of the Coastal Mountains in the States of Aragua and Carabobo

i) Creation of the agency

This Authority was created by Decree 2309, in June, 1992. The text of this decree is similar to that creating the authority for the Tuy river.

As in the previous case, this riverbasin is administered by a Superior Council, an Advisory Council, an Executive Director and General Management, Territorial and other Operational Units.

ii) Integrated project for recovering Valencia Lake

Valencia Lake is at the centre of the most heavily populated riverbasin in the country, where there are various types of settlements and a very high industrial density for food processing and primary activities based on irrigation, livestock breeding, etc. All this results in Valencia Lake exhibiting growing pollution levels and since it is an enclosed basin, an imbalance in the hydrological cycle has resulted, with rising water levels, which, in turn, has had impacts on bordering areas.

To solve these problems, an executive unit has been constituted for the project and is proceeding to develop the design and execution of a vast treatment plan. It is estimated that the total cost of the total recovery of this lake will reach US$125 million. The system for recovering the lake consists in creating water by-passes, in such a way as to divert the waste emissions affecting its quantity and quality away from the lake, and at the same time, to build a series of treatment plants.

iii) Water supply and sanitation

The national administration of water supply has been the responsibility of the National Institute of Sanitation Works (INOS), a nation-wide autonomous agency responsible for the provision of drinking water in urban areas. It is also charged with the treatment and disposal of sewage.

The Ministry of Health and Social Welfare is responsible for water supply and sanitation in rural areas, and some regional corporations have responsibilities of this nature.

In the last five years, the sector has been undergoing a reform process. In the first place, the National Institute of Sanitation Works (INOS) was decentralized and turned into regional water companies. The public company, the Venezuelan Water Company (HIDROVEN), was created, to which the regional water companies report.

This process of decentralization and dispersion, through which the regionalization or municipalization of the companies was originally attempted, is also directed to increase the participation of private companies, which can administer the water and sewerage systems directly, either in lease or by concession.

The government companies became autonomous in 1992, not only in their operations, but also financially. This is consistent with the importance given to regional management in the decentralization process. The government companies are the following:

- The Venezuela Water Company (HIDROVEN)
- The Trujillana Water Company
- The GuaricóTiznados Water System
- The YacambúQuibor Water System
- The Cojedes Regional Water Development Company
- The Maracaibo Plain Regional Development Company (PLANIMARA)
- The National Reforestation Company (CONARE)

At the same time, the creation of the State Environmental Council was suggested, for interinstitutional coordination at the regional level, conceived as a tool for the deliberation, support and execution of government policies.

At present, in addition to that mentioned, no significant progress has been made towards the participation of the private sector or towards the effective self-financing of the various water companies. The political and economic instability affecting the country has contributed to this, and has impeded the establishment of real tariffs for public services.

i) Irrigation and drainage

Irrigation is the responsibility of the Ministry of Agriculture, and the Ministry of the Environment and Renewable Natural Resources (MARNR) acts as the coordinating agency. The General Directorate of Sanitation and Irrigation supervises, monitors and maintains the public irrigation works. There are user associations that participate in the administration of the various irrigation projects, as well as an important area irrigated by strictly private developments. One of the points most often mentioned in the discussions about a future Venezuelan water management law, is precisely this, the problem of how to handle all the existing water use which has largely been developed through private irrigation.

j) Hydroelectricity

The Venezuelan electricity sector is made up of four public companies and seven private companies. All are autonomous as concerns management and the provision of the service, but they are subject to the governmental regulations of the Ministry of Energy and Mines. In 1990, 61% of the electrical energy was hydroelectricity.

Outside of the arrangement to transfer funds from the energy sector to the regional agencies or to the riverbasin management agencies, there are no coordinating bodies that facilitate integrated water resource management.

k) The pending water resource and riverbasin regulations

A project to regulate the water resources and riverbasins in keeping with the Organic Environment Law, the Organic Land Management Law and the Forest, Lands and Waters Law is being considered. It outlines the creation of a national system of water resource planning involving the incorporation of regional plans.

The Ministry reserves to itself the leading role in the administration of water resources. The elaboration of a national inventory of the resources is proposed, the elaboration and update of the national plan and of the regional plans mentioned above, the granting of concessions, allocations and authorizations for water use, and other actions related to the policing, the monitoring, the planning of studies, projects, the development of regulations, promotion and development activities, etc.

It is intended to create the National Planning Council for the Rational Exploitation of Water Resources, as an advisory body for the development of the national plan and the regional plans.

The regulations project establishes the form of the authorizations and grants for water resource use which will be administered by the Ministry of the Environment and Renewable Natural Resources (MARNR). It is established that all uses of public waters will require a concession, whether private or public.

In the case of grants of onerous title, the interested party will pay a fee to the national exchequer for the exploitation of the resource, which will be calculated on the basis of the quantity of water, its relative shortage in the place of extraction, its quality, the variability of the regime and its energy potential. It should be underlined, that the amount, form and moment of payment will be

established by a joint agreement between the Treasury and the Ministry of the Environment. That is, the price of the water will be negotiated in each particular case.

The concession contract must include a description of the project, where the water is taken and the quantity; it must specify the term of the grant, the payment conditions, etc. As for the protection of the quality of the water resources, it is specified that the quality of the water will be governed by the rules contained in the organic law of the environment, leaving the problems of the contract to the regulations current at its signing.

The regulations referring to riverbasin conservation are being developed in the same way, where the discussion is fundamentally about planning and user participation in riverbasin conservation projects.

Finally, the regulations project provides a set of criteria for identifying and handling special aspects in the conservation and rational use of the water and riverbasins.

III. MAIN CONCLUSIONS

1. Water resource management, including the provision of basic water services, is being decentralized in all the countries analyzed in the region, without exception. There are many different procedures, including:

a) the transfer of total responsibility for water resource management to a regional authority (Corporation, State, Municipality);

b) the transfer of management to formally constituted user associations, particularly for irrigation;

c) granting of the services in concession to public or private agencies;

d) direct privatization by tender;

e) the creation of water markets: the assignment of property rights to the water and permitting them to be traded on the market.

2. There is an undeniable trend to the self-financing of water-based services. The job of water authorities is to obtain financing for building infrastructure and to facilitate the organization of the agencies that will administer the services.

3. Although there is a will to establish an overall framework of regulations for the sustainable and integrated management of the water resources, the trends are not so clear in establishing operational methods for: a) fixing policy, b) institutional coordination, c) finding adequate planning mechanisms and d) carrying out the projects.

4. The advent of environmental problems has led to water resources being seen as one component more of the environmental systems. In many cases this has led to losing sight of the

"uniqueness" character of water and sometimes its primary role as the sustenance of environmental systems is forgotten. Colombia can be cited as an example where, in the process of developing a modern environmental law, water resources were divided up institutionally - that is, placed under the jurisdiction of three different ministries. This is also the case in Argentina, where there an important emphasis on the development of the environmental sector and the formal water authority remains in another ministry.

5. This new way of viewing the question, which has become general in Latin America and the Caribbean, has led to the requirement that saleable water services (drinking water, irrigation, hydroelectricity) will, in the future, have to finance the externalities associated with the provision of such services.

6. A new source of financing for water management is making an appearance, payments for the right to pollute. In fact, pollution control is the area where there is least experience in the region, and it is interesting to see what is going on in Mexico. It is clear that the countries of the region have to develop policies and strategies for controlling pollution; develop information bases; develop useful technology; advance in institutional development; establish financing systems, etc.

7. Water resource management at the riverbasin level is considered to be the most appropriate way of internalizing the externalities of the water system, both the impacts caused by the use of the water, and the exogenous effects.

8. In the experiments in water resource management at the basin level, there is still a noticeably strong emphasis on the study of the physical components of the systems, or on sectoral activities and investments. The organizational component, by far the most important, is very little developed. The Colombian corporations can be cited as successful cases.

9. Progress towards sustainable and integrated water resource management is hindered by many factors. One of the most important is the tremendous deficiency existing in the provision of water supply and sanitation, that still exists four years after the end of the water supply decade. This tense and growing sectoral need, intensified with the appearance of cholera, leads to integrated management being given second priority.

10. Although it seems obvious, the countries that have better organized the water sector have responded more coherently, effectively, and rapidly to problems such as cholera or natural disasters affecting the sector. Where the water authorities are weak or disperse, response naturally consists in a multitude of irrelevant efforts, with no clear impact, continuity or guarantee.

11. In the same way, where the water sector is better organized, decentralization has been more rapid and effective. Mexico is a case in point.

12. Some countries of the region still do not have the necessary institutional or social conditions for implementing the changes that are prevailing in the region, even though the political authorities have no doubts about the good sense of the change, nor of its urgency. Institutional and social feasibility have to be considered. (The case of Venezuela for social feasibility, and of Brazil for institutional feasibility)

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Annex I

THE BRAZILIAN EXPERIENCE IN INTEGRATED WATER AND RIVERBASIN MANAGEMENT

1. The case of Ceará

Ceará, located in the arid northeast of Brazil, has institutionalized a system of water resource administration.

For this, a Water Resources Secretariat has been created at state level and is responsible for the coordination of the state water policy. The Hydraulic Works Superintendency was created for the implementation of the water supply and irrigation infrastructure works.

The technical and scientific support of the Cearense Foundation for Meteorology and Water Resources was used for managing the water resources and for carrying out the climatic and water environment monitoring. Finally, the diagnosis, study and planning of the water resources was developed by the State Water Resources Plan (PLANERH), with the cooperation of the Water Resources Secretariat.

The water resources policy implemented by the government of Ceará plans the following action programme:

a) A programme of regional reservoirs, to provide the state with a network of permanent medium-sized reservoirs for regulating rivers and streams, guaranteeing water supply and irrigation over the whole state.

b) A programme of water transfer, integrating the water distribution works so that water can be allocated to the areas that require it.

c) A regional poles irrigation project, designed to generate an irrigation mosaic that facilitates farming.

d) A considerable programme of small hydraulic works that permits multiple-purpose water use in the State.

The State has created an integrated water resource management system consistent with the national water bill.

In the first place, the system consists of an associated committee, called the Ceará Water Resources Council, of deliberative character and with the purpose of coordinating the execution of state policy. It is to formulate and negotiate the use policies for the supply and preservation of the water resources; to promote the cooperation of the municipal and federal government agencies with the community organizations and to deliberate on matters related with water resources. This Council is presided over by the Ceará Water Resources Secretary, and includes representatives of various government agencies, such as the Planning and Coordination Secretariat, the Development and Environment Secretariat, the Agriculture and Agrarian Reform Secretariat, the Transportation, Energy and Communications and Works Secretariat, and representatives of the Industry and Trade

Secretariat, of the Social Action Secretariat, of the Prefects Association of the State of Ceará, a representative of the Federal University of Ceará, a representative of the Brazilian Water Resources Association and one of the Brazilian Association of Sanitary Engineers.

Second, it has a Water Resources Secretariat as executive agency. This supreme executive agency responsible for the management department, is related to the Cearense Meteorology and Water Resources Foundation, and the Hydraulic Works Superintendency.

In third place, it has a State Water Resources Committee, directed by the Director of the Department of State Water Resource Management, and representatives of various superintendencies, foundations and State companies.

It has a financial office which is responsible for applying rates for the use of water. It exchanges resources with the federal government, either paying for waters received, or receiving shared funds. It charges for the costs related to the administration, and interacts with other State and federal sources of revenue.

As indicated by the bill, there are riverbasin committees. The form of each committee depends on the peculiarities of each basin, but it is recommended that it be made up of users and water resource public servants. It establishes a set of criteria for making up these committees.

2. The Rio Doce Project (Minas Gerais and Espíritu Santo)

The Ministry of Mines and Energy, through the National Water and Energy Department (DNAEE), developed a study of the Doce riverbasin, starting in June, 1989. It was divided into four main phases.

The first phase of the project, which was completed in 1990, produced a detailed diagnosis of the quality of the water and the causes of its degradation. Parallel with this diagnosis, a survey of the sources of the pollution was made and water quality objectives were defined. These objectives are based on the most critical use for man, drinking water. These elements permitted the design of an integrated management program for the riverbasin.

In the second phase, a master plan was developed, which defined priorities for integrated action at the riverbasin level for reaching the quality objectives in the rivers. Thus, an action programme over a 17 year period was developed, with an initial phase of two years and three five-year plans, whose activities are decided from year to year. The total cost for these activities was estimated at US$2.2 billions.

The purpose of the third phase of the project was to study means of financing through the application of the user-pays, polluter-pays principle. It was found that it was possible, thanks to the creation of a committee and of a basin agency, to guarantee that the financial participation of the users of the riverbasin would generate 50% of the necessary investment resources. The development of these entities in the way conceived in the Doce river project, depends on the institutional procedures outlined in the water bill which is currently under debate. Until this is passed, action can be begun through the Special Doce river Commission which has the approval of the federal government through the Ministry of Mines and Energy, and of the Minas Gerais and Epirítu Santo state governments.

The fourth phase of the Doce river project will consist in the transfer of the technologies to other critical riverbasins in the country, starting with the basin of the Paraiba Do Sul river.

The Doce river project and the project being negotiated for the river Paraiba Do Sul have been developed with French technical cooperation.

As can be appreciated, this is a project which proceeded very well in the development of all the technical components and progress has been made in the economic studies for part of the financing of the project. Nevertheless, the delays in passing the water resources law prevent progress in setting up the institutional structure, a key element for integrated water resource management.

3. Paraná

The Paraná State Secretariat for Agriculture and Supply is developing a programme called Rural Paraná. The objective of this programme is the management and conservation of soils and the control of water erosion, to reverse the degradation of the natural resources, on the basis of technological alternatives for increasing crop yields and, consequently, incomes from agriculture.

The programme is based on the incorporation of techniques for increasing vegetation cover, improving the permeability of the soil profile, increasing soil capacity for water storage, and decreasing erosion by run-off. Locally, the control of surface run-off and water pollution, is basically an agricultural problem.

The programme, although it does not centrally involve water resources, is, however, directed to the combination of water resources and soils that sustains the rural activity of the State. The programme takes in an area of 6,000,000 hectares, within which 2,100 small riverbasins will be worked on. The beneficiaries are some 165,000 rural properties.

All the technical actions are developed on the base of the small riverbasins, since they are the most easily adapted to the objectives of the plan developed. The selection of the small riverbasins is made in each individual municipality by the Municipal Commission, according to criteria that have been fixed beforehand.

The agencies carrying out the project are the State Secretariat for Agriculture and Supply and companies linked to the State government. Executive responsibilities have been given to the producer cooperatives, to the agricultural planning companies and prefectures, according to procedures that have been established. At the support level, the financial agents, the producer associations, the municipal, regional and State commissions related to soil management and water resources play an important role.

The project has six components: a) agricultural research, b) rural extension, c) a soil management and conservation and pollution control fund, d) the improvement of the municipal apparatus, e) the development of railroad terminals for the distribution of critical input, f) forest development, g) monitoring and inspection of the use of the soil, and h) training.

Annex II

NATIONAL WATER LAW OF MEXICO

The national water law regulates the administration of water and the establishment of a water programme. It describes the norms for allocating water use rights, determines the criteria for protected areas and establishes the criteria for water use. It also deals with the prevention and control of water pollution, the criteria for investment in hydraulic infrastructure, and establishes the infractions, the sanctions and the resources for the execution of the law.

i) Description of the Law

In general terms, this law represents some considerable modernization of water resource management, specifying aspects such as planning and programming of management and the rational and efficient use of the resource. It reiterates the inalienable and imprescriptible public ownership of the waters, as stated in article 27 of the national constitution.

It reflects modern thinking concerning the efficient use of natural resources and the preservation of their quality, and also mentions integrated water management, with greater user participation and the consolidation of water programming. It ratifies the National Water Commission as the only federal authority for the administration of the resource.

ii) The National Water Commission (CNA) and the Riverbasin Councils

The objectives of the law are to regulate the development, use and exploitation of the water, its distribution and control, as well as the preservation of its quantity and quality to achieve its sustainable integrated development. This is a definition of what could be called integrated water resource management.

It ratifies the National Water Commission (CNA) as the national administrative authority in water affairs, an autonomous agency of the Secretariat for Agriculture and Water Resources. Article 13 states that the National Water Commission (CNA) will set up riverbasin councils, as bodies for coordinating and facilitating cooperation between the commission, federal government dependencies and units, state or municipal agencies and departments and the user representatives of the respective riverbasin, in order to develop and carry out programmes and actions for better water administration, the development of the hydraulic infrastructure and the respective services and the preservation of resources in the riverbasin.

Thus, the riverbasin councils are established as the primary instrument for integrated water resource management. Article 14 specifies that the commission will accredit, encourage and support the organization of the users to improve the use of the water and the preservation of its quality. It also specifies, in article 15, that it will formulate, install and evaluate a water programme.

iii) The concessions

The water-use rights will be conceded by concessions granted issued by the Commission.

Article 29 specifies that it is the obligation of the concessionaires, as well as building works and exploiting the water, to make the payments established by the current legislation.

Water for urban or public use will be allocated to the municipal or state water supply and sanitation systems, which are responsible to the commission. In all cases the form of guaranteeing payment of the quotas, products and use, that is established by the legislation, will be applied.

With respect to agricultural use, the law states that all owners or occupiers of agricultural land, whatever their legal status, will have the right to develop, use or exploit the water conceded to them by the Commission. The Commission can authorize the use of water granted in ways different from the terms of the grant, when a new owner so wishes and it does not cause damages to third parties.

The agricultural water use rights will be transferrable.

The water use grants can be made to individuals or legal persons for exploitation or to legal persons for the administration or operation of irrigation systems or for the common development or use of public waters for agricultural purposes.

For the administration of systems, the legal person must have a set of regulations defining the forms and conditions of operation, distribution, etc. The law provides the irrigation districts with the freedom to partially or totally modify the use they make of the water, pursuant to the dictates of their own bylaws.

The development or use of water in "ejidos" and communities or on land held in common, will obey the regulations of the "ejido" or the community. When the general assembly of the "ejido" resolves that the member can become full owner of his plot, the right to use the amount of water necessary for the irrigation of his land will have to be transferred, and the sources and respective volumes specified, respecting established rights.

The producers or farmers can freely associate, thus constituting a legal person, to form systems for the provision of agricultural irrigation services. In these cases the grant will be made to the legal person which that group of users constitutes, and these grants will be freely transferable, according to the legal regulations.

iv) Water for the irrigation districts

Article 64 gives the criteria for irrigation districts. In cases where the federal government may have participated in the financing, construction, operation and administration of the necessary works for the operation of the district, the Commission can proceed immediately to pass over the administration and operation of the same to the users, under the terms of this law and its regulations. The districts will then be operated, preserved and maintained by the users, themselves who will organize themselves according to the criteria for association defined by the law.

Each irrigation district will establish a water committee which will set the regulations for the district. This will act as the decision-making body for the adequate managing of the water and of the infrastructure. The users in the irrigation districts are obligated to use the water and the services according to the regulations and to pay quotas for the irrigation service which have been agreed on by the users themselves, and which will have to cover at least the administration and operational costs of the service as well as the costs of conservation and maintenance of the works. These quotas will be submitted to the authorization of the Commission, which could object if they do not comply with the abovementioned requirements.

Article 71 states that the federal executive will encourage the organization of producers or farmers and the construction of the necessary infrastructure for setting up irrigation districts.

v) Use for the Generation of Electricity

Article 78 says that the Commission, on the basis of its national resource use studies and plans, can grant the right to water use to the Federal Electricity Commission (CFE) administratively, which grant will determine the volume to be used for the generation of electricity and for cooling the plants, as well as the conditions terminating the grant.

The Commission will programme the periodic extraction of the water from each river or lake or any public water deposit and its distribution, to coordinate the use for hydroelectricity with the other uses of the water. This situation, where the authority determining the operational regulations of the dams is not the hydroelectricity authority, is very novel in Latin America and the Caribbean. In most of the countries, it is the hydroelectricity sector which sets the operation of the dams according to its needs, with no express intervention of the rest of the users of the water system.

Article 79 states that the Federal Executive decides who builds the hydraulic works, case by case, whether it be the Water Commission or the Federal Electricity Commission.

v) Flash flood control and flood protection

The Commission, in coordination with municipal or state governments, is empowered to build and to operate works for flood control and for the protection of areas susceptible to inundation. For this, the Commission will classify the areas according to flood risk, and issue the necessary regulations and recommendations for operational, control and follow-up measures, and will apply contingency funds for this purpose.

The Commission will also intervene when water emergencies occur or are caused by external climatological phenomena, always in coordination with the competent authorities.

vi) Prevention and control of water pollution

The Commission will be responsible for promoting, building and operating federal infrastructure and the necessary services for the preservation, conservation and improvement of the quality of the water in the riverbasins and aquifers.

It will also design integrated water resource protection programmes, and will set the specific discharge standards that are required for waste waters that are generated by whatever means and

monitor their observance. It will be empowered to authorize the dumping of waste waters into the sea, under conditions agreed upon in cooperation with the Secretariat of the Navy.

The Commission will also control the quality of the water for human consumption; will promote the adoption and application of disposal methods for garbage, waste and toxic materials, sludges, etc. that contaminate underground or surface waters, and will exercise its responsibilities for the prevention and control of pollution, and for its monitoring and policing.

The Commission is the body responsible for setting the standards for discharges, determining the assimilation and dilution capacity of the national water bodies and the pollutant charges that these can receive, as well as quality goals and timetables. Both legal persons and individuals will require a permit from the Commission for discharging waste waters into water bodies, whether intermittently, permanently or fortuitously. The Commission, previous to the granting of permits, will have to develop a classification of the water bodies.

When the waste could potentially affect the sources of drinking water supply or could affect public health, the commission will deny the permit and/or will revoke previously granted permits.

The Commission can order the suspension of activities giving rise to the discharge of waste water without a permit, or when the quality of the water discharged is not in conformity with the regulations, when payment for the right to use or exploit goods in the public domain, such as receiving water bodies are in arrears, or when those responsible for the discharge use a dilution process to meet the established standards.

vii) The hydraulic infrastructure

With respect to water infrastructure, the law states that the water users can, themselves or through third parties, build the hydraulic infrastructure works that are required for the development, use or exploitation of the water resource. The administration and operation of these will be the responsibility of either the individual users or the user associations.

The Commission will be empowered to establish regulations or take action to prevent the construction or operation of works that alter the state of the water in a river or endanger the life of persons or the safety of their goods.

It is considered in the public interest to foster and encourage the participation of private individuals in the financing, construction and operation of hydraulic infrastructure. Therefore, the Commission will be empowered to negotiate contracts with private individuals for the development of public works and services. It will be empowered to grant partial or total concessions for the operation or preservation of the hydraulic infrastructure built by the federal government and for the supply of the respective services. It will be empowered to grant partial or total concessions for the building, equipping and operating of the federal hydraulic infrastructure and for providing the respective services.

In the cases of the abovementioned partial or total grants, the Commission will fix the minimum bases for tenders. The selection will be made on the basis of the minimum tariffs that answer to the criteria of seriousness, reliability and quality, established in the bases for each particular case.

viii) Tariffs and costs recovery

The minimum tariff has to encourage the efficient use of water, discourage excessive use, anticipate necessary adjustments for variations in costs, according to known and measurable indicators, and specify a given time period, that at no time can be less than the period required to recover the capital investment.

Finally, the law refers to the recovery of public investment. Federal investments will be recovered according to the improvements tax law for federal public hydraulic infrastructure works, through the establishment of quotas to be paid by the persons benefiting.

The operational, conservation and maintenance costs, will have to be charged to the users of the services. In the case of the irrigation districts and irrigation units, land titles or, in the case of "ejidatarios" or communes, titles to the use or exploitation of plots can be used as guarantees.

Finally, it states that the development, use or exploitation of public waters, including groundwater, will be subject to payment, by the users, of the quotas established by the Federal Law of Rights.